

AN EXPLORATORY FACTOR ANALYSIS OF LAKE ONTARIO RESIDENT BASS ANGLER MOTIVATIONS, CONSTRAINTS, AND FACILITATORS

Diane M. Kuehn
SUNY College of Environmental Science and Forestry

Matthew Brincka
SUNY ESF

Valerie A. Luzadis
SUNY ESF

Abstract

In 2009, SUNY ESF completed a survey of 7,000 property owners in the seven New York counties bordering Lake Ontario in order to examine the motivations, constraints, and facilitators related to resident bass fishing participation. The questionnaire included five-point scale questions on motivations and constraints/facilitators to fishing. Resident anglers returned 681 completed surveys. A short follow-up survey was distributed to all non-respondents and 264 additional responses were received from anglers. After data entry, bass anglers were identified based on respondents' preferences for either largemouth or smallmouth bass fishing. Two exploratory factor analyses were conducted: one for variables related to motivations and one for constraints/facilitators. The factor analyses yielded 10 motivation-related factors and 11 constraints/facilitators. Motivations for fishing were affiliation and nature appreciation/enjoyment. Factors identified by respondents as constraining fishing participation were lack of time and bad weather; factors found to facilitate fishing participation were good weather, current/past experience, and access.

1.0 Introduction

The main goal of this study is to contribute to a sustainable coastal economy in the Lake Ontario region by providing information to coastal businesses and tourism promotion agencies on the motivations, constraints, and facilitators associated with resident bass fishing. Currently, Lake Ontario tourism businesses are strongly dependent on non-resident anglers who are largely fishing for salmon and trout. By tapping into the underutilized and large market group of resident bass anglers, this study will provide a mechanism for creating a stable angler market that is less affected by rising fuel costs and the state of the economy than the non-resident angler market.

This study uses a property owner survey for New York's Lake Ontario region (Jefferson, Oswego, Cayuga, Wayne, Monroe, Orleans, and Niagara counties) to examine motivations and constraints/facilitators to bass fishing by resident anglers. The objective of this study is to identify and quantify the motivations and constraints/facilitators for Lake Ontario resident anglers. To meet this objective, an exploratory principal components factor analysis was used and factor means were calculated.

2.0 Literature review

Motivations have been defined in the literature as the "cognitive forces that drive people to achieve particular goal states" (Decker et al. 2001, p.47). Siemer, Brown, and Decker (1989) identified motivations for salmonid fishing that included affiliation, relaxation/escape, achievement, and nature appreciation. Kuehn, Dawson, and Hoffman (2006) identified additional motivations such as enjoyment and nurturing others into fishing. Additional motivations previously identified are included in Table 1.

Constraints have been defined as factors that influence leisure preferences and/or intervene between preferences and participation (Crawford & Godbey 1987, Henderson et al. 1988). By contrast, "facilitators" are described as factors "perceived by individuals to enable or promote the formation of leisure preferences and to encourage or enhance participation" (Raymore 2002, p. 39). While constraints create barriers to leisure preferences and/or limit recreational participation, facilitators enable participation. Elements such as opportunity, time, and economics can be both facilitators and constraints, depending on the situation of an individual. Other previously identified constraints and facilitators are listed in Table 1.

To create a framework for this study that incorporates motivations, constraints, and facilitators, we incorporated elements of three theoretical frameworks: the wildlife-related recreation involvement model (Decker et al. 1987); the hierarchical leisure constraints model (Crawford et al. 1991); and the ecological approach to understanding influences (i.e., facilitators and constraints) on participation (Raymore 2002). In the wildlife-related recreation involvement model, goals (i.e., motivations) influence internal and external factors that in turn influence the decision to perform a behavior and the behavior itself. Two domains are identified in the model: a psychological domain that includes goals and internal influences (e.g., an individual's beliefs and abilities), and a social domain that includes external influences (e.g., the expectations of others). The two domains provide a partial framework for the motivations and constraints/facilitators used in this study (Table 1).

The hierarchical leisure constraints model (Crawford et al. 1991) suggests that both constraints and motivations influence leisure preferences and participation. The model includes interpersonal, intrapersonal, and structural constraints, but does not include specific types of motivations (e.g., internal versus external) or facilitators (Raymore 2002). The third theoretical framework included in this study is the ecological approach to understanding influences on participation proposed by Raymore (2002). This framework expands the three types of constraints (i.e., structural, interpersonal, intrapersonal; Crawford et al. 1991) to include facilitators (Table 1).

<Insert Table 1 about here>

3.0 Methods

In 2009, a random sample of 7,000 property owners (1,000 per county) was compiled from the online property tax records for each Lake Ontario county in New York. Care was taken to ensure that no duplicates were included in the database (i.e., for individuals who owned more than one parcel). A survey of the property owners was conducted in fall 2009 using a modified Tailored Design Method (Dillman 2007); respondents were given the option of completing a paper copy of the questionnaire or an identical online version. Input concerning the questionnaire was obtained through a focus group session with the Lake Ontario Fisheries Coalition, and reviews by the Lake Ontario Sportfishing Promotion Council, NYS Department of Environmental Conservation staff, and NY Sea Grant specialists. Following the initial survey period, a short non-response survey was distributed by mail to all non-respondents ($n = 4,277$) and 264 of these were completed and returned. Statistical analysis using two-independent-samples t-tests ($p \leq 0.05$) subsequently compared the mean number of anglers in each household and fishing participation (mean number of trips per year) for respondents to the short survey (initial non-respondents) and respondents to the full survey.

The questionnaire included questions about motivations, constraints and facilitators, demographics, and fishing characteristics. The qualifying question "Have you or another member of your household participated in fishing at least once between 2005 and 2009?" was used to identify households containing an angler; for those responding "yes", an adult angler within the household was asked to complete the questionnaire. Responding anglers were asked to identify their fishing participation (i.e., number of fishing trips each year from 2005 to 2009), as well as their fish species preference: smallmouth bass, largemouth bass, Coho and Chinook salmon, rainbow trout/steelhead, lake/brown trout, perch, walleye, no species preference, other (Wilde & Ditton 1994). Participation in bass fishing was quantified by averaging the annual number of fishing trips taken from 2005 through 2009 for those anglers indicating a preference for largemouth and smallmouth bass fishing.

Wording and concepts for statements related to motivations and constraints/facilitators were based on previous sportfishing studies. A five-point scale (i.e., -2 = strongly disagree, -1 = disagree, 0 = neutral, 1 = agree, 2 = strongly agree) was used to identify the degree of respondents' agreement with motivation statements related to fishing. For constraints and facilitators, respondents were asked: "How important are the following for limiting or enabling your participation in fishing?" Constraints and facilitators were conceptualized as opposites on a five-point scale, ranging from -2 (greatly limits participation) to 0 (neither) to 2 (greatly enables participation).

Data were entered into SPSS. An exploratory principal components factor analysis with Varimax rotation was conducted for largemouth and smallmouth bass anglers combined; separate analyses were used for motivations and constraints/facilitators. Cronbach's alphas were calculated for factors based on the results of the principal components analysis; based on Hair et al. (1998), factors with an alpha less than 0.7 were determined to have inadequate internal consistency.

4.0 Results and Discussion

4.1 Overall Response Rates

Of the 7,000 full surveys mailed to Lake Ontario residents, 1,303 were completed and returned (this included 681 anglers and 622 non-anglers). Following the removal of undeliverable addresses and non-Lake Ontario property owners, the qualified sample was 5,580, resulting in a response rate of 23% (1303/5580). Eighteen percent of the responding anglers (103 respondents) were smallmouth bass anglers and 11% (62 respondents) were largemouth bass anglers.

A total of 608 non-respondents (including 264 anglers) replied to the short non-respondent survey that was sent to the 4,277 non-respondents (response rate = 14%). There were no significant differences between respondents and non-respondents for the mean number of individuals in the household or mean number of household members interested in fishing in the future. However, there was a significant difference between respondents and initial non-respondents on the mean number of anglers in each household: non-respondent households had a slightly higher number of anglers (mean = 2.3 anglers) than respondent households (mean = 2.1 anglers); $p = 0.019$. Although there was no significant difference between respondent and non-respondent anglers for the mean number of Lake Ontario fishing trips taken in 2009, there was a significant difference for the mean number of all fishing trips taken in 2009 (mean for non-respondents = 13.6 trips; mean for respondents = 17.2 trips; $p = 0.034$).

4.2 Demographics and Fishing Characteristics

Responding bass anglers averaged 57 years old and had an average of 15 years of education. Ninety-one percent were males and 9% were females. The majority (69%) resided in a rural area, hamlet, or village having fewer than 5,000 residents. Forty-seven percent of respondents had an income between \$51,000 and \$100,000 per year.

Responding bass anglers took an average of 15 trips per year between 2005 and 2009. Forty-seven percent fished in Lake Ontario, while 29% fished in the lake's tributaries and 22% fished in its embayments. Most (61%) used a spinning reel; 34% used a spin casting reel. Although fishing from a motor boat was most common (71%), 48% also fished from shore. (NOTE: overlap exists between equipment and fishing location categories because respondents often chose more than one category.)

4.3 Factor analyses

For the motivations, ten factors were identified through Principal Components Factor Analysis. Most factors were similar to the original constructs identified through literature review (Table 1). Differences occurred in the personal achievement factor, originally operationalized as one construct, but identified in this study as four separate constructs (i.e., challenge & skills, food, competition, and the catch) through the factor analysis. In addition, enjoyment and nature appreciation, identified as two separate constructs in the literature, were identified as one factor through the factor analysis. The Cronbach's alphas for the factors were all above 0.7, except for "expectations of others" (alpha = 0.480).

For the constraints and facilitators, eleven factors were identified through principal components factor analysis. However, two variables (poor weather and good weather), while loading on the same factor, had inverse factor loadings and opposite values; these two variables were separated before calculating construct means in order to prevent the variables from "cancelling each other out" and creating a neutral factor mean. Weather had originally been operationalized as part of the "opportunity" construct but was identified in this study as two separate constructs (i.e., access/equipment and weather) through the factor analysis. All Cronbach's alphas for constraints and supports were above 0.7, except for "social support" (alpha = 0.696).

4.4 Motivations, Constraints, and Facilitators

Analysis of factor means reveals that bass anglers residing in New York's Lake Ontario region are primarily motivated to fish by nature appreciation/enjoyment and affiliation (i.e., spending time with others; Table 2). Bad weather and lack of time (i.e., family/work obligations) are the primary constraints, while the main facilitators are good weather, current/past experience, and access/equipment (Table 3).

<Insert Tables 2 and 3 about here>

5.0 Discussion and Conclusion

The motivations found to be most important to bass angler respondents (i.e., nature appreciation/enjoyment and affiliation) suggest that bass anglers fish to spend time with friends and family in the outdoors, and enjoy the sport of fishing itself. Fishing for food was not a motivation for responding bass anglers, which is understandable given that bass are not known for their flavor. Competition was also not a motivator; bass anglers who participate in fishing derbies likely do so in order to spend time with friends and family outdoors rather than to compete against other anglers. The four factors identified from the personal achievement construct (i.e., challenge & skills, food, competition, and the catch) suggest that different angler groups likely have different perceptions of personal achievement; further study is needed to clarify differences between these four factors among angler groups.

The constraints identified by most respondents were bad weather and lack of time. The problem with weather makes sense since a large percentage of bass anglers fish from a boat, and Lake Ontario is often inaccessible by boat when the weather is poor. The lack of time constraint includes time spent at work, on family obligations, and for maintaining a household, all of which limit the amount of free time available for fishing. Perceptions of the environment and economic costs were identified as slight constraints, having mean values of -0.2 each. Although both of these constraints are perceived as negatives by anglers, neither is likely to greatly limit participation in fishing for the average responding bass angler.

Three main facilitators were identified by responding resident anglers. Good weather, the most important facilitator, likely makes it possible for anglers to reach Lake Ontario by boat. Current/past experience with fishing gives anglers the skills they need to fish, facilitating their participation. Access is needed for shoreline fishing as well as for launching boats. Other facilitators included level of commitment, level of knowledge, and social support, all of which had moderate factor means (i.e. were moderate facilitators). Health and well-being had the lowest mean value of all facilitators, possibly due to the fact that angler health varies by age and individual which creates more variation in this factor than in others. A final factor, perceptions of the Lake Ontario fishery's management, was neutral; it seems that respondents' perceptions of management neither constrain nor facilitate fishing involvement.

In conclusion, the objective of this study (i.e., to identify and quantify the motivational and constraint/facilitator factors for Lake Ontario resident anglers) was accomplished with an exploratory factor analysis. Results indicate that bass anglers fish primarily for the enjoyment of fishing, as well as to spend time with friends and family in nature. Providing and promoting fishing experiences that focus on the social side of fishing, spending time in nature, and the enjoyment of reeling in a fish would likely

be most effective for increasing the interest of resident anglers in fishing. With regard to constraints and facilitators, it might be helpful to assess, improve, or increase the amount of shoreline access to ensure adequate boat launch facilities and shoreline fishing access. Because bass fishing appears to be weather dependent, it is important to provide adequate shoreline access for times when poor weather prevents anglers from boating. Current and past fishing experience are important facilitators that give anglers the skills they need to participate in fishing. Previous research by Kuehn et al. (2006) examined the importance of childhood and adolescence fishing participation on adult participation; our study seems to reinforce the idea that individuals who fish as children are more likely to fish as adults. Therefore, expanding programs that focus on engaging children in fishing may help prevent a decline in resident angler participation in the future. In summary, future management efforts need to focus on providing adequate access, promoting the social/enjoyment aspects of fishing, and bringing more young anglers into the sport.

6.0 Citations

- Aas, O. 1995. **Constraints on sportfishing and effect of management actions to increase participation rates in fishing.** North American Journal of Fisheries Management. 15: 631-638.
- Alexandris, K.; Tsorbatzoudis, C.; Grouios, G. 2002. **Perceived constraints on recreational sport participation: Investigating their relationship with intrinsic motivation, extrinsic motivation, and amotivation.** Journal of Leisure Research. 34(3): 233-252.
- Crawford, D.W.; Godbey, G. 1987. **Reconceptualizing barriers to family leisure.** Leisure Sciences. 9: 119-127.
- Crawford, D.W.; Jackson, E.L.; Godbey, G. 1991. **A hierarchical model of leisure constraints.** Leisure Sciences. 13: 309-320.
- Decker, D.T.; Brown, T.L.; Driver, B.L.; Brown, P.J. 1987. **Theoretical developments in assessing social values of wildlife: Toward a comprehensive understanding of wildlife recreation involvement.** In Decker, D.J.; Goff, G.R., eds. Valuing wildlife: Economic and social perspectives. Boulder, CO: Westview Press.
- Decker, D.J.; Brown, T.L.; Siemer, W.F. 2001. **Human dimensions of wildlife management in North America.** Bethesda, MD: The Wildlife Society.
- Dillman, D. 2007. **Mail and internet surveys: The tailored design method.** New York: John Wiley.
- Hair, J.F.; Anderson, R.E.; Tatham, R.L.; Black, W.C. 1998. **Multivariate Data Analysis (5th ed).** Upper Saddle River, NJ: Prentice Hall.
- Henderson, K A.; Stalnaker, D.; Taylor, G. 1988. **The relationship between barriers to recreation and gender-role personality traits for women.** Journal of Leisure Research. 20: 69-80.
- Kuehn, D.M.; Dawson, C.P.; Hoffman, R. 2006. **Exploring fishing socialization among male and female anglers in New York's eastern Lake Ontario area.** Human Dimensions of Wildlife. 11: 115-127.
- Jackson, E.L.; Henderson, K.A. 1995. **Gender-based analysis of leisure constraints.** Leisure Sciences. 17: 31-51.
- Jackson, E.L.; Scott, D. 1999. **Constraints to leisure.** In Jackson, E.L.; Burton, T.L., eds. Leisure studies: Prospects for the twenty-first century. State College, PA: Venture Publishing: 299-321.
- Raymore, L.A. 2002. **Facilitators to leisure.** Journal of Leisure Research. 34(1): 37-51.
- Ritter, C.; Ditton, R.B.; Riechers, R.K. 1992. **Constraints to sport fishing: Implications for fisheries management.** Fisheries. 17(4): 16-19.
- Siemer, W.F.; Brown, T.L.; Decker, D.J. 1989. **An exploratory study of Lake Ontario's boating salmonid anglers: Implications for research on fishing involvement.** Human Dimensions Research Unit Series, No. 89-4. Ithaca, NY: Cornell University.
- Wilde, G.R.; Ditton, R.B. 1994. **A management-oriented approach to understanding diversity among largemouth bass anglers.** North American Journal of Fisheries Management. 14: 34-40.

Table 1. Constructs and domains operationalized for this study

Domain	Category of construct	Construct	Source of construct
Psychological ^a	Internal motivations ^a	Enjoyment	Kuehn et al. 2006
		Nature appreciation	Siemer et al. 1989
		Affiliation	Siemer et al. 1989
		Personal achievement (challenge & skills, food, the catch, competition)	Siemer et al. 1989
		Nurture	Kuehn et al. 2006
		Escape	Siemer et al. 1989
	Intrapersonal constraints/facilitators ^{bc}	Satisfaction with sport	Siemer et al. 1989
		Current/Past experience	Kuehn et al. 2006
		Level of knowledge	Jackson & Scott 1999; Alexandris et al. 2002
		Level of commitment	Kuehn et al. 2006
Social ^a	Interpersonal constraints/facilitators ^{bc}	Perceptions of the environment	Ritter et al. 1992; Siemer et al. 1989
		Perceptions of management	Ritter et al. 1992; Siemer et al. 1989
Situational ^b	Structural constraints/facilitators ^{bc}	Expectations of others	Kuehn et al. 2006; Siemer et al. 1989
		Social support	Kuehn et al. 2006; Siemer et al. 1989; Jackson & Scott, 1999
		Opportunity (access/equipment, weather)	Siemer et al. 1989; Kuehn et al. 2006; Ritter et al. 1992
		Economic	Siemer et al. 1989
		Time	Jackson & Henderson, 1995; Jackson & Scott, 1999
		Health/Well-being	Siemer et al. 1989; Jackson & Scott, 1999; Aas, 1995

^aDecker et al. 1987.

^bCrawford et al. 1991.

^cRaymore 2002.

Table 2. Exploratory factor analysis results of the motivations of bass anglers

Motivation	Variables	Factor loadings	Mean	% Variance
Nature appreciation & enjoyment	• Because I enjoy the experience of fishing	0.730	1.3	11.53%
	• Because I enjoy the excitement of reeling in a fish	0.676		
	• Because I enjoy spending time in nature	0.793		
	• To relax	0.650		
	• To be surrounded by nature	0.700		
	• Because I appreciate the beauty of fish	0.482		
Affiliation	• Because I appreciate the beauty of nature	0.771	1.0	9.22%
	• To spend time with family and/or friends	0.844		
	• For the companionship of other anglers	0.547		
	• To share the fishing experience with friends and/or relatives	0.800		
Challenge & skills	• Because I expect to enjoy my time with friends and/or family	0.751	0.9	8.52%
	• For the challenge of catching fish	0.648		
	• To learn new fishing skills and techniques	0.811		
	• To try different fishing techniques, equipment, tackle, and/or bait	0.819		
Nurture	• To explore new fishing locations	0.518	0.7	9.46%
	• To share my knowledge of fishing with friends and/or relatives	0.785		
	• To pass on my family fishing traditions to others	0.861		
	• Because I like to teach others (i.e., adults and/or children) how to fish	0.722		
Escape	• Because passing my knowledge on to younger generations is important to me	0.859	0.6	6.43%
	• For the solitude of fishing alone	0.760		
	• For peace and quiet	0.694		
Satisfaction with catch	• To escape from daily obligations (work, errands, etc.)	0.716	0.5	5.37%
	• Because I am satisfied with the number of fish I normally catch	0.862		
The Catch	• Because I am satisfied with the quality of the fishing experience I normally have	0.827	0.5	4.65%
	• To catch large fish, even if I only catch one	0.449		
	• To catch numerous fish, even if they are small	0.641		
	• Because I expect to catch fish	0.703		
Food	• To be successful at catching fish	0.369	-0.6	4.87%
	• To provide food for my family	0.842		
Expectations of others	• To catch fish for food	0.899	-0.8	4.84%
	• Because my relatives and friends expect me to go fishing	0.754		
Competition	• Because I am forced to go fishing by friends and/or relatives	0.514	-0.9	7.72%
	• To compete in fishing events such as derbies, tournaments, and competitions	0.765		
	• For the achievement of participating in a fishing derby or tournament	0.850		
	• To compete with other anglers over who catches the biggest or the most fish	0.860		
Total variance				72.61%

^aMotivations are on a scale of -2 = very unimportant, -1 = unimportant, 0 = neutral, 1 = important, 2 = very important.

Table 3. Exploratory factor analysis for constraints and facilitators of bass anglers

Type of construct	Construct	Variables	Factor loadings	Mean ^a	% Variance				
Constraints	Bad weather ^b	<ul style="list-style-type: none"> Poor weather conditions 	0.785	-0.8	--				
	Time	<ul style="list-style-type: none"> Family obligations (e.g., caring for children or other relatives) Time spent maintaining my household (e.g., cleaning, cooking, shopping, repairs) Time spent working in a paid job The amount of free time I have 	0.822 0.847 0.782 0.782	-0.5	6.14%				
		Perceptions of the environment	<ul style="list-style-type: none"> My thoughts about diseases in Lake Ontario fish My thoughts about contaminant levels in Lake Ontario fish My thoughts about Lake Ontario's water quality My thoughts about Lake Ontario's water levels My thoughts about the health of the Lake Ontario environment in general My thoughts about eating fish from Lake Ontario My thoughts about the quality of the Lake Ontario fishery 	0.817 0.892 0.852 0.658 0.794 0.602 0.542	-0.2	8.44%			
			Economic costs	<ul style="list-style-type: none"> The cost of paying for a fishing license The cost of travelling to a fishing location (e.g., fuel costs) The cost of purchasing bait and tackle The cost of purchasing fishing equipment (e.g., rods & reels) 	0.656 0.720 0.798 0.766	-0.2	5.80%		
				Neutral	Perceptions of management	<ul style="list-style-type: none"> Regulations concerning catch limits and size for fish caught on Lake Ontario, its embayments, and tributaries Fishing license requirements for New York State Levels of fish stocked in Lake Ontario Management of the Lake Ontario fishery in general 	0.365 0.474 0.842 0.693	0.0	4.21%
	Good weather ^b					<ul style="list-style-type: none"> Good weather conditions 	-0.438	0.9	--
	Facilitators					Current/Past experience	<ul style="list-style-type: none"> Having fished or not fished as a child Having fished or not fished as a teenager Being able to find a fishing partner 	0.807 0.829 0.600	0.7
			Access and equipment				<ul style="list-style-type: none"> My ability to easily travel to fishing locations The availability of fishing equipment The proximity of my home to fishing locations 	0.885 0.869 0.856	0.6
		Level of commitment		<ul style="list-style-type: none"> My dedication to the sport of fishing My involvement in fishing organizations, events, and/or programs My family's history of involvement in fishing The focus of fishing in my life My level of interest in participating in fishing 	0.735 0.470 0.717 0.822 0.654		0.6	6.17%	
	Level of knowledge			<ul style="list-style-type: none"> My knowledge of fishing techniques My knowledge of boat access and/or shoreline fishing sites on Lake Ontario, its embayments, or tributaries My knowledge of the Lake Ontario fishery in general My knowledge of the catch rates of the fish species I prefer Handling fish and/or bait 	0.757 0.723 0.839 0.542 0.528	0.5	6.96%		
Social support			<ul style="list-style-type: none"> Being able to fish with someone who can teach me new fishing techniques Being encouraged to fish by friends and relatives throughout my life Having friends (who are the same age as me) support my involvement in fishing 	0.588 0.740 0.755	0.5	4.25%			
			Health and well-being	<ul style="list-style-type: none"> My health My physical abilities My age-related abilities My thoughts about the safety of myself or my family while 	0.908 0.910 0.892 0.727	0.3	6.99%		

fishing	
• My level of energy remaining after completing my daily obligations	0.807
Total variance	58.70%

^aConstraints and facilitators are on a scale of -2 = greatly limits, -1 = limits, 0 = neutral, 1 = enables, 2 = greatly enables.

^bThese two variables originally loaded onto one factor, but were separated due to inverse factor loadings and opposite values which would have created a neutral factor.