DO CHOICES OF SPORT FISHERIES REFLECT ANGLER PREFERENCES FOR SITE ATTRIBUTES?

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ABSTRACT: A revised recreation choice model is proposed and partially tested using results of a 1980 survey of Colorado anglers. Results of discriminant analyses show modest and useful prediction from preference for trout fishery site attributes to choice of type of fishery used.

PURPOSES

During the past 20 years, considerable research has studied the preferences and behaviors of outdoor recreationists. Those studies have had economic (e.g., Dwyer and others 1977), sociological (e.g., Cheek and Burch 1976), psychological (e.g., Knopf 1983) and other disciplinary orientations. Topics examined have been varied and include psychological need assessment (Tinsley and Kass 1980), visual perception and landscape assessment (Elsner and Smardon 1979), recreation experience preference (Driver and Brown 1978), conflict resolution (Jacob and Schreyer 1980), user satisfaction (Dorfman 1978), and trend prediction (Stynes and others 1980). Most of the studies conducted within each of these areas have attempted to understand and explain recreation behavior. Only a few studies have focused on predicting the users' choice of recreation activities, settings or areas from a variety of independent variables.

Two situations help explain why greater predictability has not been attained between area, site, or activity choice as dependent variables and area attributes, experience preferences, and other independent variables. One has been the general tendency of recreation behavioral scientists to report results of statistical tests of differences between classes and subclasses of independent variables, but not report amounts of variance explained. The other has been the infrequent use of theoretical models to suggest probable paths of statistical association (Driver and Knopf 1981, Tinsley 1984).

Because efforts are needed to both improve explanation and prediction of choice as a critical component of recreation behavior, this paper presents and partially tests a revised cognitive model of recreation site choice. The model builds on other models presented in the literature (Harris 1983, Krumpe and McLaughlin 1982, Haas and others 1981, Driver and Brown 1975). Its new dimensions are that it emphasizes the concept of constrained demand (or preferences), and it details more explicitly the conceptual link between preferences for specific setting attributes of a site and preferences for specific types of desired experiences.

The model applies to all recreation area/site choices. After it is described, the model is partially applied to test two hypotheses about choice of sport fisheries in Colorado:

1. Preferences for the attributes of specific types of Colorado sport fisheries will be significantly related to anglers' choices of fisheries.
2. Choices of Colorado sport fisheries actually used will be influenced by constraining and facilitating attributes of those fisheries.

A REVISED MODEL

The revised model of recreation area and site choice (figure 1) draws heavily on our previous research (Harris 1983, Driver and Brown 1975).

One feature of the model is its elaboration of the concept of constrained demand. Constrained demand is emphasized, because the model recognizes that most human decisions are strongly influenced by limited money, time, and other personal resources and capabilities. Demands, and behavior, are constrained psychologically, too, because most individuals are limited in the amount and complexity of information they can process while making decisions.

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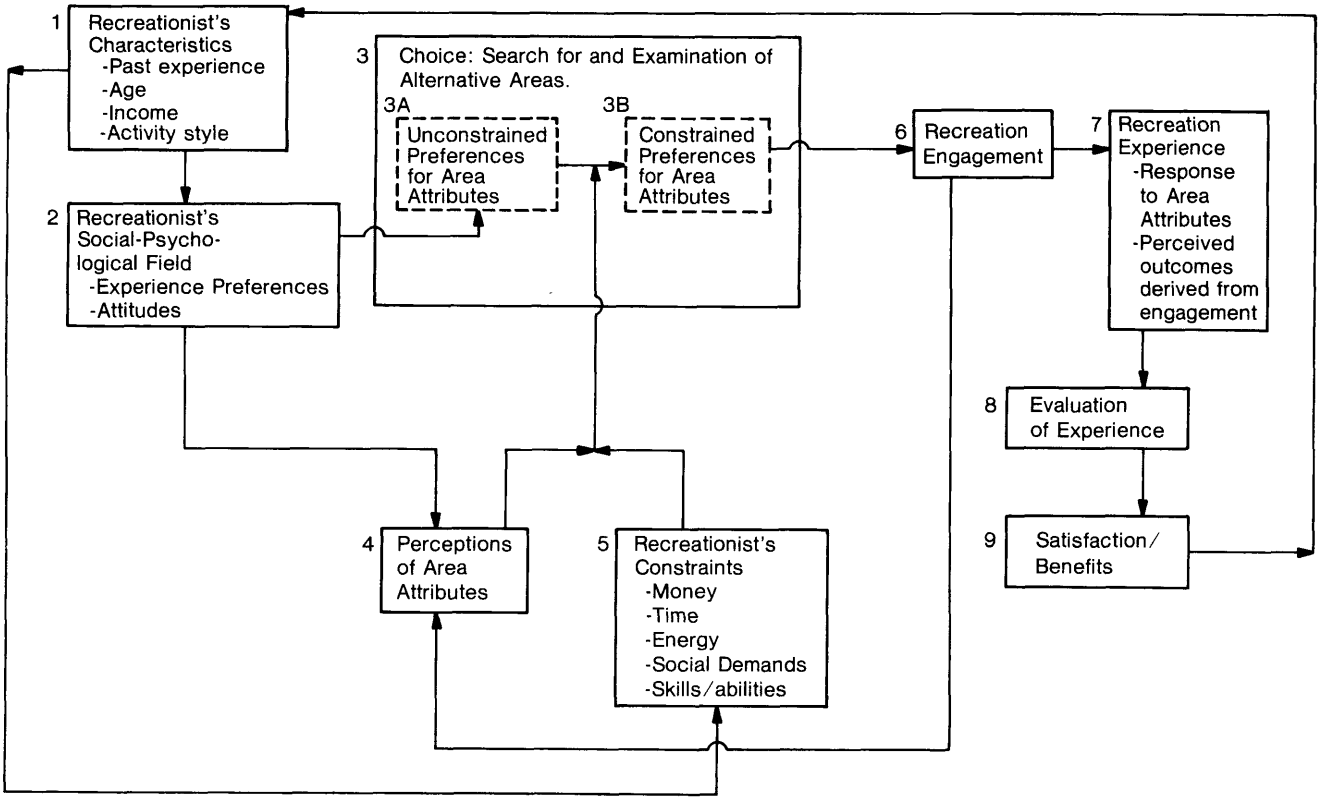

Figure 1.--A behavioral model of recreation choice.

An example of a current recreation planning problem, the allocation of fishery management resources to different types of Colorado fisheries, is used to clarify the model components and their relationships. To simplify the discussion, the model depicts the process with which a given angler chooses to visit a particular type of sport fishery.

The model begins with a potential recreationist with distinguishing characteristics (Box 1). That recreationist possesses a "social psychological field" (Box 2), which consists of mental constructs including motives and attitudes. One distinction made in this conceptualization is that angler attitudes include preferences for particular site attributes that can be used to distinguish among different types of settings, while angler experience preferences are antecedent to attitudes toward site attributes, may be less salient, and may or may not be attribute-dependent. Thus, the experience preferences explain the "why" behind the setting attribute preferences which relate to "what for whom." The extent to which these attributes are expected and valued depends on the extent to which an angler has specialized in the activity of fishing. Attributes theorized to be relevant here include fish-related attributes (e.g., species of fish, rate of catch, etc.) and other setting attributes (i.e., biophysical, social, and managerial site attributes).

These preferences for setting attributes, however, are unconstrained preferences (Box 3A); an individual's schedule of unconstrained preferences is represented in microeconomic theory by the concept of a utility function. In reality, limits exist on the use of any site that stem from the interaction of the recreationist's perception of site attributes (Box 4) and actual constraints on the recreationist (e.g., money, time, skill level, group norms, etc; Box 5). We theorize that factors such as the distance traveled to a site are perceived to be constraining attributes of that site, and that the recreationist's experience preferences and attitudes can significantly influence his/her perceptions of a site and its constraining attributes.

In the face of these constraints, the individual chooses among the attributes of available alternative sites. The site finally chosen represents the decisionmaker's constrained set of preferences for site attributes (Box 3B). This concept of constrained preferences parallels the concept of demand as formulated in microeconomic theory; demand curves are, in theory, derived by tracing out these price-quantity points where each individual's indifference curve (which reflects that individual's utility, or unconstrained preferences) intersects his/her budget constraint function. Implicit in this decision

process is a consideration of the values and expected levels of the salient attributes of the various alternative sites. Only minimal levels of availability may suffice for some site attributes, and the decision process in which site attributes are considered may be more appropriately modelled with a lexicographic choice rule than with the mental calculus implicit in subjective expected utility models.

If the individual recreates at the site chosen (Box 6), that recreationist will experience the site attributes and perceive that certain outcomes have been derived from that engagement. This response to the engagement is the recreation experience (Box 7). The recreationist evaluates the site and the experience by comparing the attributes and outcomes expected and desired from the engagement with those actually experienced (Box 8). It is on the basis of this comparison that the individual assesses his/her satisfaction with the site (Box 9).

This conceptualization provides an extended framework that integrates both site choice and recreation experience evaluation in a model of recreationist decisionmaking. Perhaps the most basic relationship suggested by our model is that between the recreationist's constrained preferences for site attributes and his/her choice of a type of site to visit. Although this conceptual link underlies both theory of recreation choice and consumer demand theory (Lancaster 1971), little research to date has attempted to assess the correlation between actual choice behaviors and stated preferences for particular site attributes (both constraining and facilitating).

METHODS

Subjects

The data were collected in 1981 as part of a survey of angler demands for Colorado sport fisheries. A random sample of persons who had acquired licenses for fishing in Colorado in 1980 was drawn. Questionnaires were mailed to these individuals in two waves, followed by a postcard reminder. Of the total sample of 1502 licensees, 484 (or 32 percent) returned usable questionnaires.

Although this rate of response was relatively low, it was of the same order of magnitude as that obtained by the Colorado Division of Wildlife on its annual angler surveys. A telephone survey of a sample of nonrespondents indicated that most nonrespondents were minimally interested anglers and that they were not users of any particular type of fishery. Thus, the survey responses obtained were probably from the more serious, concerned, and actively participating anglers. Given that these are the anglers whose desires and preferences are likely to be of greatest concern in fishery management planning, this sample was judged to be adequate.

Data Preparation

The responding anglers were asked to record the number of fishing trips they had taken to each of four types of fishing sites: (1) wild, or trout fisheries in mountainous areas that are not readily accessible by vehicle, (2) basic-yield, or trout fisheries in mountainous areas that can be easily reached by vehicle, (3) rural, or mixed species waters, typically cool or warm, in nonurban areas of Colorado, and (4) urban, or warm-water fisheries bordering or within the cities of Colorado. In addition, respondents were asked to indicate the type for which they had recorded the highest number (i.e, the most frequented fishery type). As a validity check, the consistency of the responses to these two methods of measuring the most frequented fishery type was investigated and the case involved was dropped from the analysis when an inconsistency was found.

The anglers also responded to 32 preference items in terms of the last (most recent) trip they had taken to a fishery of their most frequented type. For these items, the respondent was asked to rate the importance of biophysical, facility, social, and fish-related attributes for choosing the fishing site visited on that trip, using a six-point Likert-type scale with response options ranging from Not At All Important (1) to Extremely Important (6).

Analysis

The 32 preference items were clustered into groups on the basis of correlations among the responses to those items using the ICLUST VI clustering program. ICLUST VI first searches the initial item pool for that pair of items which is most highly correlated, and these items are combined to form a cluster. This procedure is repeated and the remaining items and clusters, are formed into higher-order clusters until Cronbach's alpha or an estimate of "coefficient beta" (the worst split-half reliability) of the combined cluster would be less than that of sub-clusters. This clustering procedure and subjective judgment were used to decide the content of the final scales. To obtain scale scores, an average was taken of respondent's ratings on all of the items comprising that scale.

Next, discriminant analysis was used to determine significant differences in the attribute preference scale scores of four groups

identified on the basis of the fishery type they reported they visited most frequently. The groups identified by choice of a type of fishery to frequent were the dependent variable, and the attribute preference scales were the discriminating or independent variables. Given that the weighting coefficients in the discriminant function are a measure of the correlation between the independent variables and the discriminant function (and are thus roughly analogous in interpretation to the beta weights in regression analysis), this analysis suggests the relative importance of the preference scales for discriminating among the groups.

RESULTS

Cluster analysis of the attribute preference items resulted in six multiple-item scales and four single-item scales (see table 1). Reliability coefficients for the six multiple-item scales ranged from 0.75 to 0.88.

The numbers of respondents reporting a choice of each of the four fishery types are listed in table 2. A total of 260 fishermen (70%) preferred the basic-yield type of fishery, 77 (21%) chose the wild type of fishery, 25 (7%) the rural type of fishery, and 9 (2%) the urban type of fishery.

Also included in table 2 are the group memberships of the respondents predicted on the basis of their discriminant function scores. As that table shows, 43 percent of the individuals who were predicted to be in the basic-yield group were in fact in that group, 77 percent of those predicted to be in the wild group were in that group, 40 percent of those predicted to be in the rural group were actually in that group, and 89 percent of those predicted to be in the urban group were in that group. Overall, 51 percent of the cases were correctly classified.

The results of the discriminant analysis suggested that significant differences did exist in the attribute preferences of anglers choosing different types of recreation areas to visit most frequently. As table 3 shows, the square of the canonical correlation for the first and most important discriminant function was .33, the proportion of the variance in this function associated with the dependent variable. This function accounted for 48.6 percent of total variance in the discriminating variables. (See Brown and Tinsley 1983 for a discussion of evaluating discriminant functions.) In addition, 7 percent of the variance in the second function was associated with the variance in the dependent variable; that second function accounted for an additional 7.8 percent of the total variance in the discriminating variables.

Table 3 also lists all the attribute preference scales that were included as independent variables in the discriminant analysis, along with the mean importance ratings of the four choice-based groups. The first function is

Table 1.--Items for attribute preference scales, with scale reliability coefficients.

Scale items	Reliability Coefficient[1]
Familiar waters	NA
New waters	NA
Waters close to home or work	NA
Fast-moving waters	NA
Trophy fish	.90
-- Catching as large a fish as you can	
-- Catching trophy fish	
-- Catching big fish	
Unique fish	.77
-- Catching kinds of fish not often caught in Colorado	
-- Catching kinds of fish not common in Colorado	
-- Catching fish not raised in hatcheries	
Smart fish	.86
-- Outsmarting more experienced fish	
-- Fishing for smarter fish	
-- Pitting your wits against the fish	
-- Fishing where you have to be skilled to catch fish	
Wild setting	.88
-- Seeing few man-made structures	
-- Fishing an area of high scenic beauty	
-- Fishing where you are likely to see only a small number of other fishermen	
-- Fishing where you feel far away from people and cities	
-- Fishing in remote areas	
-- Fishing where you cannot see or hear busy traffic	
-- Fishing where other people are not engaged in other recreational activities	
Fish yield	.80
-- Catching your limit	
-- Catching fish to eat	
-- Fishing where fish are biting regardless of what else you find at the area	
-- Catching as many fish as you can	
-- Catching enough fish for a good meal	
-- Catching fish to store for future needs	
Facilities	.75
-- Fishing at areas where the whole family enjoys recreating	
-- Fishing where boat launches, parking lots, boat rentals, etc., are available	
-- Fishing where you don't have to walk more than 15 minutes	
-- Fishing where campsites, picnic tables, restrooms, etc., are available	

[1] A reliability coefficient is not applicable (NA) for a single-item scale.

Table 2.--Numbers of anglers in actual and predicted fishery choice groups.

Actual Choice	N	Predicted Choice Groups: Basic-yield	Wild	Rural	Urban
Basic-yield	260	112 [1](43)	59 (23)	49 (19)	40 (15)
Wild	77	13 (17)	59 (77)	3 (4)	2 (2)
Rural	25	6 (24)	1 (4)	10 (40)	8 (32)
Urban	9	0 (0)	0 (0)	1 (11)	8 (89)
Totals	371	131	119	63	58

[1] Figures in parentheses represent row percentages.

defined by the "wild setting" and "facilities" scales, which were found to be equally important as discriminators and provided most of the explanation of variance in area choice. The fisherman group that actually chose the wild type of area to fish placed the greatest importance of any group on the "wild setting" attribute dimension and the least on the "facilities" dimension, while the basic-yield, rural, and urban groups reported progressively lower means on the "wild setting" dimension and progressively higher means on the "facilities" dimension.

The second function included "waters close to work or home" and "novel waters" as attribute preference scales that were nearly equally important as useful discriminators among type choices. The convenience of waters close to work or home was most important to anglers choosing the urban type of recreation area most frequently; it was of decreasing importance to rural and basic-yield user groups, while the wild choice group placed only slight importance on that attribute. No clear trend is reflected by the means obtained with the "novel waters" scale, although fishermen choosing the wild type of area placed a somewhat greater importance on that attribute in comparison with groups choosing other types of areas. "Fast-moving waters" was also an attribute important for discriminating among area choices: a clear trend was reflected in mean scores for this attribute preference scale, with the wild user group placing the greatest importance on it of any group and the basic-yield, rural, and urban choice groups reporting progressively lower means for this attribute.

These results are presented graphically in figure 2, which shows the relative positions of the four predicted choice groups vis-a-vis the two discriminant functions and the preference scores on which the functions are based. Each point represents a given group's position as reflected by that group's centroid, which was derived by evaluating the discriminant functions at the group means.

DISCUSSION

Given the complexity and uncertainty of predicting human behavior, the results of the discriminant function analysis are interpreted as disclosing a moderately high degree of consistency between fishermen's choice of type of fishery and their preferences for attributes characterizing each type. With an adjustment for the size of each of the four groups, 25 percent of the members of each group would be correctly classified as actual members of the group by chance alone. (We disregarded any prior probabilities of classifying anglers based on group sizes, which would have masked the association between our independent and dependent variables). In contrast, the predictive model based on the two discriminant functions generally did much better than this random allocation; it correctly classified 77 percent of the anglers in the wild group, 43 percent of the anglers in the basic-yield group, 40 percent of the anglers in the rural group, and 89 percent of the anglers in the urban group. These proportions indicate that the model was most effective in identifying anglers in the wild and urban groups. This result is to be expected, given that these two groups differed the most in their attribute preferences (see table 3, figure 2). The model was less effective in identifying members of the basic-yield and rural groups, although it still significantly increased the accuracy of classification in the case of these groups over that achieved with a random process.

These results provide support for our first hypothesis, suggesting that, when anglers' preferences for specific fishery attributes that are important in a particular choice situation are considered, actual choice behaviors of the anglers do reflect the importance placed on those attributes. Nonetheless, using the square of the canonical correlation coefficient as a rough indicator, at least 60 percent of the variance in area type choice was unassociated with the variance in attribute preferences. This finding is not unexpected, given the possible sources of variance for which we did not account. A number of these sources point to possible limitations of the study. For instance, there may have been critical decision criteria underlying the choice process (e.g., knowledge of available sites) that were not included in the analysis but that would have explained some of the error it revealed. In addition, the methods used to obtain attribute preference ratings were somewhat circuitous and could have caused some instrument bias. A respondent had to first recall numbers of annual trips taken to specific types of sport fisheries

Table 3.--Discriminant analysis of choices of types of fisheries.

Attribute Preference Scales	Mean Scores on Preference Scales by Choice Groups[1]				Discriminant Function Coefficients[2]	
	Wild	Basic-yield	Rural	Urban	Discriminant Function 1	Discriminant Function 2
Wild Setting	5.15	4.17	3.35	3.27	-0.58	
	[3](0.84)	(1.04)	(1.16)	(0.98)		
Facilities	2.09	3.12	3.75	3.87	0.58	
	(0.82)	(1.03)	(0.88)	(0.81)		
Waters close to work or home	2.21	2.65	3.64	5.11		-0.66
	(1.60)	(1.75)	(1.85)	(1.05)		
Novel Waters	4.06	3.17	3.36	3.22		-0.63
	(1.49)	(1.48)	(1.44)	(0.97)		
Fast-moving waters	3.30	2.97	2.12	2.11		0.42
	(1.38)	(1.54)	(1.13)	(0.93)		
Smart Fish	3.50	3.25	2.79	2.89		
	(1.37)	(1.32)	(1.30)	(1.19)		
Familiar waters	3.31	3.98	4.28	4.33		
	(1.67)	(1.50)	(1.10)	(1.50)		
Unique fish	3.03	2.50	2.17	2.59		
	(1.49)	(1.24)	(1.15)	(1.19)		
Trophy fish	3.50	3.48	3.43	3.52		
	(1.52)	(1.46)	(1.42)	(1.37)		
Fish-yield	3.34	3.35	3.42	3.96		
	(1.09)	(1.08)	(1.20)	(0.41)		
Percent of variance explained in area choice[4]					33.17	7.39
Percent of variance explained in important ratings					84.32	13.35
Chi-square value					[5]178.70	[5]32.39

[1]Choice groups consist of respondents choosing a type of fishery to fish most frequently; mean preference scores are based on a scale ranging from 1 ("Not At All Important") to 6 ("Extremely Important").
[2]Only moderate to large coefficients (>0.40) are listed.
[3]Numbers in parentheses are standard deviations.
[4]Square of the canonical correlation coefficient for that function.
[5]Statistically significant, $p \leq 0.05$.

then record that type he/she had visited most frequently, then think specifically of the last trip taken to an area of that type, and finally rate the importance of 32 attribute-related items for choosing to visit that specific area. Choice of a general area type would be only indirectly related to the importance of site attributes for choosing the last area visited, and this link was further attenuated through the structure of the questionnaire. So we might expect some error. If anything, our results suggest that people were reasonably capable in following the instructions of the questionnaire and conscientious in answering the questions it contained.

It is also important to recognize that complete homogeneity of preferences should not be expected for a group of anglers using a given type of fishery. To the contrary, it follows from recent theory on recreation behavior (e.g., Driver and Brown 1978) that, because even recreationists using the same site differ in terms of their experience preferences, differences in preferences for site attributes should also be found. Therefore, although differences in attribute importance ratings should be greater among the groups frequenting different types of fisheries than they are among anglers within any one group, heterogeneity in the preferences of anglers using a particular type of fishery is to be expected.

Despite the error factor in our results, we believe that they also confirmed our second hypothesis that preferences for both constraining and facilitating attributes influenced the anglers' choices. Perhaps the most interesting findings of the study are suggested by a consideration of the role of specific attribute preferences. For example, the most important discriminating preferences were not ones for attributes of the area that were directly fish-related (e.g., potential number or size of fish that might be caught). Rather, preferences for setting attributes unrelated to fishery characteristics were most important. In fact, when the importance means for fish-related attributes (e.g., trophy fish, fish yield, unique fish, etc.) were compared across choice groups, all of the groups placed similar and fairly high levels of importance on these features, as one might expect of serious fishermen in any setting. The greater

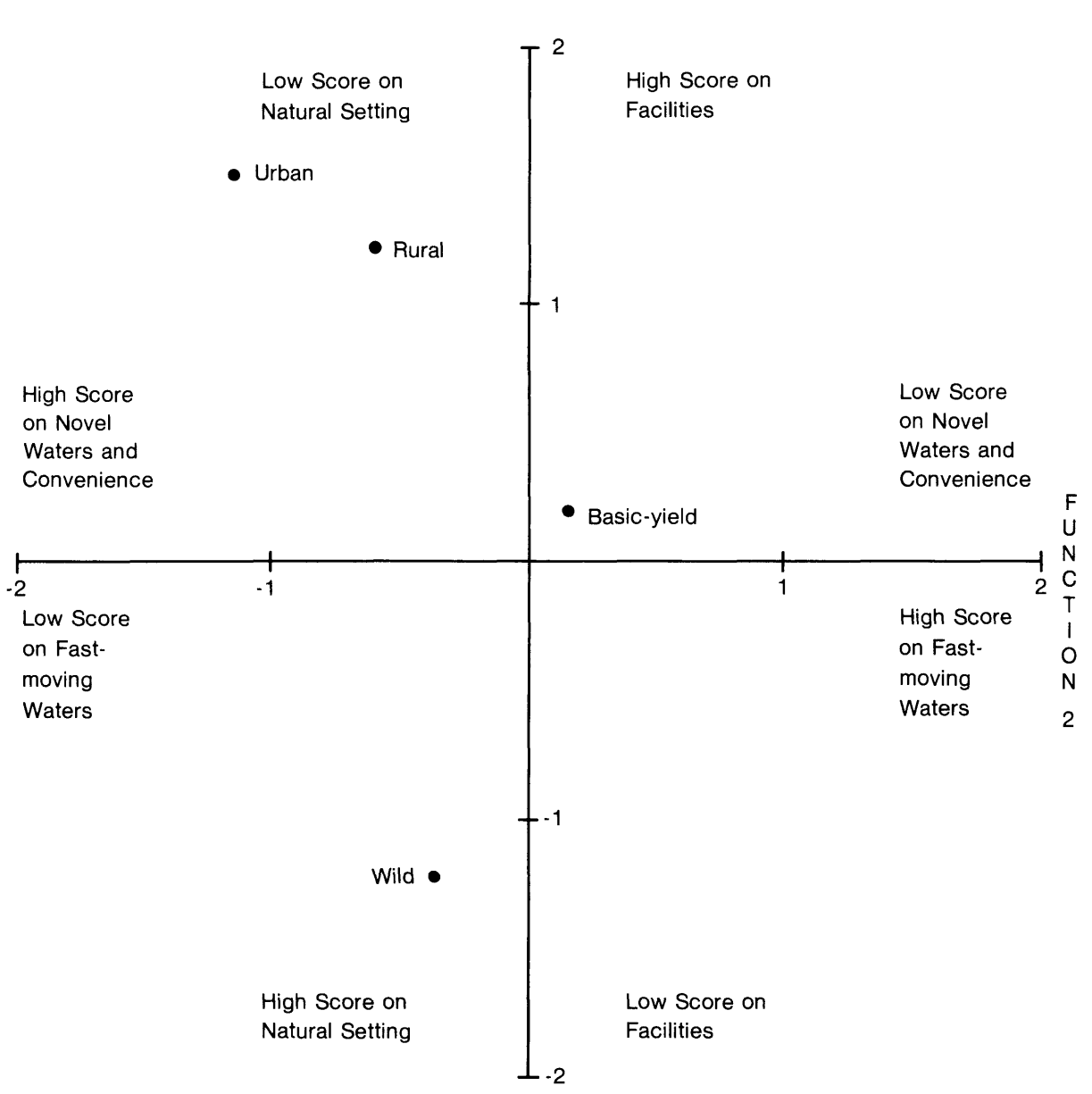

Figure 2.--Relative positions of four predicted fishing groups in relation to two discriminant functions and preference scores upon which the functions were based.

importance of setting variables as discriminators of area choice indicates that site attributes defining the character of the overall recreation experience, and not just fish-related attributes, are important to fishermen.

Further, as theorized in the revised model, the setting attributes considered in the choice process are both constraining and facilitating ones. For example, the most important attributes for choice discrimination included "wild setting" and "facilities". In the case of the group choosing the wild type of fishery to visit most frequently, the "wild setting" attribute was definitely an attractive or facilitating feature, while the presence of "facilities" might be interpreted (on the basis of its low importance) as a detracting feature of an area in the minds of these fishermen. The convenience of "waters close to work or home" was an important factor in the second function, especially for the urban group whose high importance score on this attribute reflects the constraint that distance from fisheries apparently represents to the group. Also useful as a discriminator was the attribute "novel waters," which was an important facilitating feature to the wild group. (It might be noted that "familiar waters" was more attractive to the groups using the more developed and con-

venient fishery types.) This finding may have particular relevance for efforts to model recreation site demand and evaluate site benefits, which make the basic assumption that, all site attractiveness features being equal, recreationists will choose the site closest to them. The importance of novelty for members of the wild group suggests that they, in particular, might well visit a more distant site for the sake of its novelty, and failure to account for this influence could result in biased estimates of site demand and value.

A conclusion, then, that might be drawn from the study findings concerns efforts to understand the decisionmaking processes of recreationists making site choices. The results of the research suggest that only a small number of area attribute dimensions may be central determinants of site choice, and this finding lends some weight to those proposing that simpler choice rules are appropriate for modeling processes of recreationist decision making (e. g., Krumpe and McLaughlin 1982).

In addition, the study findings indicate the value of measuring preferences for specific area attributes along with preferences for specific types of experiences. However, further research is needed to examine the relationship between recreation experience and site-attribute preferences as well as to more fully describe other elements and relationships influencing recreation decisionmaking processes.

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