ANGLER SPECIALIZATION AMONG SALMON AND TROUT ANGLERS ON LAKE ONTARIO

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The angler specialization concept was studied using the expectancy model of motivation. An exploratory study of Lake Ontario salmon and trout anglers was conducted to test the relationships between the variables of the expectancy model of motivation and actual angling participation.

Introduction

The angling specialization concept was proposed by Bryan (1977, 1979) to explain the formation of motives and the general process of motivational change that leads an angler to seek different species, settings, equipment, and experiences. The hierarchical progression of angler social development proposed by Bryan (1977, 1979) suggested that anglers could be categorized into four types: (1) occasional angler, (2) generalist angler, (3) tackle-species specialist, and (4) method-species-setting specialist. These angler types were based on angler equipment, target species, and fishing activities (e.g., dry fly trout angler) and tended to define the motivational context by association with the angling activity and equipment. The concept of angling specialization has been further explored by fisheries researchers interested in social interactions, angling motivations, and social implications for fishery management (Steele et al., 1990; Hahn, 1991; Ditton et al., 1992; Dawson et al., 1992a and 1992b).

One of the alternate motivational approaches to studying angler specialization is the expectancy theory (Dawson et al., 1992a). Expectancy theory provides an operational research approach to studying angler specialization and a comprehensive framework to assist managers in understanding the management implications of the findings. The expectancy model of motivation (Figure 1) used in this study is based on the work of Vroom (1964) and others (Hanner et al., 1983; Landy and Trumbo, 1983; Nadler and Lawler, 1983). The three variables of this theory are:
(1) Expectancy -- the relative probability that an individual ascribes to his/her ability to perform a task successfully;
(2) Instrumentality -- the relative probability that an individual ascribes to his/her ability to attain the desired outcome; and
(3) Valence -- the relative value that an individual places on the expected outcome.

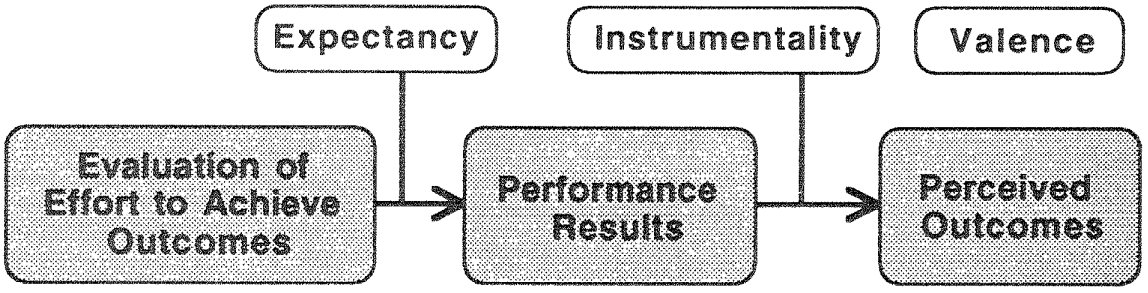

Figure 1. Expectancy model of motivation.

Methods

An exploratory study was conducted on Lake Ontario salmon and trout boat anglers to evaluate the angler specialization concept for the method-species-setting specialist category and test the relationships between the three variables of the expectancy model of motivation for specialized fishing activities. A sample of anglers was selected from respondents to a previous (1989) statewide survey of anglers who reported fishing in Lake Ontario during 1988 (Connelly et al., 1990). A random sample of 396 anglers was selected and sent a mail survey in 1992. Fifty-five surveys were undeliverable due to address changes by anglers. After two reminders, 190 anglers responded (56% response) of the 341 surveys deliverable.

Information collected on the mail survey included angling participation in Lake Ontario during 1991 for salmon and trout, fishing equipment and techniques used, and measures of angler expectancy, instrumentality, and valence. Salmon/trout angler expectancy was a self-reported rating of the individual's fishing skill or competence with a specific fishing technique for a specific species using a five point scale of: (0.00) Not competent, (0.25) Somewhat competent, (0.50) Competent, (0.75) Very competent, and (1.00) Extremely competent. Salmon/trout angler instrumentality was a self-reported rating of the individual's probability of catching one or more fish with given a fishing technique for a specific species using a five point scale of: (0.00) Not probable, (0.25) Somewhat probable, (0.50) Probable, (0.75) Very probable, and (1.00) Extremely probable. Salmon/trout angler valence was self-reported participation in fishing on Lake Ontario during the years 1989 through 1992 (i.e., the number of years fished) for a specific species (i.e., Chinook & Coho salmon, Steelhead, Brown trout, and Lake trout); this assumes that the time and resources invested in participation is an index for the relative value of the outcome.

Anglers use different fishing techniques and equipment for different species depending on the season, fish location and depth, fish feeding habits and preferences, and angler equipment and ability. All anglers in the study fished Lake Ontario from a boat (i.e., the setting was similar for all anglers surveyed).

The first goal of this study was to investigate the three general variables in the expectancy model: expectancy, instrumentality, and valence. The statistical hypotheses examined were:
(1) Expectancy (technique competence) variables between species or between techniques were not associated; (2) Instrumentality (probability of catching fish) variables between species or between techniques were not associated; and (3) Valence (days of participation) variables between species or between techniques were not associated. The second goal was to investigate the relationship between the expectancy motivation scale score and actual participation for 1991 angling on Lake Ontario (the most recent year with complete annual participation information).

Results

Angler expectancy or fishing skill and competency ratings for each technique and species (Table 1) suggest that the average angler is reportedly competent in the use of downriggers and flatlining but somewhat less competent with planer boards. A high degree of variability in competency ratings was reported between anglers for each species and technique. The statistical hypotheses that these expectancy variables between species and techniques were not associated was rejected since the correlations between all 12 variables were statistically significant ($p<.001$) (Table 2).

Table 1. Mean reported fishing technique skill or competence (expectancy) ratings and standard deviations for each technique and species.

	Mean (rating)	Standard Deviation
Downriggers		
Salmon	.46	.29
Steelhead	.41	.30
Brown Trout	.43	.29
Lake Trout	.50	.32
Planer Boards		
Salmon	.27	.27
Steelhead	.28	.30
Brown Trout	.31	.31
Lake Trout	.26	.27
Flatlining		
Salmon	.44	.30
Steelhead	.41	.31
Brown Trout	.46	.31
Lake Trout	.41	.30

The self-reported angler instrumentality or probability of catching fish ratings for each technique and species (Table 3) suggest that the average angler considers it very probable that they can catch one or more fish with downriggers but somewhat less probable with planer boards and flatlining. A high degree of variability in instrumentality ratings was reported between anglers for each species and technique. The statistical hypotheses that these instrumentality variables between species and techniques were not associated was rejected since the correlations between the majority of all 12 variables were statistically significant ($p<.001$) (Table 4).

The average number of years (valence) that anglers have returned to fish for each species on Lake Ontario, since they were first contacted in 1988, suggests that the average angler more highly values salmon as a target species more than the other three trout species (Table 5). A high degree of variability in valence ratings was reported between anglers for each species. The statistical hypotheses that these valence variables between species were not associated was rejected since all of the correlations between the four variables were statistically significant ($p<.001$) (Table 5).

Table 2. Correlation coefficients for reported fishing technique skill or competence (expectancy) compared between technique and species (2-tailed significance test, and $p< .001$ for all correlations).

	Downriggers				Planer Boards				Flatlining			
	Salmon	Steel-head	Brown Trout	Lake Trout	Salmon	Steel-head	Brown Trout	Lake Trout	Salmon	Steel-head	Brown Trout	Lake Trout
Downriggers												
Salmon	1.00											
Steelhead	.85	1.00										
Brown Trout	.84	.79	1.00									
Lake Trout	.88	.76	.80	1.00								
Planer Boards												
Salmon	.62	.60	.52	.55	1.00							
Steelhead	.64	.70	.55	.57	.87	1.00						
Brown Trout	.62	.60	.62	.61	.84	.85	1.00					
Lake Trout	.54	.51	.51	.54	.82	.74	.77	1.00				
Flatlining												
Salmon	.55	.57	.51	.47	.46	.41	.37	.37	1.00			
Steelhead	.53	.67	.51	.44	.50	.57	.42	.44	.86	1.00		
Brown Trout	.58	56	.64	.52	.42	.46	.53	.41	.80	.75	1.00	
Lake Trout	.44	.45	.45	.44	.37	.30	.30	.47	.82	.78	.72	1.00

Table 3. Mean reported probability for catching fish (instrumentality) ratings and standard deviations for each technique and species.

	Mean (rating)	Standard Deviation
Downriggers		
Salmon	.61	.29
Steelhead	.51	.30
Brown Trout	.55	.29
Lake Trout	.66	.30
Planer Boards		
Salmon	.34	.28
Steelhead	.38	.32
Brown Trout	.43	.33
Lake Trout	.34	.29
Flatlining		
Salmon	.38	.28
Steelhead	.40	.28
Brown Trout	.48	.30
Lake Trout	.38	.28

Table 4. Correlation coefficients for reported probability for catching fish (instrumentality) with a given technique compared between technique and species (2-tailed significance test, and p< .001 for all correlations greater than .26).

	Downriggers				Planer Boards				Flatlining			
	Salmon	Steel-head	Brown Trout	Lake Trout	Salmon	Steel-head	Brown Trout	Lake Trout	Salmon	Steel-head	Brown Trout	Lake Trout
Downriggers												
Salmon	1.00											
Steelhead	.77	1.00										
Brown Trout	.60	.60	1.00									
Lake Trout	.69	.62	.74	1.00								
Planer Boards												
Salmon	.47	.53	.34	.32	1.00							
Steelhead	.51	.65	.42	.45	.73	1.00						
Brown Trout	.45	.46	.59	.55	.54	.66	1.00					
Lake Trout	.19	.23	.35	.35	.57	.56	.58	1.00				
Flatlining												
Salmon	.38	.42	.21	.21	.57	.43	.26	.23	1.00			
Steelhead	.39	.47	.22	.29	.53	.63	.39	.39	.66	1.00		
Brown Trout	.32	27	.46	.40	.24	.40	.64	.40	.40	.54	1.00	
Lake Trout	.11	.10	.24	.20	.26	.24	.20	.57	.47	.44	.52	1.00

Table 5. Mean number of years fishing for the target species (valence) and correlation coefficients for participation in fishing on Lake Ontario during the years 1989 through 1992 compared between species (2-tailed significance test, and p< .001 for all correlations).

		Correlation Coefficients			
Species	Mean (years of angling)	Salmon	Steel-head	Brown Trout	Lake Trout
Salmon	1.9	1.00			
Steelhead	1.3	.61	1.00		
Brown Trout	1.5	.54	.61	1.00	
Lake Trout	1.4	.45	.44	.66	1.00

The number of days that anglers have fished for each species using the three techniques on Lake Ontario suggests that the average angler prefers salmon as a target species more than the other three trout species (Table 6). A high degree of variability in participation was reported between anglers for each species and technique. The statistical hypotheses that these participation variables between species and techniques were not associated was rejected because the majority of the correlations between the 12 variables were statistically significant (p<.001) (Table 7).

The scale scores for motivation using the expectancy theory were calculated, on a case-by-case basis, by the formula that motivation = expectancy x instrumentality x valence. The highest scale scores were for salmon and lake trout fishing using downriggers (Table 8). The calculated scores range from 0 to 1 and had a high degree of variability. To test these motivation scale scores, they were compared with the participation variables for 1991 on Lake Ontario to determine if there was any correlation between motivation and actual angling participation.

the correlations between the motivation scale scores and actual participation were not as high as anticipated; ranging from .21 to .70 (Table 8). Stronger correlations were observed between the valence variable and actual participation (i.e., a one-variable comparison with participation and not the three-variable scale score that includes valence); ranging from .43 to .77 (Table 8). However, the correlation between valence and actual participation in 1991 also raises questions about the use of this variable (i.e., number of years fished) to represent valence in this study.

Discussion

The specialization concept suggests that method-species-setting specialists would tend to focus on specific target species and fishing techniques. This study attempted to hold the setting relatively constant by choosing Lake Ontario boating anglers who use three distinct angling methods and target four species of fish. Previous studies indicated that Lake Ontario anglers use different fishing techniques and equipment for different species depending on the season, fish location and depth, fish feeding habits and preferences, and angler equipment and ability. The anticipated results from this study were that: (1) distinct groups of anglers would be categorized by angling techniques used and target species sought (i.e., associations between the 12 species and fishing technique combinations would not be evident); and (2) the motivational scale score calculated by the expectancy theory approach would be highly correlated with actual participation (i.e., associations between motivational scale scores and actual participation for the 12 species and fishing technique combinations would be evident). Such results were not found in the statistical results presented herein nor in additional cluster and factor analysis study results conducted but not presented here.

Table 6. Mean reported number of days fishing on Lake Ontario during 1991 and standard deviations for each technique and species.

	Mean (days of angling)	Standard Deviation
Downriggers		
Salmon	4.6	12.2
Steelhead	2.5	7.1
Brown Trout	2.2	6.1
Lake Trout	3.1	9.6
Planer Boards		
Salmon	0.4	2.0
Steelhead	0.9	3.7
Brown Trout	1.6	10.0
Lake Trout	0.1	0.7
Flatlining		
Salmon	0.6	2.0
Steelhead	0.7	2.7
Brown Trout	0.7	2.3
Lake Trout	0.3	1.0

Table 7. Correlation coefficients for reported number of days of fishing on Lake Ontario during 1991 compared between technique and species (2-tailed significance test, and p< .001 for all correlations greater than .25).

	Downriggers				Planer Boards				Flatlining			
	Salmon	Steel-head	Brown Trout	Lake Trout	Salmon	Steel-head	Brown Trout	Lake Trout	Salmon	Steel-head	Brown Trout	Lake Trout
Downriggers												
Salmon	1.00											
Steelhead	.72	1.00										
Brown Trout	.68	.82	1.00									
Lake Trout	.75	.80	78	1.00								
Planer Boards												
Salmon	.44	.44	.37	.37	1.00							
Steelhead	.57	.42	.39	.40	.77	1.00						
Brown Trout	.41	.25	.15	.18	.89	.82	1.00					
Lake Trout	17	.28	.21	.25	.19	.21	.09	1.00				
Flatlining												
Salmon	.25	.26	.30	.37	.16	.23	.07	.07	1.00			
Steelhead	.56	.46	.50	.51	.79	.76	.72	.06	.35	1.00		
Brown Trout	.32	28	.37	.32	.18	.19	.11	.08	.23	.40	1.00	
Lake Trout	.13	.10	.06	.23	.01	.02	.01	.24	.58	.14	.26	1.00

Possibly a more extreme comparison between salmon/trout (e.g., cold-water fishery) and bass anglers (e.g., warm-water fishery) on Lake Ontario would have produced results that fit better with the general fishing specialization concept. However, additional variables on angler preferences and substitution for target species, angler preferences and substitution for fishing techniques, abundance and availability of target species, and others may be important to understanding the limits of the fishing specialization concept versus more opportunistic angler behavior.

The statistical correlations found in this study between the 12 target species and fishing technique variables for expectancy, instrumentality, valence, and actual participation suggest that the specialization concept is more complex and multidimensional than indicated by earlier researchers. For example, some anglers on Lake Ontario may be more specialized on fishing techniques than species and more opportunistic in that they will target whatever species of trout and salmon that is susceptible to the fishing techniques they are more competent with in that area and season. Such possibilities do not fit easily within the current fishing specialization concept as presented by Bryan (1977) and will require the development of more complex models of angler behavior, decision-making, and motivation, and the use of multivariate statistical analysis for empirical testing of such theories and hypotheses.

This exploratory study has shown the difficulties inherent in operationalizing a model of angler behavior using the expectancy theory. Determining an appropriate valence variable (i.e., the relative value that anglers place on the expected outcome of successfully catching the target species) was problematic and the one employed in this study (i.e., number of years of fishing with the techniques for the target species) was highly correlated with actual days of fishing participation in 1991 on Lake Ontario. Conversely, the motivational scale score derived from this expectancy model was not highly correlated with actual fishing participation in 1991 on Lake Ontario for salmon/trout boat-based anglers.

Table 8. Mean expectancy scale scores (score = expectancy x instrumentality x valence) and standard deviations and scale score correlations with participation and valence variables (2-tailed significance test, and p< .001 for all correlations greater than .30) for each technique and species.

	Mean Expectancy Scale Score	Standard Deviation of the Expectancy Scale Score	Scale Score Correlation with Actual Participation	Valence Correlation with Actual Participation
Downriggers				
Salmon	.81	.98	.44	.66
Steelhead	.52	.92	.60	.74
Brown Trout	.54	.83	.35	.70
Lake Trout	71	1.00	.38	.77
Planer Boards				
Salmon	.30	.49	.32	.43
Steelhead	.38	.81	.69	.60
Brown Trout	.41	.80	.35	.61
Lake Trout	.26	.60	.70	.51
Flatlining				
Salmon	.43	.67	.21	.51
Steelhead	.40	.78	.27	.68
Brown Trout	.52	.89	.40	.69
Lake Trout	.36	.73	.38	.60

Some of the concepts reported in the literature on angler progression through sequential and hierarchical stages of fishing specialization appear intuitively pleasing and are part of the current concepts in fisheries management; however, empirical evidence to support or alter such concepts is more difficult to obtain. At present, research on models of angler or any recreational behavior and decision-making is fragmented and not integrated or comprehensive. The challenge for the future is to develop empirically based models of angling behavior and decision-making that can describe angler behavior patterns, predict angler behavior under varying circumstances, and suggest how fishery managers can influence angler behavior.

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