North American Journal of Fisheries Management
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/ujfm20

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Available online: 10 Nov 2011

To cite this article: Ben Beardmore, Wolfgang Haider, Len M. Hunt & Robert Arlinghaus (2011): The Importance of Trip Context for Determining Primary Angler Motivations: Are More Specialized Anglers More Catch-Oriented than Previously Believed?, North American Journal of Fisheries Management, 31:5, 861-879

To link to this article: http://dx.doi.org/10.1080/02755947.2011.629855

North American Journal of Fisheries Management 31:861–879, 2011

ISSN: 0275-5947 print / 1548-8675 online
DOI: 10.1080/02755947.2011.629855

ARTICLE

The Importance of Trip Context for Determining Primary Angler Motivations: Are More Specialized Anglers More Catch-Oriented than Previously Believed?

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Abstract

Most conclusions from general assessments of angler motivations indicate that noncatch motives are more important to anglers than catch motives. Such research usually assesses the general motivation structure by anglers. To assess both general and more context-specific angler motivations, we surveyed the same anglers from northeastern Germany using two phases of a complementary survey design. First, a 1-year diary was used to collect trip-specific information; second, a personalized mail survey was used to elicit context-specific motivation information. Anglers selected their most important motives for their most frequent trip–target species combination (i.e., context) from a list of 10 salient fishing motives. Anglers frequently cited catch motives as the most important across a range of target species, large-bodied species such as northern pike *Esox lucius* being primarily associated with trophy fishing. Some species (such as small-bodied cyprinids) were targeted for noncatch reasons, while others (such as European perch [also known as Eurasian perch] *Perca fluviatilis*) attracted anglers seeking a multitude of psychological outcomes. Five distinct angler types were identified based on similarity of prime fishing motivation, namely, trophy-seeking anglers; nontrophy, challenge-seeking anglers; nature-oriented anglers; meal-sharing anglers; and social anglers. Members of these angler groups were similar in demographics and general angling behaviors but differed with respect to several indicators of angler specialization, indicating that committed anglers are more catch-oriented than previously assumed.

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Received November 12, 2010; accepted May 26, 2011

Ever since the pioneering work on angler motivations by Driver and colleagues (e.g., Driver and Knopf 1976), many researchers have grappled with the question, "Why do people go fishing?" Motivations (i.e., the underlying forces that act on a tendency to engage in an activity with an expected outcome; Atkinson 1969) have received considerable attention by researchers studying the human dimensions of recreational fisheries (Ditton 2004). Most researchers agree that fishing, and more generally outdoor recreation, is a goal-oriented behavioral process, in which anglers choose behaviors to achieve desired psychological outcomes (Driver 1985; Manfredo et al. 1996). Understanding motivations can help managers to design policies and interventions that align with anglers' expected outcomes (e.g., Driver 1985; Fedler and Ditton 1994).

Reasons for fishing relate to either angling-specific aspects of the experience (e.g., a desire to fulfill catch-related psychological outcomes) or more general psychological outcomes that are not specifically related to the process of catching a fish, usually referred to as noncatch motives (e.g., a desire to relax, to experience solitude, or for affiliation; Fisher 1997). Methodologically, angler motivation researchers have primarily asked respondents to rate the importance of both activity-general and activity-specific aspects of the fishing experience to measure underlying latent motivation dimensions (reviewed in Fedler and Ditton 1994; Manfredo et al. 1996). With ratings from anglers for each stated motive in a scale consisting of many different dimensions and aspects (i.e., items) such measurements capture the importance of multiple expected psychological outcomes that are often assessed as general fishing motives by anglers (e.g., Fedler and Ditton 1994; Wilde and Ditton 1999; Ross and Loomis 2001). Because participants might fulfill multiple outcomes simultaneously from their fishing activity (Hendee 1974; Driver and Knopf 1976; Fedler and Ditton 1994), this approach is well suited to reveal the general motivational structure of recreational fishing. A detailed assessment to measure more trip-specific motivations, however, would present a considerable burden on respondents if asked to complete the response task for every type of fishing trip undertaken and has, therefore, not been attempted in cross-sectional survey designs.

While the importance of catch and noncatch motives varies among angler groups (Fedler and Ditton 1994; Aas and Kaltenborn 1995; Wilde et al. 1998), most motivation researchers have concluded that noncatch motives are more important than catch-related motivations as reasons to fish (defined generally), based on analyses aggregated to the population or subpopulation level (e.g., Moeller and Engelken 1972; Driver and Knopf 1976; reviewed in Fedler and Ditton 1994; Ditton 2004). Some fisheries biologists and managers have become concerned about the managerial applicability of these findings. Arguments for example revolved around the observation of unexpectedly strong opposition by anglers to the implementation of restrictions on their catch and harvest opportunities, despite the supposedly high importance placed by angler on noncatch motives relative to catch aspects (e.g., Matlock et al. 1988; Matlock 1991). Many social scientists studying anglers believe that the "cynicism" (Hunt et al. 2002) among some fishery managers and biologists about the practical applications of motivational information has arisen from misunderstandings of survey data or underlying research concepts (e.g., Ditton and Fedler 1989; Peyton and Gigliotti 1989; Arlinghaus 2006). In particular, the issue of trip context is germane to the argument because one cannot expect that general human dimensions concepts, such as the importance that anglers attach to aspects of fishing in general, will explain preferences and behaviors associated with specific types or experiences of fishing (e.g., fishing on a specific water body; Peyton and Gigliotti 1989). Therefore, angler rejection of new catch and harvest constraints on a given fishery is consistent with research that concludes that noncatch motives, in general, are more important to anglers than are catch motives because this does not imply that catching fish is unimportant (Peyton and Gigliotti 1989).

Using the general motivation assessment approach mentioned above, researchers have studied the general structure of the fishing experience in many different applications (e.g., Moeller and Engelken 1972; Driver and Knopf 1976; Fedler and Ditton 1994). Researchers have also long realized that different anglers hold different motivations for fishing (e.g., Driver and Cooksey 1980). Recreation specialization (Bryan 1977) represents one possible reason why different anglers should have different motives for fishing (Ditton et al. 1992). This multidimensional concept (Bryan 1977; Ditton et al. 1992; Scott and Shafer 2001) proposes a range of anglers, from beginner to expert, associated with cognitive (e.g., increasing levels of knowledge and skill), psychological (e.g., centrality of the activity to one's lifestyle and one's commitment to engaging in the activity), and behavioral dimensions (e.g., frequency of participation in an activity; Buchanan 1985). More specialized anglers are more committed and avid (Bryan 1977) and are more dependent on a specific resource to meet their experience preferences (Ditton et al. 1992). While the most specialized anglers in many environments may be less motivated by consumptive motives (Bryan 1977; Ditton et al. 1992), the opposite might hold for more specialized anglers targeting species of high culinary value in different cultural spheres (Dorow et al. 2010). Therefore, depending on the context and culture for fishing, more specialized anglers may engage in voluntary catch-and-release fishing, while in another context the very same specialized anglers might harvest all caught fish. Therefore, motivations by anglers differing by degree of specialization, and equally specialized anglers in different cultural environments might be more variable than previously assumed.

There is an increasing recognition of the importance of context among researchers who have studied the motivations of anglers. For example, the species targeted by anglers (Siemer and Brown 1994; Wilde and Ditton 1999) and the social setting for the activity (e.g., Ross and Loomis 2001; Arlinghaus and Mehner 2004) have been found to influence the importance of specific motivations of anglers. While these studies revealed that

catch is more important to some angler groups than to others (e.g., Ross and Loomis 2001; Hutt and Neal 2010), noncatch aspects of the fishing experience were usually reported to be more important than catch aspects across most angler groups (Ditton 2004). Many anglers actually participate in many different types of fishing, which compromises approaches classifying anglers into specific groups based on a single fishing activity. Consequently, considering anglers to have identical motivations for all trip contexts lacks the specificity required to connect motivations to specific angling behaviors. Therefore, making the link between motivations and behaviors requires not only an understanding of heterogeneity among anglers (e.g., recreational specialization), but understanding the intra-angler heterogeneity arising from changing contexts for each fishing trip. This second need is clearly an area where research is required.

We were interested in further understanding how trip context shapes the primary motivations of anglers. To this end, we tested an innovative survey approach to assess angler motivations across a wide range of angling activities. Our objectives were to (1) account for within-angler variation in trip contexts (as defined by choice of target species and fishing site) when assessing primary angling motives, (2) identify groups of anglers with similar context-specific motivations, and (3) test whether these groups differ both in their degree of angler specialization and fishing behavior. We hypothesized that adding trip context to angler motivation assessment would better reveal the importance of catch motives to anglers, or at least to some angler types, based on the assumption that the ability of an angler to fulfill certain catch expectations is dependent on the biological characteristics of the species being targeted. By testing this assumption, we hoped to contribute towards resolving management-oriented conflicts about the importance of catch to anglers.

METHODS

Participant sampling.—Our study area was the German state of Mecklenburg-Vorpommern, which is located in the northeastern lowlands of Germany. This state offers anglers diverse, multilocation, multispecies fishing opportunities, including fisheries in salt water on the Baltic coast, freshwater in over 2,000 inland standing water bodies larger than 1 ha (Winkler et al. 2007) and several river networks and canals. Managing the recreational fishery in Mecklenburg-Vorpommern is complex. Coastal waters are managed directly by the state, and freshwater fishing rights are split between angling clubs (organized in a state angling association) and several commercial fisheries operators selling angling licenses (Daedlow et al. 2011). Recreational fishing is a popular pastime in Mecklenburg-Vorpommern; about 387,000 people age 14 and older are engaged in fishing (Dorow and Arlinghaus 2011). Participation rates in fishing are highest in Mecklenburg-Vorpommern among all of the 16 states in Germany (Arlinghaus 2004).

We sampled resident anglers (originating within the state of Mecklenburg-Vorpommern) and nonresident anglers (originating from seven bordering states) who planned to fish in Mecklenburg-Vorpommern between September 2006 and August 2007. Participants were selected from a random sample of state fishing license holders supplemented by anglers recruited by random digit dialing (Dorow and Arlinghaus 2011). All anglers were interviewed by phone to provide demographic and other angler characteristics (e.g., angler experience). In total, 1,121 anglers were recruited into a 1-year angling trip diary program that asked for trip-level information, including target species, catch, harvest, and location (see for details Dorow and Arlinghaus 2011). During the diary period, four telephone contacts were conducted to keep participants motivated in the study and to clarify any emerging concerns or questions. After 1 year, a fishing reel was sent to all participants as an incentive promised at the onset of the study. These efforts resulted in 648 completed and returned diaries, which contained at least one recorded trip (response rate: 58%). Of these, 31 respondents were excluded from further analyses because they were unique in exclusively targeting rare species in small private ponds or because they provided insufficient data about their trips.

For the remaining 617 respondents, a 20-page follow-up mail survey, which was pretested intensively with 40 anglers in personal sessions, was mailed in October 2008. The focus of this self-administered questionnaire was to supplement the behavioral information derived from the diaries and the telephone interviews with additional information about the anglers. We added questions on general and context-specific angler motivations to this survey. Survey procedures were based on the tailored design method (Salant and Dillman 1994), which included a reminder postcard and replacement survey sent to nonrespondents at 2-week intervals after the initial mailing. As an additional incentive, the survey package included (1) a summary of angler trip information from the diary for the sample as a whole, (2) a personalized insert summarizing the angler's personal diary, and (3) a fishing lure. Using information from the diary, we personalized the follow-up motivation survey by reminding respondents of the types of fishing trips they had taken (i.e., targeting certain species at specific locations), thus enabling us to elicit motivation information associated with specific trip contexts.

Angling motivation assessment.—The importance of various angling motivations to respondents was measured in two ways, with both approaches relying on the same list of 10 motivation items (Figure 1). As Finn and Loomis (2001) noted, research on catch motives has lagged behind noncatch motives. Consequently, our item list emphasized catch-related motivations, adding three of the most salient noncatch-related motivation dimensions (described by Sutton 2007): socializing (represented by the item "to be with friends/family"), enjoying nature (represented by the item "to experience nature"), and enjoying solitude (grouped by Sutton 2007 in a domain representing relaxation). Seven catch-related items were used to represent two distinct subdimensions within catch motives reported by Sutton (2007), i.e., catching fish (trophy, large numbers, or

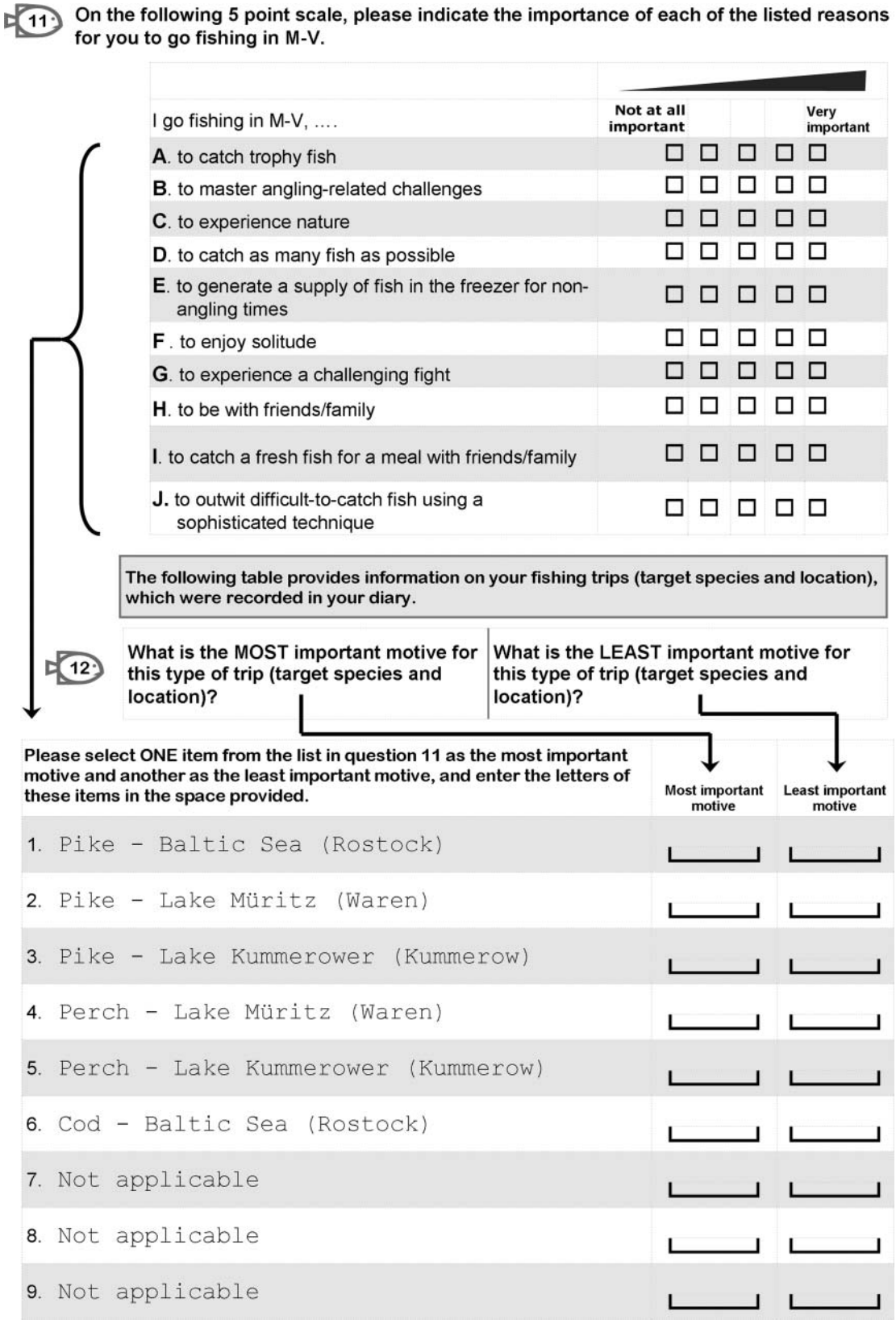

FIGURE 1. Form used to obtain angler responses to 10 classic questions about motivations for fishing and personalized fishing trip descriptions in Mecklenburg-Vorpommern (M-V), Germany (translated from German).

both) and retaining fish. Some items were taken verbatim from Sutton (2007) and translated to German, modifying the wording to reflect common jargon; however, some additional changes were made to other items from the original list. First, we split the item "to catch fish for eating" presented by Sutton (2007) into two items reflecting both immediate ("to catch a fresh fish for a meal with friends/family") and future consumption ("to generate a supply of fish in the freezer for nonangling times"). While these two items both relate to eating fish, in the context of selecting a particular target species, we considered these two aspects to be different enough to warrant separate treatment. We also supplemented the traditional challenge-seeking item, "to master angling-related challenges" by adding the item, "to outwit difficult-to-catch fish using a sophisticated technique." This change reflected our belief of a conceptual difference between the general challenge of fishing and the additional challenges associated with targeting potentially wary fish with a particularly sophisticated method (e.g., fly fishing).

The first assessment of angler motivations in our survey (Figure 1) replicated the traditional approach of angler motivation research (e.g., Driver and Knopf 1976; Fedler and Ditton 1994). Accordingly, respondents were asked to rate the level of importance from 1 (not at all important) to 5 (very important) for each of the 10 reasons to go fishing in Mecklenburg-Vorpommern. This task served two important purposes. First, it familiarized respondents with all reasons, which were used in the context-specific task. Second, it allowed us to uncover the underlying structure of the scale via exploratory factor analysis. This exploration was necessary because our study introduced new items in the motivation scale. Factor analysis with varimax rotation was used to group the 10 items (reasons) into motivation domains. For factors with eigenvalues greater than 1.0 and factor loadings greater than |0.4|, a reliability analysis using the Cronbach alpha criterion was used (Nunnally and Bernstein 1994). Items were combined into factors if reliability was greater than 0.6 (Nunnally and Bernstein 1994), and the mean values from the items within a factor provided indices of each angler's motivational importance for each factor. To compare the importance of individual angling motives, pairwise comparisons between factor item means and individual item means not grouped into factors were conducted using Bonferroni-Holm-adjusted Wilcoxon's signed ranks tests for dependent samples (Holm 1979).

The second, context-specific approach to assessing angler motivations relied on data from the diary to tailor each survey to the specific experiences of the respondent from the previous year. This tailoring aided respondent's recall of their context and allowed us to test for the context-dependency of prime angling motivations. We defined each context as a combination of target species and location. To account for larger water bodies with multiple points of road access, the location description included the nearest town. Across the entire sample of anglers, 757 distinct locations and 9 focal freshwater and marine fish species or species groups were included in the study. To limit the burden on respondents, each personalized questionnaire focused on a maximum of three species and three locations that each angler had previously directed most of his or her effort as reported in the diary (Figure 1). Therefore, a single respondent evaluated up to nine different contexts. For 68% of the sampled anglers, these nine potential contexts accounted for all trips reported in their diary.

We did not examine motivations for specific fishing sites because with few exceptions fewer than five anglers visited any particular site. Nevertheless, including site-specific references in the motivation assessment gave respondents multiple opportunities to evaluate their motives for targeting a particular species by providing additional and salient context. The following nine freshwater and marine species or species groups were included in the study: common carp *Cyprinus carpio*, coarse fish (small-bodied cyprinids such as roach *Rutilus rutilus* and bream *Abramis brama*), Atlantic cod *Gadus morhua*, European eel *Anguilla anguilla*, European perch (also known as Eurasian perch) *Perca fluviatilis*, northern pike *Esox lucius*, Atlantic herring *Clupea harengus*, a "flatfish" species group (marine species such as European flounder *Platichthys flesus*, turbot *Psetta maxima* and sole *Solea solea* [also known as *Solea vulgaris*]) and zander *Sander lucioperca*. Species groupings for coarse fish ("Weissfische") and flatfish ("Plattfische") were used because they coincide with common angling terms used to define fishing targets, much as North American anglers report targeting "panfish."

To reduce respondent burden, we restricted the focus of inquiry to the most salient motives associated with each context (Figure 1). Respondents were asked to indicate the single most important and least important reasons from the previously mentioned list of 10 items for choosing each context. As such, respondents were forced to differentiate among the items on the list rather than evaluate each motive item independently. Asking for both the most and least important motive is similar to the maximum difference conjoint approach in choice modeling (Flynn et al. 2007; for an application to recreational fishing see Dorow et al. 2009). The validity of combining assessments of both the most and least important motive in a single analysis, however, is predicated upon the assumption that the choice (i.e., preference) process for the least important item is inversely proportional to that of the most important (Flynn et al. 2007), an assumption that did not hold in our case. Therefore, the least important motivations were dropped from further analysis, which does not violate the theoretical foundation for the statistical analysis of the most important data.

For each angler, we weighted the most important motivation by the relative effort that the angler expended on that fishing context, which allowed us to plot the relative effort per motive for each species. Species-specific effort was measured in hours of directed fishing as recorded in the diary and scaled between 0 and 1. For example, if a respondent directed all of his or her angling effort in Mecklenburg-Vorpommern to a single species and location, their most important motivation was allocated a

weight of 1. A species–location combination that received 9% of an angler's total effort was weighted 0.09, such that the sum of all weights over all contexts for a given angler equaled 1. In this way, anglers who fished for multiple species and (or) visited multiple fishing sites were not overrepresented in the analysis. Thus, the species-specific motivational profiles reflected anglers' effort for each species across multiple locations, while treating each angler as a sampling unit.

The context-specific responses were also used to classify respondents into clusters using effort-weighted motives to create an individual angler's motivational profile. Adopting the approach by Specziár and Rezsu (2009) to classify feeding guilds among fish by gut content analysis, we grouped anglers into motivation clusters by using criteria of motivational similarity. The classification for measuring the degree of motivational overlap among individual anglers was based on matrices of the Czekanowski overlap index (Krebs 1989). The overlap index was calculated for each pair of anglers as

$$D_{jk} = \sum_{i=1}^{m} (\min p_{ij}, p_{ik}),$$

where D_{jk} is the motivation overlap between angler j and k in the sample of n anglers, p_{ij} and p_{ik} are the proportions of effort where motivation i was considered most important to anglers j and k, and m is the total number of motivations. The index ranges from 0 (no overlap) to 1 (complete overlap; i.e., identical motivation profiles between two anglers). After calculating the index for each pair of anglers in the sample, the resulting $n \times n$ similarity matrix was subjected to Ward's hierarchical cluster analysis using a squared Euclidean distance measure. The final number of classes was chosen to coincide with the increase in slope of proximity coefficient, signaling substantial increases in difference among cluster groupings (Aldenderfer and Blashfield 1984). The effort attributable to each motivation was then described for each resulting angler cluster. The clusters were compared on angler characteristics that were obtained in the telephone and mail surveys, including sociodemographic information (e.g., age, education levels); recreation specialization (Bryan 1977), as defined by the amount of time (e.g., number of fishing trips per year, years of fishing experience); money invested (e.g., rates of boat ownership, angling holidays); and centrality-to-lifestyle (Kim et al. 1997), which was measured on a scale of seven statements, each rated from 1 (strongly disagree) to 5 (strongly agree). These items were subjected to factor analysis, revealing a single factor with high reliability ($\alpha = 0.82$). Consequently, the item mean for each respondent was taken as an indicator of centrality to lifestyle.

Additional comparisons of species-specific fishing behaviors among angling subgroups were conducted using information from the angling diary, including the distribution of effort among species, travel distance, catch per unit effort (CPUE), retention rate, and the size of the largest retained fish. For each of these calculations, we first summarized data across all trips for each angler and then compared across anglers. Categorical data were analyzed using Pearson's chi-square tests; metric or quasi-metric data were analyzed using one-way analysis of variance (ANOVA) and appropriate post hoc tests (Tukey for homogenous variances, Dunnett T-3 for heterogeneous variances). All statistical analyses were conducted with SPSS/PASW 18 at $\alpha = 0.05$. In comparing angler clusters, a less conservative significance value ($P \leq 0.10$) was used due to small sample sizes.

RESULTS

Survey and Sample Description

Of 617 surveys mailed to diary participants, 463 surveys were returned, for an effective response rate of 79% (discounting 34 nondeliverable surveys). These respondents comprised 41% of all anglers initially recruited into the diary program 2 years earlier. An assessment of nonresponse bias between the respondents to the mail survey and nonrespondents, who were initially recruited into the random sample in Mecklenburg-Vorpommern (from where diary participants originated), was conducted using information collected during telephone interviews from 2006. Respondents were somewhat older than nonrespondents and tended to be more avid anglers, fishing more frequently at both coastal and freshwater sites. Based on the differences in avidity and demographics between mail survey respondents and nonrespondents, we caution readers from generalizing the findings of this study to the overall angler population level in Mecklenburg-Vorpommern.

General Angler Motivations

Factor analysis of the motivational importance rating task revealed four general factors (i.e., latent domains): (1) challenge of fishing, (2) catching and consuming fish, (3) setting, and (4) socializing. However, Cronbach's alpha reliability coefficients indicated an acceptable level of reliability only for the two catch-related dimensions (Table 1), which together accounted for all catch-related motives. The challenge factor captured all challenge-oriented items ("to master angling-related challenges; to outwit difficult-to-catch fish using a sophisticated technique; to experience a challenging fight") and the trophy fish item ("to catch trophy fish"), suggesting that catching exceptionally large fish is generally considered a challenging aspect of fishing. The item emphasizing the importance of catching large numbers of fish ("to catch as many fish as possible") and both consumption items ("to catch a fresh fish for a meal with friends/family; to generate a supply of fish in the freezer for nonangling times") formed one factor indicating the consumptive aspects of fishing. By contrast, the noncatch motivations ("to experience nature; to enjoy solitude; to be with friends/family") did not produce a reliable underlying latent motivational factor, which reflected the unique constructs underlying each of the three activity-general items included in the survey.

Wilcoxon rank-sum tests comparing the means of the catch-related factors with the item means for the noncatch motivations

TABLE 1. Descriptive statistics, factor loadings, and contrasts for general angler motivations based on importance ratings by anglers in Mecklenburg-Vorpommern, Germany; α = Cronbach's reliability measure.

		Descriptive statistics[a]			Factor loadings[b]				Wilcoxon's rank-sum test (Z score[c])			
Motivation	Wording in survey	N	Mean	SE	Challenge	Consumption	Setting	Social	Consumption	NATURE	SOLITUDE	SOCIALIZE
Challenge ($\alpha = 0.782$)		447	2.96	0.047					***−7.66***[d]	***−15.78***[e]	***−5.20***[d]	***−6.25***[e]
MASTER	To master angling-related challenges	447	2.95	0.058	0.789	0.125	0.007	0.115				
OUTWIT	To outwit difficult-to-catch fish using a sophisticated technique	448	2.83	0.065	0.783	0.110	−0.010	0.014				
FIGHT	To experience a challenging fight	450	3.29	0.060	0.778	0.079	0.125	0.045				
TROPHY	To catch trophy fish	447	2.78	0.058	0.653	0.382	−0.015	0.058				
Consumption ($\alpha = 0.620$)		445	2.58	0.042						***−16.51***[d]	***−9.75***[d]	***−10.81***[d]
NUMBERS	To catch as many fish as possible	449	2.57	0.055	0.363	0.664	−0.116	0.017				
MEAL	To catch a fresh fish for a meal with family/friends	453	3.39	0.057	0.154	0.668	0.110	0.365				
FREEZER	To generate a supply of fish for nonangling times	445	1.76	0.049	0.076	0.808	−0.031	−0.098				
Setting ($\alpha = 0.439$)												
NATURE	To experience nature	456	4.39	0.046	0.183	−0.227	0.663	0.419			***−13.25***[d]	***−11.93***[d]
SOLITUDE	To enjoy solitude	452	3.35	0.057	−0.037	0.091	0.875	−0.224				−.624[e]
Socialize (α = N/A)												
SOCIALIZE	To be with friends/family	447	3.40	0.060	0.070	0.092	−0.066	0.893				
Valid N (listwise)		434										

[a]Items were rated from 1 (not at all important) to 5 (very important).
[b]Cumulative variance explained = 0.6940.
[c]Bold italics indicate statistically significant differences at $P < 0.001$ (Bonferroni–Holm corrected).
[d]Based on positive ranks.
[e]Based on negative ranks.

revealed significant differences between all motivations, except between enjoying solitude and being with friends and family (Table 1). On average, respondents rated noncatch motivation items as more important than the overall catch motivation factors and experiencing nature as the most important fishing motive (mean = 4.4 on a scale from 1 = not at all important to 5 = very important as a reason to fish in the study area), followed by being with friends and family (3.4), and enjoying solitude (3.4). The challenge motive factor (3.0) and consumptive motive factor (2.6) were rated significantly lower. The only catch items with an average item score greater than three were "to catch a fresh fish for a meal with family/friends" and "to experience a challenging fight," indicating that occasional consumption of fish and the challenge associated with landing a fish were rated similarly to two noncatch motives, namely "to be with friends/family" and "to enjoy solitude." The frequency distribution of ratings for each of the 10 motives (Figure 2) highlighted the consistency with which anglers rated the importance of noncatch motives, whereas the ratings of the catch motives exhibited considerably more variation among individuals.

Context-Specific Angler Motivations

When anglers were asked to indicate the single most important reason for targeting a particular species–location combination, catch motives featured prominently as the primary reason to target many species (Figure 3). Despite all fish species attracting each of the 10 individual catch and noncatch motivations to some degree, there were some noteworthy trends in the modes of the most prominent motivations for a given species. In particular, between 20% and 30% of effort directed at common carp, northern pike and zander was driven by the primary desire of catching trophy fish. By contrast, Atlantic herring, a marine schooling species offering a seasonal fishery with high daily catch rates, stood out as a species where catching as many fish as possible was frequently cited as the most important motivator of angling activity, accounting for 36% of the directed effort to

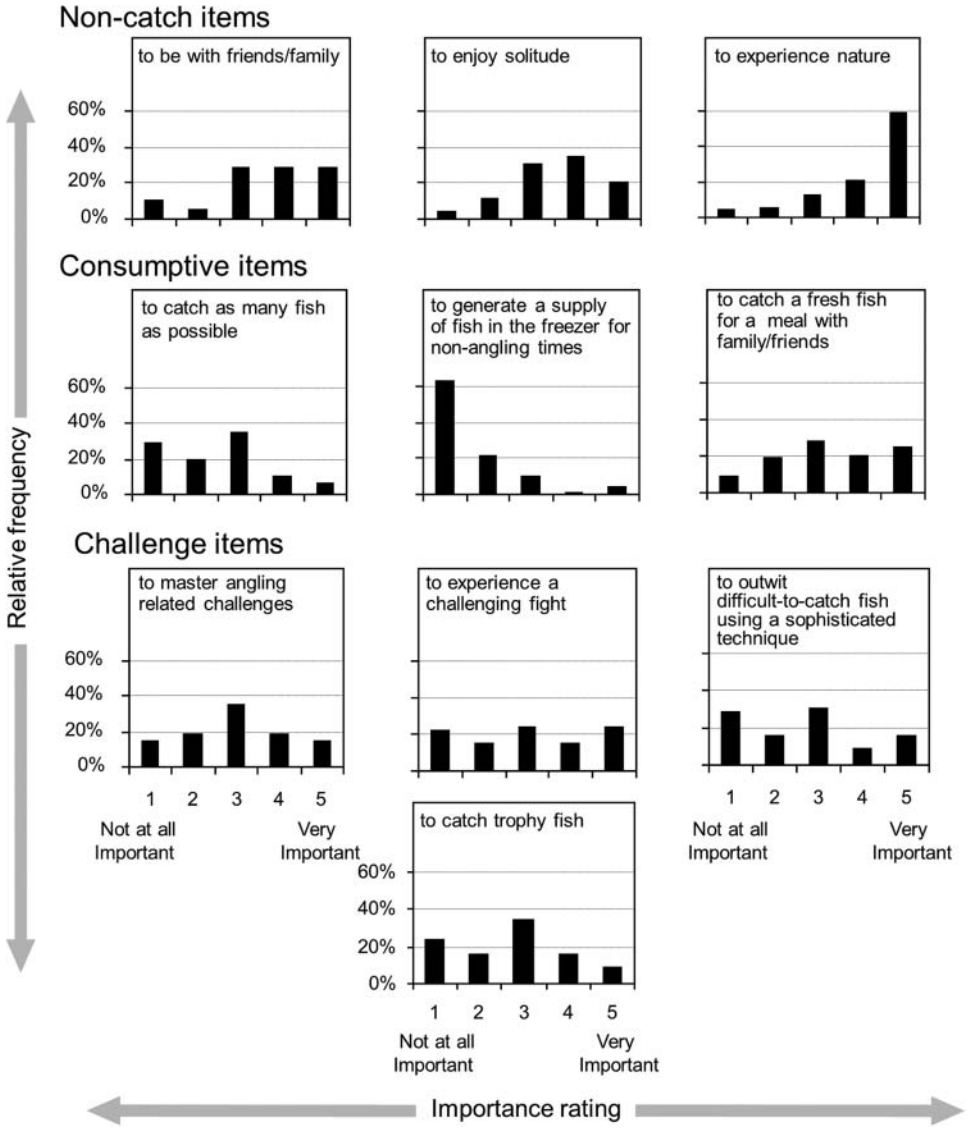

FIGURE 2. Frequency distributions of the importance of different motivations to anglers in Mecklenburg-Vorpommern, by broad motivational category.

herring. Small-bodied and abundant coarse fish such as roach and bream were frequently targeted to experience nature (30% of directed effort), and it is noteworthy that the motive "to enjoy solitude" was never cited as a reason for targeting coarse fish. The other freshwater (European perch), catadromous (European eel), and marine fish species (Atlantic cod, flatfish) were not associated with any single motive but attracted effort equally for two or more reasons. More than 10% of effort directed at perch and eel was primarily driven by the desire to experience nature, or by consumptive and trophy motives, and cod was targeted more than 10% of the time for socializing and experiencing a challenging fight. Flatfish attracted the most diverse motivations, 6 of 10 motives each accounting for more than 10% of directed effort. Overall, the species-specific motivation results indicated that catch-related motives and, thus, the expected catch outcomes provided by different fish species to anglers differed greatly among species.

Motivationally Similar Angler Types

We identified five distinct angler groups based on motivation similarity (Figure 4). Four clusters were clearly defined by their strong preference for a single primary motivation that accounted, on average, for more than 60% of their total directed effort; they were labeled accordingly. Members of cluster 1 ($N = 96$; 27% of the sample) fished primarily to experience nature and were, therefore, labeled "nature-oriented." Members of cluster 2 ($N = 75$; 21%) allocated a similar proportion of their effort to catching trophy fish; consequently, cluster 2 was termed "trophy-seeking." The members of the third cluster ($N = 48$; 14%) directed their effort primarily to be with friends and

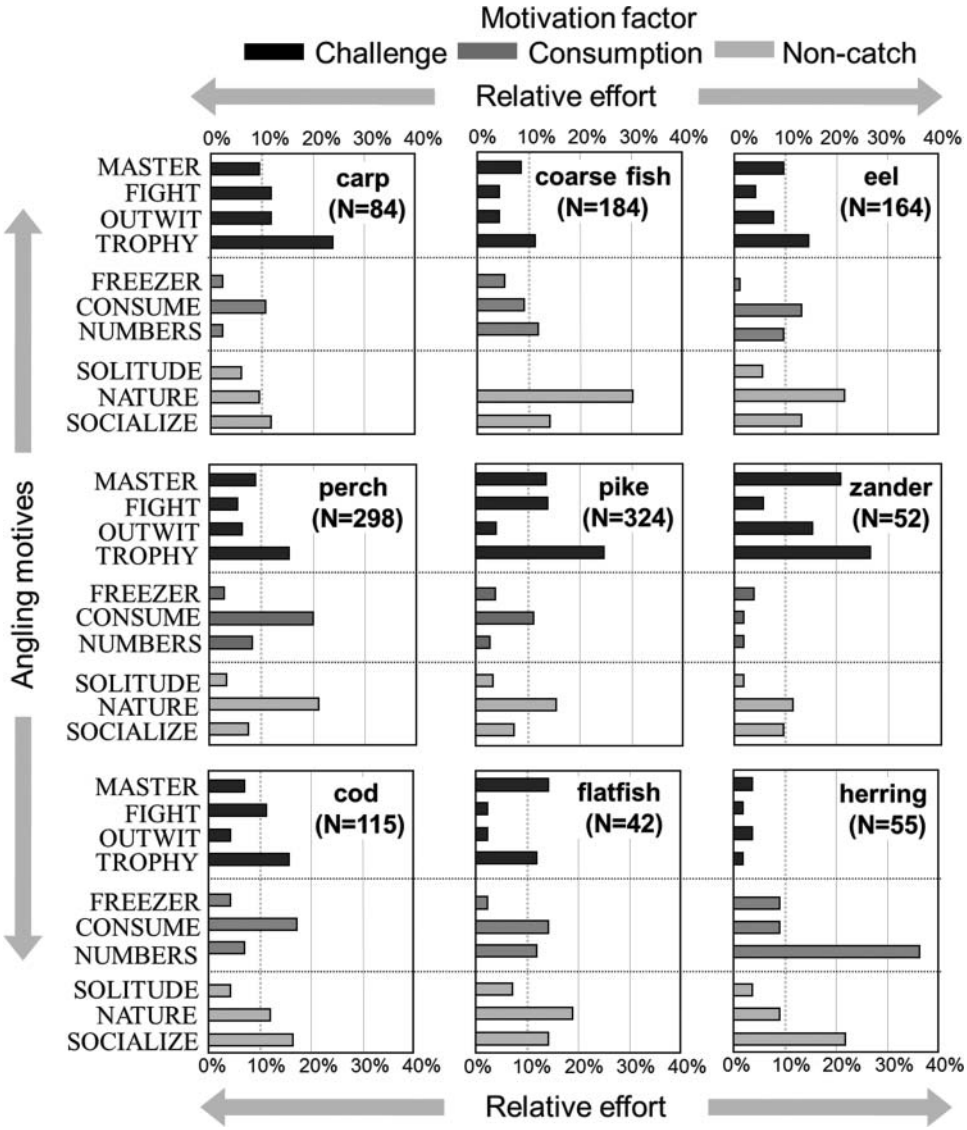

FIGURE 3. Relative effort associated with each of the most important motives for targeting nine different species or species groups by anglers in Mecklenburg-Vorpommern. The dashed line at 10% indicates the expected frequency if all motivations were chosen equally.

family, and this cluster, thus, was described as "social." Anglers in the fourth cluster ($N = 45$; 13%) directed effort primarily to obtain fish for a single meal with family and friends and were, therefore, considered members of the "meal sharing" cluster. For each cluster, less than 10% of effort was attributed to any other motive; however, for all clusters, the mean effort associated with each of the 10 motives was not zero. Members of the fifth cluster, which was the second largest ($N = 90$; 25%), showed no clearly predominant motive. These anglers tended to pursue fishing opportunities that offered various nontrophy related challenges associated with catching fish somewhat more often than did the other groups and were, thus, characterized as "nontrophy challenge-seeking." The hierarchical relationship among clusters documented that nature-oriented anglers were related most closely to trophy-seeking anglers, the remaining three clusters grouping together on a separate branch of the dendrogram (Figure 4).

Members of the five clusters did not differ on many sociodemographic characteristics; no statistically significant differences were apparent in gender, residency in Mecklenburg-Vorpommern, education, or household income. However, the clusters differed significantly by age (ANOVA: $F_{353} = 4.68$, $P < 0.01$), with social anglers being the youngest at an average 39.5 years of age (SE, 2.0), while consumptive anglers were the oldest at 49.6 years (SE,1.9; Tukey-adjusted $P = 0.03$).

Members of the motivational clusters differed in behavioral and attitudinal characteristics related to angler specialization and commitment (Tables 2, 3). Major differences appeared for years of fishing experience (ANOVA: $F_{353} = 2.69$, $P = 0.03$), social anglers being the least experienced (averaged

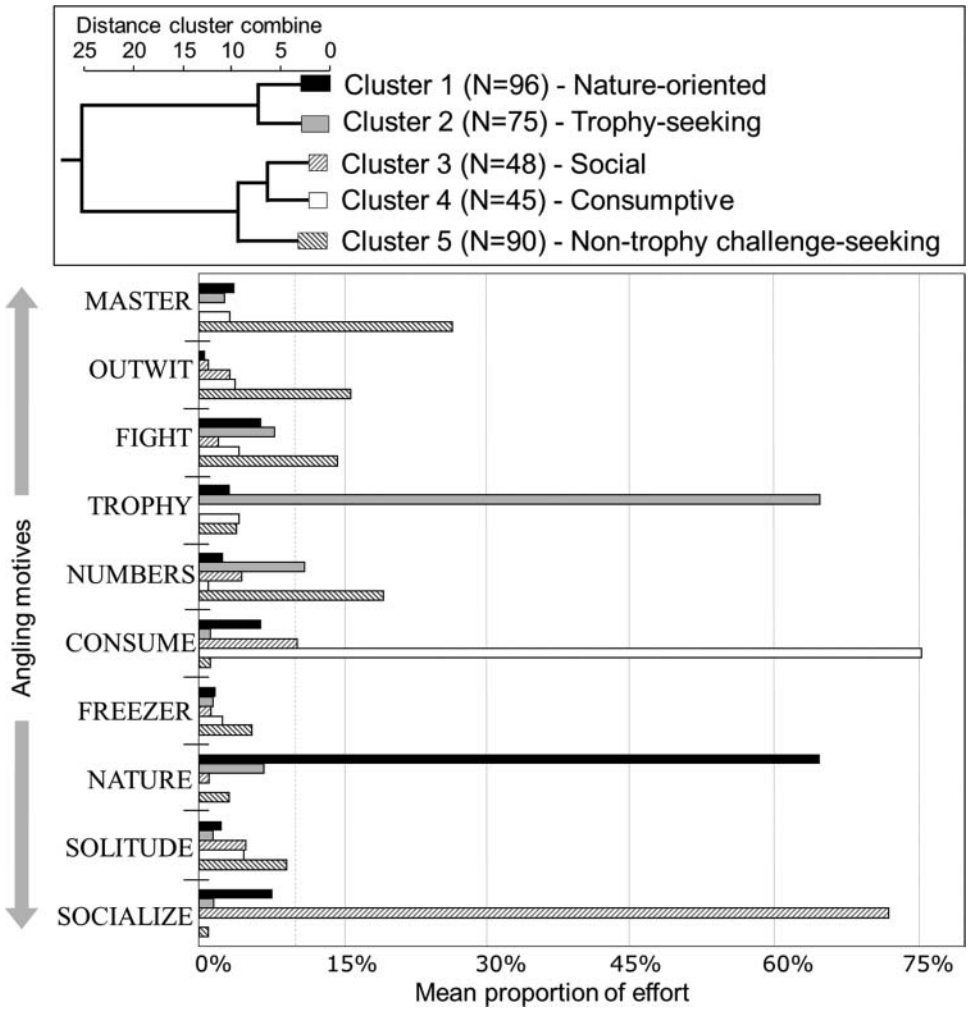

FIGURE 4. Hierarchical clusters based on the similarity of the most important angler motives and the proportion of their effort attributed to each motive by cluster. The scale on the dendrogram indicates the distance separating each bifurcation in the cluster analysis, and the width of the cluster boxes indicates the variation within the clusters.

16.5 years of experience) and meal-sharing anglers being the most experienced anglers (26.4 years; Tukey-adjusted $P < 0.01$). Nontrophy challenge seekers and social anglers were more likely to have taken an angling holiday outside Mecklenburg-Vorpommern during the study period than were meal-sharing or trophy anglers ($\chi^2 = 13.16$, df $= 4$, $P < 0.01$). Other variables were significant at the 10% level: boat ownership ($\chi^2 = 8.72$, df $= 4$, $P = 0.07$), average one-way travel distance (ANOVA: $F_{353} = 2.29$, $P = 0.06$), and centrality of angling to lifestyle (ANOVA: $F_{353} = 2.11$, $P = 0.08$). Social anglers tended to travel farthest to fish within Mecklenburg-Vorpommern. Nontrophy challenge seekers and trophy-seeking anglers had the highest mean centrality scores, followed by meal-sharing anglers; social and nature-oriented anglers exhibited the lowest scores. No statistically significant differences were found for membership in state angling associations ($\chi^2 = 7.66$; df $= 4$; $P = 0.11$) or local angling clubs ($\chi^2 = 10.49$; df $= 4$; $P = 0.23$), mean number of fishing trips in a year (ANOVA: $F_{353} = 1.52$, $P = 0.20$), or the average duration of fishing trips (ANOVA: $F_{353} = 1.22$, $P = 0.30$).

While differences among the five motivational clusters were not pronounced in demography or general angler behaviors, greater contrast among the five clusters was evident when more specific fishing behaviors and trip characteristics were compared across species (Tables 4, 5). Members within each cluster targeted each species to some degree, indicating that a particular species might fulfill various fishing motives as perceived by particular angler types (Table 4). The most targeted species, attracting more than two-thirds of each cluster, were northern pike and European perch, followed by 50–65% of anglers targeting European eel and coarse fish. Common carp and flatfish attracted less than one-third of anglers from each segment. Significant differences ($P < 0.05$) in the fraction of each cluster targeting a particular species were evident in European perch and Atlantic herring (Table 4). Perch attracted more consumptive and

TABLE 2. Characteristics associated with five motivational clusters for anglers from Mecklenburg-Vorpommern. Data are the numbers (*N*) and percentages of observations.

	Nature-oriented ($N = 96$)		Trophy-seeking ($N = 75$)		Social ($N = 45$)		Meal-sharing ($N = 48$)		Nontrophy challenge-seeking ($N = 90$)			
Characteristic	*N*	%	*N*	%	*N*	%	*N*	%	*N*	%	Pearson χ^2	*P*
Angling holiday >3d												
Yes	14	14.6	6	8.2	12	25.5	6	13.3	21	23.3	13.16	<0.01
No	82	85.4	67	91.8	35	74.5	39	86.7	69	76.7		
Boat ownership												
Yes	36	37.5	41	54.7	14	31.1	22	45.8	41	45.6	8.72	0.07
No	50	52.1	29	38.7	28	62.2	23	47.9	37	41.1		
Angling association membership												
Yes	58.4	60.8	46.1	61.5	29.5	65.6	27.7	57.7	55.3	61.4	7.66	0.11
No	32	33.3	25	33.3	26	57.8	15	31.3	38	42.2		
Angling club membership												
Yes	59	61.5	41	54.7	19	42.2	27	56.3	47	52.2	5.32	0.26
No	27	28.1	29	38.7	21	46.7	17	35.4	31	34.4		

trophy-seeking anglers and fewer social anglers than expected ($\chi^2 = 9.01$, $P = 0.05$), while herring attracted more nontrophy challenge-seeking and social anglers but fewer nature-oriented and trophy-seeking anglers than expected ($\chi^2 = 9.60$, $P < 0.01$). While differences between motivational clusters in mean one-way travel distance were small when aggregated across all species, differences in travel propensity and distance were more pronounced when examining travel behavior for anglers targeting particular species. Given that an angler targeted the species in question, average travel distance was generally greatest for the marine species: Atlantic herring, flatfish and Atlantic cod. For these species, social anglers tended to travel the shortest distance. The reverse was true for many freshwater species where social anglers traveled furthest.

Finally, we examined the catch and harvest behavior across clusters (Table 5). Overall, the species with the highest average CPUEs were the naturally the most abundant and small-bodied species (Atlantic herring, coarse fish and European perch), while zander, common carp, and European eel exhibited the lowest CPUE of all species examined. Herring and eel were associated with the highest retention rates of all species across angler types (>0.8), while retention rates for perch were comparatively low at 0.5–0.6. The CPUE, retention rate, and size of largest retained fish differed substantially among motivation clusters, with few

TABLE 3. Additional characteristics associated with five motivational clusters for anglers from Mecklenburg-Vorpommern. Data are means and SEs.

	Nature-oriented ($N = 96$)		Trophy-seeking ($N = 75$)		Social ($N = 45$)		Meal-sharing ($N = 48$)		Nontrophy challenge-seeking ($N = 90$)			
Characteristic	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	ANOVA *F*	*P*
Fishing experience (years)[a]	23.8 x	1.7 x	24.2 x	2 x	16.5 y	2	26.4 x	2.4 x	22.6 x, y	1.6	2.69	0.03
Annual number of trips	19.3	1.6	20.3	1.7	17.1	2.3	28.9	3.3	22.6	1.9	1.52	0.20
Average trip duration (h)	4.2	0.1	4.4	0.3	4.7	0.5	3.8	0.2	4.6	0.2	1.23	0.30
Average one-way travel distance (km)	36.8	6.4	29.1	7.1	52.1	9.9	19.6	2.8	42.5	6.5	2.29	0.06
Centrality scale item mean ($\alpha = 0.817$)[b]	2.3	0.1	2.5	0.1	2.3	0.1	2.4	0.1	2.6	0.1	2.11	0.08

[a]Common letters denote homogeneous subsets ($P < 0.05$) based on appropriate post hoc tests (Tukey for homogeneous variances and Dunnett T3 for heterogeneous, variances).
[b]Based on a single factor derived from the centrality to lifestyle developed by Kim et al. (1997).

TABLE 4. Species-specific targeting frequencies and distances traveled for five motivational clusters of anglers from Mecklenburg-Vorpommern. See Table 2 for sample sizes. Asterisks indicate significant differences at $P < 0.05$; common letters denote Tukey homogeneous subsets ($P < 0.05$) based on findings of variance homogeneity.

		Anglers targeting species			One-way travel (km)		
Species	Angler type	*N*	%	Pearson χ^2	Mean	SE	ANOVA *F*
Common carp	Nature-oriented	30	31	4.92	24.5	3.0	2.76*
	Trophy-seeking	25	33		24.6	5.0	
	Social	11	24		32.8	8.3	
	Meal-sharing	15	31		30.5	3.9	
	Nontrophy challenge-seeking	37	41		16	2.0	
Coarse fish[a]	Nature-oriented	61	64	6.11	25.3 x	3.0	4.37*
	Trophy-seeking	50	67		14.9 y	2.0	
	Social	26	58		19.0 xy	2.6	
	Meal-sharing	29	60		14.1 y	1.0	
	Nontrophy challenge-seeking	46	51		22.7 xy	2.1	
European eel	Nature-oriented	50	52	3.08	19.2 y	1.6	23.04*
	Trophy-seeking	39	52		23.6 y	2.7	
	Social	25	56		54.9 x	6.5	
	Meal-sharing	30	63		20.0 y	1.6	
	Nontrophy challenge-seeking	48	53		21.3 y	1.3	
European perch	Nature-oriented	66	69	9.01*	15.6 yz	1.0	12.74*
	Trophy-seeking	62	83		18.8 yz	2.2	
	Social	30	67		33.7 x	3.8	
	Meal-sharing	37	77		14.4 z	0.6	
	Nontrophy challenge-seeking	68	76		21.1 y	1.5	
Northern pike	Nature-oriented	76	79	8.66	26.2 y	2.2	15.9*
	Trophy-seeking	61	81		17.7 z	1.5	
	Social	32	71		39.0 x	4.5	
	Meal-sharing	38	79		15.4 z	0.7	
	Nontrophy challenge-seeking	75	83		24.9 y	1.3	
Zander	Nature-oriented	25	26	6.75	17.9 y	1.9	25.17*
	Trophy-seeking	26	35		17.7 y	4.5	
	Social	17	38		75.1 x	12.4	
	Meal-sharing	15	31		14.8 y	2.2	
	Nontrophy challenge-seeking	40	44		23.1 y	1.5	
Atlantic cod	Nature-oriented	42	44	6.57	68.1 y	6.3	8.09*
	Trophy-seeking	24	32		78.0 y	7.9	
	Social	28	62		42.6 z	4.3	
	Meal-sharing	21	44		59.1 yz	5.4	
	Nontrophy challenge-seeking	40	44		88.8 x	5.6	
Flatfish[a]	Nature-oriented	26	27	3.12	33.9 y	4.2	6.56*
	Trophy-seeking	16	21		68.6 x	4.4	
	Social	14	31		23.2 y	5.2	
	Meal-sharing	15	31		30.9 y	6.7	
	Nontrophy challenge-seeking	20	22		42.9 xy	5.8	
Atlantic herring	Nature-oriented	29	30	9.60*	32.3 y	5.5	4.24*
	Trophy-seeking	23	31		52.0 xy	11.1	
	Social	23	51		35.3 xy	3.2	
	Meal-sharing	18	38		51.8 xy	6.9	
	Nontrophy challenge-seeking	43	48		57.0 x	4.5	

[a]See methods.

TABLE 5. Species-specific catch per unit effort (CPUE), retention rates, and sizes of the largest fish retained among angler clusters from Mecklenburg-Vorpommern. Asterisks indicate significant differences at $P < 0.05$; common letters denote homogeneous subsets ($P < 0.05$) based on appropriate post hoc tests (Tukey for homogeneous variances and Dunnett T3 for heterogeneous variances).

		CPUE (fish/h)				Proportion retained				Largest retained fish (cm)			
Species	Angler type	*N*	Mean	SE	*F*	*N*	Mean	SE	*F*	*N*	Mean	SE	*F*
Common carp	Nature-oriented	30	0.16	0.02	1.26	29	0.71 xy	0.05	2.65*	25	53.6 z	1.4	10.49*
	Trophy-seeking	25	0.19	0.03		25	0.63 y	0.05		23	64.6 x	1.6	
	Social	11	0.16	0.03		11	0.64 y	0.08		11	63.1 xy	2.3	
	Meal-sharing	15	0.09	0.03		15	0.81 x	0.11		15	53.1 yz	2.0	
	Nontrophy challenge-seeking	37	0.15	0.02		35	0.83 x	0.04		32	55.7 z	1.2	
Coarse fish[a]	Nature-oriented	61	3.26	0.43	1.38	61	0.77 x	0.06	4.64*	60	20.6 y	1.6	9.9*
	Trophy-seeking	50	3.39	0.65		50	0.82 x	0.08		47	38.9 x	3.5	
	Social	26	5.48	1.19		26	0.25 y	0.13		24	33.0 x	1.1	
	Meal-sharing	29	3.76	1.03		29	0.61 xy	0.18		28	18.0 y	2.6	
	Nontrophy challenge-seeking	46	4.28	0.56		46	0.63 xy	0.13		44	18.1 y	3.4	
European eel	Nature-oriented	50	0.27 x	0.02	6.89*	47	0.80	0.03	1.65	46	57.7 z	0.9	9.3*
	Trophy-seeking	39	0.23 xy	0.02		36	0.80	0.03		35	64.5 x	1.0	
	Social	25	0.27 x	0.03		22	0.80	0.04		22	64.7 x	1.3	
	Meal-sharing	30	0.18 y	0.02		27	0.84	0.04		27	60.0 yz	1.1	
	Nontrophy challenge-seeking	48	0.15 y	0.01		44	0.80	0.03		44	62.5 xy	0.8	
European perch	Nature-oriented	66	2.60 y	0.17	9.59*	65	0.64 x	0.02	9.99*	63	27.3 xy	0.3	3.42*
	Trophy-seeking	62	3.78 x	0.28		62	0.63 x	0.02		61	27.8 xy	0.4	
	Social	30	2.94 xy	0.31		30	0.53 y	0.03		29	28.5 x	0.6	
	Meal-sharing	37	4.32 x	0.27		36	0.50 y	0.02		34	26.5 y	0.3	
	Nontrophy challenge-seeking	68	4.30 x	0.31		68	0.54 y	0.02		65	26.8 xy	0.3	
Northern pike	Nature-oriented	76	0.43 xy	0.03	4.83*	72	0.68	0.02	1.18	66	65.1 y	0.7	7.16*
	Trophy-seeking	61	0.51 x	0.03		60	0.92	0.22		56	67.2 x	0.7	
	Social	32	0.31 y	0.03		31	0.68	0.05		27	65.9 yz	1.4	
	Meal-sharing	38	0.42 xy	0.03		37	0.72	0.03		35	61.9 z	0.7	
	Nontrophy challenge-seeking	75	0.41 y	0.02		69	0.60	0.02		65	66.6 x	0.7	
Zander	Nature-oriented	25	0.14 z	0.02	5.87*	21	0.85 x	0.05	10.98*	20	55.8 xy	1.7	3.97*
	Trophy-seeking	26	0.52 x	0.08		23	0.85 x	0.04		21	57.9 x	1.4	
	Social	17	0.40 y	0.12		12	0.31 z	0.08		10	63.6 x	4.0	
	Meal-sharing	15	0.44 xy	0.15		11	0.63 yz	0.11		11	49.8 y	1.5	
	Nontrophy challenge-seeking	40	0.23 z	0.04		38	0.65 y	0.05		36	56.1 xy	0.9	
Atlantic cod	Nature-oriented	42	1.03 y	0.1	8.94*	40	0.95 x	0.09	3.28*	39	58.1 y	1.1	6.55*
	Trophy-seeking	24	2.12 x	0.31		22	0.77 xy	0.03		22	63.4 x	1.4	
	Social	28	1.00 y	0.1		25	0.75 xy	0.03		24	53.7 y	1.4	
	Meal-sharing	21	1.09 y	0.11		18	0.89 xy	0.02		17	59.8 xy	1.4	
	Nontrophy challenge-seeking	40	1.08 y	0.09		38	0.74 y	0.03		38	56.5 y	1.2	
Flatfish[a]	Nature-oriented	26	0.28 yz	1.41	8.93*	24	0.70	0.02	0.58	23	38.6	1.3	2.03*
	Trophy-seeking	16	0.87 x	1.84		15	0.67	0.02		15	35.7	0.8	
	Social	14	0.10 z	1.25		12	0.76	0.01		11	35.7	0.9	
	Meal-sharing	15	0.59 x	1.93		14	0.92	0.02		14	34.1	0.9	
	Nontrophy challenge-seeking	20	0.27 yz	1.73		17	0.94	0.01		17	33.5	0.5	
Atlantic herring	Nature-oriented	29	9.44 y	0.08	4.68*	29	0.96	0.08	1.94	29	26.8	2.1	1.28
	Trophy-seeking	23	14.26 xy	0.24		23	1.00	0.09		23	28.6	2.1	
	Social	23	7.40 y	0.03		23	0.99	0.12		23	28.3	2.3	
	Meal-sharing	18	14.89 xy	0.11		18	1.00	0.04		18	28.8	0.8	
	Nontrophy challenge-seeking	43	16.45 x	0.05		43	0.99	0.28		43	26.8	1.0	

exceptions (e.g., no significant differences in catch rates among angler types for carp and coarse fish). Mean values for catch and retention rates and size of largest retained fish did not follow straightforward patterns across species and angler types, and due to low sample size post hoc tests were often unable to clearly differentiate homogeneous subsets of anglers, despite significant overall ANOVAs.

The most consistent patterns were revealed by trophy-seeking anglers who exhibited among the highest catch rates of all angler types for northern pike, zander, and the three marine species but surprisingly exhibited similar harvest rates to other anglers, except for common carp (63–64% for trophy-seeking and social anglers versus 71–83% for other groups). Trophy seekers, in agreement with their primary motive, were consistently found in homogenous subsets retaining, on average, the largest fish of all angler types (e.g., about 65 cm for carp, European eel, and Atlantic cod). Meal-sharing anglers had particularly low catch rates for eel (mean, 0.18/h) but very high catch rates for European perch (4.32/h). Retention rates for meal-sharing anglers were among the highest for several species (carp, eel, cod, flatfish, and Atlantic herring), mean sizes of the largest retained fish being among the smallest for all freshwater species examined. Nontrophy challenge-seeking anglers exhibited low catch rates for eel, zander, and flatfish but had catch rates similar to meal-sharing anglers for perch. This group had lower retention rates of pike (0.60) and perch (0.54). Carp, coarse fish, and cod retained by nontrophy challenge seekers tended to be smaller; however, this group rivaled trophy seekers in catching the largest pike (67 cm). Nature-oriented anglers had low catch rates of perch, zander, flatfish, and cod but equaled meal-sharing anglers in their retention rates of most species. This cluster was never found among those with the largest mean fish sizes retained but was found among those retaining the smallest carp, coarse fish, and cod. Social anglers exhibited high catch rates of coarse fish and eel but low catch rates for pike, flatfish, and herring. These anglers tended to have low retention rates across several species (carp, coarse fish, pike, zander and perch). Low retention rates were coupled with high mean sizes for their largest fish, rivaling trophy seekers for the largest carp, coarse fish, eel, and zander.

DISCUSSION

Our study is the first to account explicitly for the effect of trip context on motivation within a single population of anglers, revealing that the importance of catch motives varies considerably depending on context, which in our study was mainly defined by target species in a given location. Furthermore, grouping anglers according to their similarity in primary motives revealed an unexpectedly strong connection between motivations and angler specialization. In particular, we found that trophy and other challenge-seeking anglers were more specialized than other anglers, in turn indicating that the more committed anglers exhibit context-specific primary motivations that are strongly oriented towards the catching aspects of fishing. Finally, the variance in most important fishing motivations was also associated with variation in species-specific angling behaviors and catch outcomes. Overall, our study revealed that catching fish is primarily important for anglers depending on trip context and that grouping anglers based on most important motivation associated with trip type allows predictions of fishing behaviors as they relate to specific patterns of catching and harvesting.

The above findings gain further support from the fact that the results of angler motivations based on the general motivation scale were consistent with the findings from other angler motivation studies (i.e., general noncatch motives are more important than catch motives; e.g., Fedler and Ditton 1994). This consistency demonstrates that our sampled anglers share a common generic motivational structure with other angler populations and ensures that our novel findings from the context-dependent approach, which emphasized catch motives as prime motives across many trip contexts, are not an artifact of a unique sample of anglers.

Given that angling is a recreational activity, it is not surprising that in the general motivation asses noncatch-related motivations have always emerged as more important than catch-related aspects of the fishing experience (Ditton 2004). This result arose because relaxation and escape from daily pressures are hallmarks of most leisure activities (Parr and Lashua 2004). By accounting for a species-specific fishing context, however, we documented that catch aspects still played a paramount role in selecting a particular fishing experience by anglers. The questions of why anglers go fishing in general and why anglers choose a particular fishery thus can have very different answers. These differences provide insight to a long-standing controversy among fisheries managers and human dimensions researchers (Matlock et al. 1988; Peyton and Gigliotti 1989). Using general angler motivations to justify very specific fishery regulations (e.g., banning harvest of fish on the assumption that anglers are primarily motivated to relax at the waterside) is unwarranted and will very likely result in conflict with anglers (Arlinghaus 2006). This insight is similar to the finding in social psychology that human behaviors are best predicted by attitudes with equivalent levels of specificity (Fazio 1990). In fact, as we showed, anglers might attach greater importance to noncatch than to catch motives in their general motivations for fishing, while also being predominantly catch-oriented when seeking specific experiences. Therefore, when designing regulations to fit the aspirations of the angler constituency, fisheries managers are advised to study specific contexts and the prime desires of anglers for these contexts.

In our study, certain species systematically tended to attract specific primary catch-related motives, indicating that each species differed in fulfilling specific primary expectations by anglers. For example, large-bodied species like northern pike, common carp, and zander were sought by anglers primarily to meet trophy motives. These species contrasted with the more

abundant and easy-to-catch small-bodied coarse fish that were typically chosen by anglers to facilitate an enjoyable and social experience in nature. Our findings corroborate earlier reports on correlations between maximum body size of fish species and trophy orientation (Fedler and Ditton 1994; Wilde and Ditton 1999). Overall, the results indicate that despite some overlap in expected outcomes, each species might fulfill very specific expectations and recreational opportunities for anglers.

Not only do our findings underscore that heterogeneity in available fishing opportunities matches heterogeneity in anglers' expectations, but as in other research (e.g., Fedler and Ditton 1994; Wilde and Ditton 1999), our findings also confirm the existence of considerable variation in primary fishing motives within the angler population. By distinguishing among anglers based on context-specific angler motivations, we identified five different angler groups. While these groups did not differ substantially in their demographic characteristics or general angling participation, comparative analyses of angler characteristics revealed other distinctions that supported a novel link between angler motives and recreational specialization theory (Bryan 1977). In particular, the angling characteristics of the motivation-defined clusters (Table 4) suggested that nature-oriented and meal-sharing anglers were the least specialized, demonstrating a low commitment to angling (as indicated by low frequency of taking an angling vacation, and boat ownership) and low mean centrality to lifestyle index. By contrast, nontrophy challenge and trophy anglers exhibited the highest values for centrality to lifestyle, suggesting they represent the most specialized anglers. This finding showed that catch motives may be most important to specialized anglers when choosing a specific trip context, and it challenges Ditton et al.'s (1992) proposition of specialization theory that increasing specialization level correlates positively with the importance attached to noncatch aspects of fishing. While our study did not test this proposition explicitly, it indicated that highly specialized anglers should maintain a strong desire to catch fish or pursue other catch-related challenges, despite the possibility that importance attached to noncatch motives might also increase. Ultimately, it is the overall importance attached to fishing that increases with specialization and involves both catch and noncatch aspects.

Although researchers have used angling experience as a behavioral indicator of angler specialization (e.g., Ditton et al. 1992), experience level was not strongly correlated with level of angler specialization in our study. Therefore, any empirical relationships between experience level of anglers and angler motivations might not correspond well with specialization theory as developed by Bryan (1977). A good example is the characteristics of the meal-sharing anglers. This angler group was the most experienced, yet these anglers exhibited a lower centrality to lifestyle index than did the nontrophy challenge and trophy anglers. Therefore, meal-sharing anglers were less specialized despite being the most experienced anglers. The lack of relation of angling experience and specialization level in our study supports previous criticisms of specialization being necessarily progressive with the angling career (Kuentzel 2001; Scott and Shafer 2001; Oh et al. 2011). If angling experience is indeed uncorrelated with level of specialization, earlier propositions relying on angling experience to relate angling motives to specialization (e.g., Ditton et al. 1992) should be revisited.

While trends for trophy anglers, nontrophy challenge anglers, and the more consumptive meal-sharing anglers relating to specialization theory were somewhat straightforward, the evidence for specialization among social anglers was mixed in our study. Members of this cluster were characterized by low centrality to lifestyle and rates of boat ownership, indicating low specialization but high frequencies of angling vacations and mean travel distance, which indicate high behavioral commitment and investment of time and monetary resources, hence, high specialization. The conflicting characteristics of social anglers might reflect the influence of more committed angling friends, and lower levels of commitment to angling in Mecklenburg-Vorpommern may be offset by greater angling participation during leisure periods that allow greater travel (e.g., holidays).

Both trophy and nontrophy challenge-seeking anglers exhibited a high centrality to lifestyle index, indicating that these two angler segments were more specialized in the spirit of Bryan (1977) than were the other three angler groups. This finding is corroborated by other characteristics of these two groups. Besides their higher mean centrality to lifestyle scores, trophy-seeking anglers had higher than expected frequencies of boat ownership, and nontrophy challenge-seekers were more likely to take an angling vacation outside Mecklenburg-Vorpommern and travel greater distances within the state. Our findings thus support early propositions from specialization theory that the importance of consumption decreases while the importance of large trophy fish and the challenge component of fishing increases as anglers develop from novice to expert (Bryan 1977). As mentioned previously, our finding that the most specialized anglers were primarily interested in the catch-related aspects of the fishing experience, however, disagrees with later tenets that the relative importance of noncatch to catch-related aspects of the fishing experience should increase as anglers become more specialized (Ditton et al. 1992). Our findings from an assessment of prime motivations in a given context instead point to an overwhelming importance of challenge-related catch aspects for more specialized anglers, consumptive and noncatch motives playing secondary roles for these committed anglers in a given context. The fact that several challenge-related motives were represented by these specialized angler groups is consistent with suggestions that specialization involves multiple trajectories (Kuentzel and Heberlein 2006), anglers diverging in their primary motives and selecting different fishing opportunities for different reasons. This divergence also suggests a reason for the low scores typically associated with ratings of catch-related items in general motivation assessments. As revealed by the rating distributions (Figure 2), the importance of individual catch motives varies widely among anglers. A catch motive that drives

one angler's choice of fishing activity may be unimportant to another angler, and when aggregated, this overall importance of catch-related aspects is lost. If committed anglers indeed exhibit divergent and specialized preferences for activity-related motives, the actual needs of these anglers may be misrepresented by the summary statistics typically associated with importance scales. This would underscore an old adage of human dimensions literature that the average angler only exists in research reports (Shafer 1969; Aas and Ditton 1998). Such an average perspective might not be particularly suited for deriving management implications because the importance of heterogeneity for informing policies to suit diverse wishes is lost (Johnston et al. 2010).

Our study supports calls from the literature for more research on behavioral heterogeneity among anglers in a relevant way to prepare the empirical ground for application in coupled social–ecological fisheries management models (Post et al. 2008; Johnston et al. 2010; Hunt et al. 2011). From a fisheries biological perspective, one might consider anglers as the top predator in aquatic systems (Johnson and Carpenter 1994). One approach to understand predatory dynamics is the concept of functional similarity, which is the basis for ecological guilds in fish ecology. Guilds are a group of species that exploit the same type of environmental resources in a similar way (Simberloff and Dayan 1991). Applied to recreational fisheries, one might consider distinct angler types whose predatory characteristics differ from each other, but are relatively homogenous within an angler type, as ecological guilds. Our study suggests that some predatory characteristics of anglers are related to context-specific primary angling motivations. Indeed, using the analogy of predatory guilds, characteristic behaviors of members of each motivation cluster were found to exhibit similar characteristics to natural predators, such as prey specificity (target species), foraging range (travel distance), intake rates (catch and harvest efficiencies) and size selectivity (maximum harvest size). Indeed, we found significant differences among characteristics of the five angler groups for each of the nine primary prey species in Mecklenburg-Vorpommern, species-specific travel, catch, and harvest behavior being associated with each motivational type revealed by distinct behavioral patterns. These findings might be used to inform future agent-based models that simulate the behavior of various angler types exploiting multispecies communities in a multilocation landscape.

Against this background, our study provides further support for the link between the psychological and behavioral dimensions of angler specialization and the actual "predatory" behaviors of different angler types. For example, we found that trophy anglers often exhibited the highest catch rates and retained, on average, larger fish than other angler groups, an indication that these are the most skilled anglers (Bryan 1977; Arterburn et al. 2002; Dorow et al. 2010). It is, however, noteworthy that trophy anglers in our case exhibited quite high harvest rates, which agrees with results from Dorow et al. (2010), who studied European eel angling in the same area. These findings of higher consumptive orientation by trophy anglers contradicts Bryan (1977) who predicted that with increasing commitment and specialization levels, the importance of trophy-sized fish should increase and the propensity to release fish should also increase. However, given the current interpretation of the German Animal Protection Act, the most acceptable reason to angle is to put fish on the table, and subsistence is deeply rooted in German fishing culture. Therefore, voluntarily releasing legal-sized fish is implicitly banned in Germany (Arlinghaus 2007). Also, in the German cultural sphere trophy fishing is not necessarily associated with voluntary catch-and-release fishing, although clear exceptions exist (e.g., trophy carp fishing; Arlinghaus 2007). Because we defined the clusters only by their selection of a single most important motive, our analysis did not account for the influence of secondary motives. Thus, trophy-seeking anglers might be simultaneously motivated, albeit to a lesser degree, by consumption. One interesting exception to the high retention rates of trophy-seeking anglers occurred for common carp. Here, trophy-seeking and social anglers exhibited the lowest retention rates, suggesting that this species could be of particularly high trophy value, but that trophy-size carp might have little consumptive value, thereby providing incentive to release otherwise harvestable fish (Arlinghaus 2007).

Indiscriminate application of our findings to inform fisheries management decisions is not recommended owing to some important study limitations. One limitation stems from the focus on only the single most important motive for any given context. While this limitation is somewhat mitigated by combining up to three locations around a common species, the importance of secondary motives is conspicuously absent. This omission was made to accommodate the need to alleviate respondent burden in a survey that had many different objectives. We attempted to enhance the quality of our data by using a best–worst design (Flynn et al. 2007); that is, we initially asked anglers to indicate their most and least preferred motive for a given context. However, we observed that the data on the least important motive proved unreliable because of a high level of item nonresponse. This phenomenon might indicate that respondents found it challenging to distinguish among motivation items that were equally unimportant to a given fishing context or that the choice process differs for selecting the least and most important motives. Future studies might consider asking respondents to rank their most important motives for each context rather than asking for extremes.

Our use of a truncated and heavily modified set of motivation items might also have affected our results. Many items we used deviated from those in established scales, and in some cases we combined constructs. For example, the item "to catch a fresh fish for a meal with friends/family" contained both consumptive and social aspects. Overall, it seems that these deviations did not seriously affect our findings because the factor analysis grouped motivational items into coherent dimensions.

Further limitations arise mainly from the small sample size and the level of analytical sophistication applied. When angler groups were identified by species-specific harvesting behavior,

we relied on a relatively small sample from a region with a highly diverse recreational fishing system. Thus, our angler groupings were correspondingly small and rendered smaller still once comparisons across groups at a species-specific level were made. This limited the power of our statistical analyses, especially for post hoc pairwise comparison tests. The generality of our results is also limited due to the unique German institutional and regulatory context. Despite these limitations, our study presents a novel approach to link angler motivations and behavior, and our findings suggest that angler motives might provide a suitable classification tool to assess heterogeneity in catch and harvest behavior. We consider it as proof-of-concept warranting application in future studies.

One of our most important findings is that the importance of catch was prominently expressed when anglers were asked for their most important motive in a given context, and that makes this approach worth replicating elsewhere. Although we derived essential trip behavior information from pairing the motivation assessment survey with a year-long trip diary and periodic telephone interviews, the amount of resources required to elicit such information is perhaps the largest methodological obstacle for implementing our context-specific motivation assessment in traditional mail or telephone-based offsite surveys. Future applications might surmount this obstacle by simply asking respondents to list the details of each type of experience (species, location, etc.), including their directed fishing effort. If available and feasible, applying internet-based survey technologies might also assist researchers with dynamically inserting information from earlier questions in the same instrument. With these adaptations, future applications of species or location-specific motivation research might be feasible for off-site state or local fishing surveys. An alternative would be to ask motivation questions in creel surveys. Future research might expand the list of motivation items to include the full spectrum identified by previous research (Fedler and Ditton 1994), as well as include additional context variables, such as the use of specific angling techniques and equipment and the social context. Methodologically, it would be of interest to directly compare the traditional rating approach with our approach, focusing on the single most important item in the context of a similarly framed and contextually defined angling opportunity.

CONCLUSIONS AND IMPLICATIONS

Our study demonstrated that catch motives constitute prime motivations for anglers in certain contexts. We also found that assessing prime fishing motives aids in the understanding of heterogeneity in recreational fishing activities and anglers, including their catching and harvesting behaviors. While our results showed that catch is important to anglers in a given context, the importance of particular motives depended on the species targeted by anglers in a given context. As expected, the importance of catch varied within the angler population, though surprisingly, it was most important to anglers demonstrating the highest levels of commitment to the activity. Our finding about the prime importance of catch motives is novel in angler motivation research, but given its focus on specific trip contexts does not contradict previous research reporting that the main reasons for fishing, in general, are often unrelated to motives to catch fish (e.g., relaxation). Overall, the existence of a pronounced diversity of motives within the angling population highlights the fact that it is critically important for managers to maintain diverse fishing opportunities and to market and manage fisheries to adequately meet the expectations of various angler groups. In this context, managing harvesting and catching opportunities will almost inevitably affect the experience of anglers and should thus be of prime consideration for fisheries managers.

ACKNOWLEDGMENTS

Funding for the diary portion of this study was provided partially (75%) by the European Financial Instrument for Fisheries Guidance 2000–2006 and the State of Mecklenburg-Vorpommern (25%). Additional funding was provided to R. A. by the Adaptfish-Project through a grant within the Pact for Innovation and Research by the Leibniz-Community (www.adaptfish.igb- berlin.de) and by the project Besatzfisch through a grant from the Ministry of Education and Research (www.besatz-fisch.de). Funding was also provided by a Canada Graduate Scholarship from the Social Sciences and Humanities Research Council of Canada to B. B. We thank the anglers participating in this survey and those providing helpful insights during the pretests and Malte Dorow for his assistance in developing the survey. We would also thank USUMA GmbH (Berlin, Germany) for execution of the field work.

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