

ANALYSIS OF ANGLER PREFERENCES AND FISHERIES MANAGEMENT OBJECTIVES WITH IMPLICATIONS FOR MANAGEMENT

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ABSTRACT

Fisheries managers have long operated under the assumptions that time spent fishing (angler-days) or pounds or numbers of fish caught (maximum sustained yield) were accurate measures of fisheries output. However, many fisheries managers today advocate development of a multidimensional output measure which would incorporate social, aesthetic, and psychological factors. The present study was undertaken to delineate and determine the relative importance of 10 items affecting the quality of angling as perceived by Virginia fee-fishermen. A self-administered questionnaire employing a modified Likert scale was used to evaluate the 10 quality-related items. A factor analysis was run which resulted in four factors relating to the quality of fee-fishing. The factors were (1) attractiveness of the fishing site, (2) amount of fishing, (3) satisfaction, and (4) improvements needed. The four factors, when combined with the mean importance scores, indicate that the quality of fee-fishing is multidimensional and not dependent solely on catch.

A portion of the survey was devoted to determining the relative importance of 9 fisheries management objectives as indicated by fisheries managers employed by the 50 state recreational fisheries management agencies. An analysis of the most important objectives, maximizing sustained yield (pounds) and catch (numbers), and the most important angling factors, revealed that a disparity exists between angler desires and managers' objectives. Some recommendations for eliminating this difference are given.

INTRODUCTION

An important but possibly unrecognized problem facing fisheries managers today is determining exactly what constitutes desirable "output" from a fisheries system. This information is needed to define sound management goals and objectives. Historically, fisheries managers have assumed that production in terms of biomass or numbers of fish was the desirable measure of output and, therefore, devoted most of their effort toward establishing, enhancing, or maintaining fish populations and their habitat. Presently, however, there is increased emphasis on developing measures of output other than biomass or numbers of fish. Some items being considered are aesthetics, crowding, companionship, motivations, and any item which affects the quality of angling or the level of satisfaction of resource users. This study was undertaken to determine:

- (1) The relative importance of 10 angling quality related items as perceived by Virginia fee-fishermen.
- (2) The relative importance of 9 fisheries management objectives as perceived by district fisheries managers employed by the 50 state fisheries management agencies.
- (3) The differences between angler preferences and fisheries managers' preferences as reflected in their management objectives.

Fee-fishermen are generally considered to be "meat" fishermen and interested solely in catch. If it could be determined that fee-fishermen regard catch as relatively unimportant, the recreational angler would surely regard catch as relatively unimportant. The relative importance of the nine management objectives should reflect fisheries managers' ideas as to what the angler desires and which components of the angling experience are most important to anglers.

BACKGROUND

Historically, fisheries managers have operated under the objective of maximum sustained yield or variations thereof (such as maximizing catch of a certain size). The assumption is that the level of catch sufficiently reflects output from a fishery. An alternate approach has been to measure quantities such as man-days of use. The assumption is that time spent afield sufficiently reflects fisheries output. However, many natural resource managers now advocate that fisheries output be measured in more human-oriented terms such as satisfactions which ultimately lead to human benefits (Hendee 1974, Hendee and Potter 1971, Talhelm 1973, Knopf et al. 1973, Potter et al. 1973, More 1973, Stankey et al. 1973). Hendee (1974) stated that the purpose of wildlife management is to provide benefits to people. The basic idea is that recreational resources offer people the opportunity for a range of experiences which in turn, give rise to various human satisfactions which may then lead to human benefits. Satisfactions are the more specific, immediately gratifying pleasures from certain aspects of

the recreational experience. Benefits, however, are the more general and enduring improved conditions resulting from one or more satisfactions; e.g., improved physical, psychological, and emotional well-being, and a richer quality of life and better personal relationships.

An approach similar to Hendee's multiple-satisfaction model is the concept of "optimum sustained yield" in fisheries (Stroud 1973). This approach emphasizes that angling quality is multidimensional and includes such things as species caught, the sizes of fish, the situations in which they are found, and the method by which they are sought or harvested. Other authors have expressed similar ideas. For example, McFadden (1969) stated that the outdoor experience, environmental aesthetics, and the sporting challenge are important angling aspects. He defined the social product of sport fishing as the aggregate of value which accrues to the participants from an enriching use of their leisure time. Moeller and Engelken (1972) used personal interviews of 100 anglers to determine the relative importance of eight selected factors related to success of a 1-day fishing trip. They found environmental factors such as water quality, natural beauty of the surrounding area, and privacy while fishing to be relatively more important than catch. Hoagland and Kennedy (1974) surveyed wilderness anglers in the Unita Mountains of Utah and found that "escape from routine" and "getting outdoors" ranked above catching fish as attractant forces. Most anglers agree that their interest is not solely in the fish they catch, but in fishing itself (Ley 1967). The above and other studies indicate that angling is a multidimensional experience with catch composing only a few dimensions. It should be emphasized, however, that there must be some minimum probability of success (catch) before intangible benefits are realized (Hendee 1974).

If managers are to implement a multiple-satisfactions approach in fisheries management, then the aspects of the angling experience need to be delineated and their perceived relative importances determined. This paper addresses the problem of determining and ranking various items in the angling experience. The problem of determining fisheries management objectives and the disparity between angler desires and managers' objectives is also addressed.

METHODS

During the spring of 1974, a self-administered questionnaire was developed to determine the relative importance of 10 selected factors relating to the quality of an angling experience. A modified Likert-type scale was used to indicate the degree of importance of each factor with responses ranging from not important to extremely important with a numerical value of 1 to 5, respectively. The items considered were water quality, access, facilities, natural beauty of the area, privacy, numbers of fish caught, sizes of fish caught, weather conditions, companionship of family and friends, and the manager's attitude and personality. Respondents were also asked to indicate their overall level of satisfaction on a scale ranging from extremely satisfied to extremely unsatisfied. Various demographic characteristics such as sex, age, income level, education, marital status, fishing experience, residency, and license type were also determined.

Questionnaires were distributed to 10 fee-fishing operations in Virginia. The operators were asked to give the self-administered questionnaires to all anglers patronizing their facility; therefore, a non-random sample for each site was selected. Nine operations returned useable questionnaires.

Many of the factors being measured on the questionnaire might be related structurally. Therefore, a multivariate statistical procedure, factor analysis, was used in data analysis. Factor analysis reduced the original set of variables to a smaller number of variables, called factors, which are amenable to interpretation (Ferguson 1971).

A second questionnaire was developed to determine the relative importance of nine fisheries management objectives. A pilot study was conducted on Virginia Polytechnic Institute and State University fisheries faculty and graduate students to aid in refining the questionnaire. The final list of fisheries management objectives consisted of the following:

- (1) Maximizing sustained yield (pounds);
- (2) Maximizing catch (numbers);
- (3) Establishing trophy fisheries;
- (4) Maximizing fishing license sales;
- (5) Maximizing angler-trips;
- (6) Maximizing angler-days;
- (7) Maximizing angler-hours;
- (8) Minimizing angler crowding; and
- (9) Minimizing angler complaints

An appropriate cover letter was attached to each questionnaire explaining the purpose and importance of the study. Six questionnaires were mailed to each state fisheries management agency along with a letter to each chief of fisheries requesting the questionnaires be sent to six representative fisheries managers. Respondents were asked to indicate the management objectives under which they are currently operating and to rank each objective.

RESULTS

Fee Fishing Survey

From an initial summary of the data, it is readily apparent that the manager's attitude, water quality, natural beauty of the area, and companionship with family and friends were relatively most important with mean scores of 4.38, 4.34, 4.17, and 4.13, respectively (Table 1). Also pertinent was the importance score of privacy while fishing (the lowest score, 3.28). The importance scores indicate that the responding fee-fishermen regard factors other than those relating directly to fish as relatively more important to the enjoyment of their fishing experience. A similar study conducted by Moeller and Engelken (1972) found water quality, natural beauty of the area, and privacy while fishing to be relatively important as indicated by 100 New York fee-fishermen. The authors concluded that the anglers desire much more from their fishing experience than merely catching fish. In the present study, size and number of fish caught ranked fifth and eighth, respectively. Therefore, anglers do derive enjoyment from parts of the recreational experience other than merely catching fish. However, a certain minimum probability for catching fish must still remain (Hendee 1974).

Table 1. Relative importance of 10 angling quality-related items in selected Virginia fee-fishing operations.

<i>Items</i>	<i>Mean Score</i>
Manager's Attitude	4.38
Water Quality	4.34
Natural Beauty of Area	4.17
Companionship	4.13
Size of Fish Caught	3.85
Facilities	3.82
Access	3.75
Number of Fish Caught	3.72
Weather	3.42
Privacy	3.28

Factor Analysis

A factor analysis was performed using a principal components extraction followed by a varimax rotation of factors corresponding to eigenvalues greater than unity, resulting in a matrix consisting of 13 factors (Dixon 1973). Eigenvalues of 1.8 and 2.3 were also used in additional varimax rotations which resulted in matrices consisting of seven and five factors, respectively. It was determined that the matrix consisting of seven factors gave the most complete "picture." Four of the seven factors relate to the quality of the fee-fishing experience.

Factor I: Attractiveness of Fishing Site

Variables with loadings (interpreted like correlation coefficients) of 0.35 or more on this factor are shown in Table 2. Variables relating to access, facilities present, and natural beauty of the area loaded highly on Factor I. Individuals who feel the natural beauty of an area is important also want access to the area and want some manmade facilities present, probably for their comfort. Quality of water and companionship with family or friends also relate heavily to the attractiveness of the site.

Factor II: Amount of Fishing

Those variables relating to the amount of fishing loaded substantially on Factor II (Table 3). Individuals with more fishing experience who made a significant number of trips per year tended to fish several hours per trip and indicated that numbers and sizes of fish caught were important to them.

Table 2. Factor I: "Attractiveness of Site" derived from factor analysis on selected Virginia fee-fishing operations.

<i>Variable</i>	<i>Loading</i>
Water Quality	0.69
Access	0.72
Facilities	0.64
Natural Beauty of Area	0.76
Privacy	0.45
Weather	0.51
Companionship	0.67
Manager's Attitude	0.42

Table 3. Factor II: "Amount of Fishing" derived from factor analysis on selected Virginia fee-fishing operations.

<i>Variable</i>	<i>Loading</i>
Number of Fish Caught	0.54
Size of Fish Caught	0.54
Fishing Experience	0.56
Trips Per Year	0.63
Hours Fished Per Trip	0.65
Resident License Holder	0.44
Education	-0.36
Income	-0.42
Snack Bar Used	0.55
Build More Ponds	0.51

Factor III: Satisfaction

Variables with loadings of 0.35 or more are shown in Table 4. Factor III may be interpreted as indicating that satisfaction with fee-fishing is linked to the improvement of stocking practices. Satisfaction was not linked to the fish caught, but rather to the perceived need of more fish stocking. This may mean that satisfaction is linked to expectations of catch.

Factor IV: Improvements Needed

Variables with loadings of 0.35 or more on Factor IV (Table 5) all relate to improvement of the fishing site. The results are unusual in that respondents who wanted to decrease crowding also wanted to have more directional signs and markers installed and have access facilities improved. One interpretation is that respondents would like to keep crowding down while having better access to fishing and better facilities for themselves. Another interpretation is that crowding is related to the number of people per unit of facilities. With ample facilities, more people may be accommodated without an increase in crowding.

Table 4. Factor III: "Satisfaction" derived from factor analysis on selected Virginia fee-fishing operations.

<i>Variable</i>	<i>Loading</i>
Weather	-0.45
Satisfaction	0.69
Children Brought Fishing	-0.35
Stock More Fish	0.76
Stock More Species	0.71

Table 5. Factor IV: "Improvements Needed" derived from factor analysis on selected Virginia fee-fishing operations.

<i>Variable</i>	<i>Loading</i>
Access	0.44
Facilities Improvements	0.46
More Signs and Markers	0.68
Decrease Crowding	0.71

Management Objectives Survey

Results from the fisheries management objectives survey (Table 6) indicate that maximizing sustained yield is the dominant objective, with 49 percent of the respondents ranking it number one. Maximizing catch was the second most important objective, with 25 percent of the respondents ranking it number one. The three "yield" oriented objectives, maximum sustained yield, maximizing catch, and establishing trophy fisheries, accounted for 77 percent of the respondents who marked an objective as being number one. In addition, only 28 percent of the respondents who marked an objective as being number one checked the "angler" oriented objectives. Some respondents marked more than one objective as being ranked number one which accounts for the above percentage total being 105 instead of 100. Among the six "angler" oriented objectives, maximizing angler-trips and angler-days were most important.

In summary, the sample of fisheries managers were "yield" oriented as indicated by their primary management objectives. This reflects that most fisheries managers view fishery output predominantly in terms of catch and not in terms of "optimum sustained yield" or multiple satisfactions.

Table 6. Number (percent) of fisheries management objectives survey respondents who ranked the 9 objectives from 1 to 9. Some respondents marked 2 objectives as being number one.

<i>Objective</i>	<i>1</i>		<i>2</i>		<i>3</i>		<i>4</i>		<i>5</i>		<i>6</i>		<i>7</i>		<i>8</i>		<i>9</i>		
	<i>No.</i>	<i>%*</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	
Max Sus Yield	118	49	38	16	9	4	8	3	1	.4									
Max Catch	61	25	71	30	17	7	3	1											
Trophy Fisheries	8	3	13	5	25	10	16	7	7	3	2	1	3	1	3	1	1	.4	
Max License Sales	6	3	4	2	11	5	3	1	1	.4	7	3	1	.4	1	.4	7	3	
Max Angler-Trips	22	9	21	9	10	4	7	3	6	3			1	.4	1	.4	1	.4	
Max Angler-Days	18	8	15	6	12	5	5	2	5	2	1	.4	2	1	2	1			
Max Angler-Hours	6	3	6	3	5	2	8	3	4	2	5	2			1	.4			
Min Angler Crowding	5	2	11	5	10	4	5	2	3	1	3	1	7	3	1	.4	2	1	
Min Angler-Complaints	8	3	11	5	24	10	7	3	7	3	1	.4	3	1	5	2	3	1	

* Indicates percent which was rounded to the nearest whole number, except percentages less than .5 which were presented as fractions.

DISCUSSION

When considered together, the four factors seem to imply that the quality of a fee-fishing experience is related not only to the amount of fishing and attractiveness of fishing sites, but also to the expectations and perceptions of the angler. There seems to be some minimum expectation of catch which determines partially the amount of fishing done by respondents. This, however, does not lead to the conclusion that the output of fee-fishing is solely pounds or numbers of fish, especially when the rankings of the various importance factors are considered.

The hypothesis that angling is a multidimensional social, psychological, and physical experience seems tenable for fee-fishing. However, the strong association between amount of suggested fish stocking improvements and satisfaction indicates that fee-fishermen are still interested in catching fish, which seems logical since many other types of recreation could provide satisfaction from viewing scenic areas, enjoying nature, getting outdoors, etc.

The results from the fee-fishing survey when appraised in conjunction with studies conducted by Moeller and Engelken (1972) and Hoagland and Kennedy (1974) reveal that catching fish is not the most important aspect of angling. Since the results from the fisheries management objectives survey (Table 6) indicate that managers are predominantly interested in producing a greater catch, the disparity between angler desires and management objectives needs to be analyzed.

Fig. 1 illustrates the disparity between fisheries managers' preferences, as reflected in their top ranked objectives, and hypothetical anglers' preferences. The managers' preference function was drawn using the proportion of managers who ranked the objectives number one (solid line). A nondiscriminating angling public might equally prefer each objective (dashed line). However, the fee fishing survey and others (Hoagland and Kennedy 1974, Moeller and Engelken 1972) indicate that the anglers' preference function might be increasing, moving from yield-oriented objectives on the left to more angler-oriented objectives on the right. This hypothetical relationship assumes that anglers prefer angling experiences which result in satisfactions and not just catch.

If fisheries managers decide to adopt a multiple-satisfactions approach and adopt the objective of maximizing angler satisfactions, a fundamental relationship might be useful as a conceptual framework. Consider the following equation:

$$\text{Expectations} - \text{Benefits} = \text{Satisfactions}$$

where benefits exceed expectations or dissatisfactions where expectations exceed benefits. The three quantities are extremely hard to measure objectively, however, indices could be developed which allow relative comparisons.

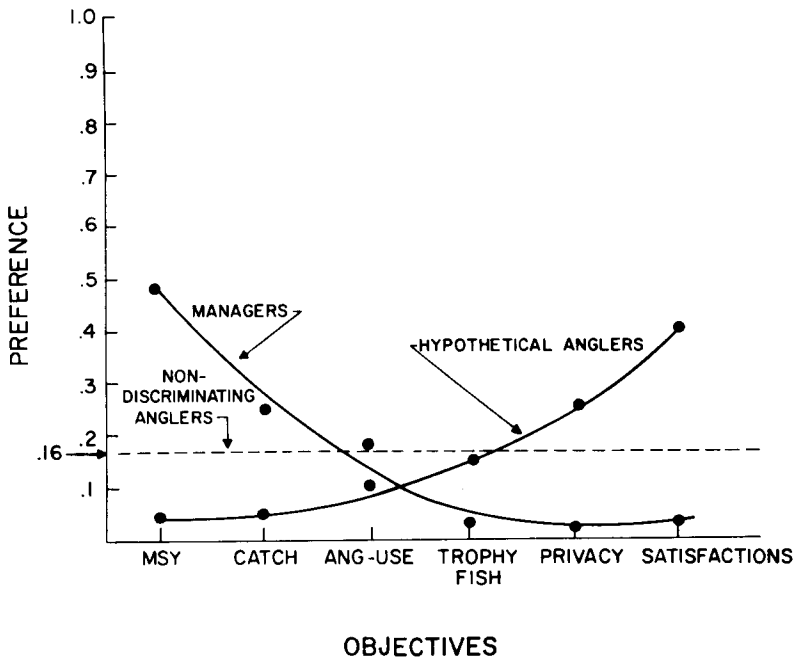


Figure 1. Preference functions for six fisheries management objectives. Fisheries managers' curve was derived using the proportion of managers who ranked an objective number one and connecting these points. The non-discriminating curve was drawn by assuming an equal proportion of anglers would rank the objectives number one. The anglers curve was drawn by hypothesizing that anglers would be discriminating and would prefer the more angler-oriented objectives.

The objective of maximizing angler satisfactions may be approached from two directions. First, and most appealing, fisheries managers could set more human-oriented objectives and attempt to increase human benefits from angling. Benefits are hard to measure and no sound methodology exists today. However, some more human-oriented factors such as angler-use can be measured. The angler-use unit could be modified by establishing categories of quality-ranked units. For example, anglers have indicated that the natural beauty of the surrounding area is extremely important as a quality angling factor. Angling areas could be categorized as extremely appealing, appealing, somewhat appealing, unappealing, and extremely unappealing. The angler use, say angler-days, from each type of area could be recorded and a rough index of angling benefits could be derived. The same approach could be extended by incorporating more quality-related angling factors such as privacy, water quality, or any factor that is deemed important by anglers. More intensified research in this area could ultimately lead to development of a management benefit unit as recommended by Lackey (1974).

The second approach to increasing the level of angler satisfactions is by manipulating the expectations of anglers. This might prove to be extremely difficult, but may be necessary with an increasing population of anglers and a decreasing resource base. One method of creating realistic angler expectations might be to publish, in pamphlet form, the use, catch, catch per effort, and similar statistics for management areas along with a quality-rating similar to the above mentioned categories. This would give the angler a better appraisal of what he can expect from his angling experience. Again, more research is needed in this area.

CONCLUSION

Effective management of any system is based upon sound goals and objectives. Fisheries management has traditionally been concerned with objectives that relate almost entirely to yield. Recent studies, however, indicate that catch may be relatively less important to many anglers. Therefore, fisheries managers might do well to alter their objectives to incorporate these angler desires. This approach might ultimately lead to increased angler satisfactions, and hence eliminate or resolve many of the "people" problems confronting many fisheries managers.

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