Fisheries Sessions

Freshwater and Saltwater Anglers: A Comparative Analysis of Differences in Attitudes Toward Management Tools

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Abstract: Philosophies of fisheries management have evolved through time and have affected, and been affected by, traditional uses of various (different) fisheries. Because of historic differences in management and utilization of freshwater and saltwater fisheries, we expected to find differences among freshwater and saltwater anglers in their support for (attitudes toward) management regulations. Using results from a statewide questionnaire of anglers in Texas, basic social and demographic characteristics and attitudes toward management tools were compared for 3 groups of anglers: those who fish in fresh water only; those who fish in salt water only; and those who fish in both fresh and salt water. Significant group differences occurred for age, income, boat ownership, tournament participation, and years of previous experience. Angler attitudes toward management tools showed significant differences for 5 of the 7 regulatory measures that were compared. Familiarity with regulatory tools appears to be strongly associated with the support that anglers give to any specific regulatory measure. Through understanding angler attitudes towards regulations, managers can better predict behavior towards regulations and adopt strategies that encourage adoption and diffusion of management tools.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 45:246–253

Approaches to managing freshwater fisheries have historically differed significantly from those used to manage saltwater fisheries. Since colonial times, the primary benefit of freshwater fisheries has been recreation (Stroud 1975). Conflicts

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with commercial fisheries were resolved with "prohibitive policy" (Yaffee 1982) in the form of local, state, or federal legislation. In contrast, until the early 1970s marine fisheries were primarily the domain of commercial fishermen and exploitation was largely laissez-faire. While recreational fishing demands were still emerging in salt water, management according to the philosophy of maximum sustainable yield (MSY) promoted harvest of a maximum supply of food from renewable ocean resources. The concept of optimum sustained yield (OSY) introduced social and economic concerns to saltwater fisheries management under the Magnuson Fishery Conservation and Management Act (16th U.S.C. 1801–1882; Roedel 1975).

There are several explanations for the differences in management philosophy between fresh water and salt water. First, the concept of exhaustability provides a useful insight. It was recognized early that small water bodies such as rivers and lakes were exhaustible, and restrictive regulations were instituted not long after colonization by the Pilgrims (Idyll 1966). Differences in management philosophy toward inland and ocean fisheries were indicated by Thomas Henry Huxley, a fisheries scientist during the late nineteenth century. While testifying in support of the concept of ocean resource inexhaustability, Huxley noted that salmon fisheries in Scottish rivers had been depleted through excessive fishing pressure (Nielsen 1976). Second, with smaller inland waters, problems become evident rapidly, and management agencies have been able to institute effective controls on these waters. Lastly, there has been a shift in U.S. population to coastal areas over the past 40 years (Fedler 1985). This has increased recreational demands on saltwater fisheries and heightened awareness of declining fish stocks.

Because of historic differences in fisheries management philosophies, regulatory approaches to freshwater and saltwater fisheries have varied. The Black Bass Act of 1926 (16th U.S.C. 851–856; repealed in 1981) and subsequent legislation led to the protection of black bass (*Micropterus* spp.) from commercial exploitation. Only recently have saltwater species been afforded this type of protection by the federal government. In the late 1980s, red drum (*Sciaenops ocellatus*) received similar protection in the Exclusive Economic Zone of the Gulf of Mexico. In 1988, a Fishery Management Plan for Billfish was approved by the U.S. Secretary of Commerce that provided restrictions on the development of a commercial market.

Whereas regulation of recreational fisheries in salt water is relatively recent in origin compared to freshwater fisheries and because many saltwater anglers are likely to view ocean fisheries as inexhaustible, we would expect saltwater anglers to indicate less support for restrictive regulations than freshwater anglers. The objectives of the present paper are to: 1) document differences in support for fishing regulations among freshwater and saltwater anglers, and 2) discuss differences in light of emerging trends and make management recommendations.

Methods

Data were collected as part of a 1989 mail survey of Texas freshwater and saltwater anglers. Fishing license sales receipts were used as a sampling frame. A systematic random sample of 10,001 license purchasers was selected to receive a

28-question, self-administered questionnaire. To ensure adequate representation of saltwater anglers, 48% of the questionnaires were addressed to anglers living in coastal counties along the Gulf of Mexico; the remaining 52% were sent to license holders in non-coastal counties. Questionnaires were completed between September and November 1989. A total of 5,341 useable questionnaires was returned for a 58.8% response rate (65.0% excluding 954 non-deliverable questionnaires).

Prior to analysis, questionnaires were screened to remove anglers who reported spending no days fishing in the previous year and who had no fishing experience, which resulted in a final sample of $N = 4{,}525$. Sample sizes for individual questions will vary based on item nonresponse.

The questionnaire included social and demographic questions to allow categorization of respondents. Among these were age, income, number of days spent fishing in fresh water and number of days spent fishing salt water in the previous 12 months, number of years of previous freshwater fishing experience, and number of years of previous saltwater fishing experience. Respondents were also asked whether they participated in fishing tournaments, belonged to fishing clubs, and whether they, or someone in their household, owned a power boat.

Those who indicated they fished ≥ 1 day in fresh water were asked to compare their fishing ability to that of other freshwater anglers using 3 self-rating categories (less skilled, equally skilled, more skilled), and to state their level of support for each of 17 freshwater fishery-management tools using a 5-point balanced response scale (1 = strongly oppose, 2 = oppose, 3 = neutral, 4 = support, and 5 = strongly support). Anglers who indicated they fished ≥ 1 day in salt water were asked a similar set of questions and were asked to indicate their level of support for 15 saltwater fishery-management tools. Anglers who fished in both fresh and salt water were asked to complete both sets of questions.

Statistical Analyses

We categorized anglers into 3 groups based on their participation in freshwater and saltwater fishing: those who fished in fresh water only, those who fished in salt water only, and those who fished in both fresh and salt water. Analysis of variance was used to test for differences among angler groups in age, number of days fishing in fresh and salt water, and previous years of fishing experience in fresh and salt water. We used Pearson's X^2 statistic to assess differences in tournament participation, fishing club membership, and boat ownership among anglers who fished only in fresh water, only in salt water, and anglers who fished in both fresh and salt water. Statistical significance was accepted at $P = 0.05$.

Management tools common to both the fresh and salt water set of questions were chosen to examine differences in support for tools of management among groups. We used multinomial response models (Agresti 1990) to test for differences among angler groups in level of support for each management tool. When heterogeneity was found among groups, pairwise contrasts were examined for the following: freshwater-only anglers vs. saltwater-only anglers, freshwater-only anglers vs. freshwater and saltwater anglers, and saltwater-only anglers vs. freshwater and saltwater

anglers. We also contrasted support among anglers who fished both fresh and salt water for management tools when applied to fresh water vs. salt water. All statistical analyses were performed using SAS (SAS Inst. Inc. 1985).

Results

Angler Characteristics

There were significant differences among the 3 groups of anglers in age and income (Table 1). On average, saltwater-only anglers were the oldest group, and anglers who fished in both fresh and salt water were the youngest (Table 1). Average income of saltwater-only anglers was greatest followed by anglers who fished in both water types and then by those who fish only in fresh water.

There were significant differences between groups in boat ownership and tournament participation. Anglers who fished both waters were most likely to own boats, whereas saltwater-only anglers were least likely to own boats. Participation in tournaments was significantly greater among anglers who fished in both fresh and salt water and anglers who fished in saltwater-only when compared to those who fished in freshwater-only. There were no differences among groups in membership in fishing clubs.

Anglers who fished only in fresh or salt water were more experienced, based on previous years of fishing in their respective waters, than were anglers who fished in both fresh and salt water. The distribution of responses were significantly different ($P = 0.05$) for previous years of fishing experience when comparing those who fished in freshwater-only and those who fished in both waters, whereas the difference between saltwater-only and those who fished in both waters was not significant (P

Table 1. Demographic and social characteristics of Texas anglers who fish in fresh water only (FW), salt water only (SW), and both fresh and salt water (FW-SW).

	FW $N = 2,132$	FW-SW $N = 1,430$	SW $N = 963$	Test Statistic	P
Age (yrs)	40.17	38.87	41.38	12.80[a]	0.0001
Income[c]	4.51	4.78	4.90	9.48[a]	0.0001
Boat owners (%)	53.42	57.06	50.99	9.10[b]	0.0110
Club members (%)	6.30	7.30	6.66	4.19[b]	0.6500
Tournament anglers (%)	11.53	16.20	14.27	16.33[b]	0.0001
Freshwater skill level	1.68	1.76		14.20[b]	0.0002
Freshwater experience (yrs)	25.64	24.37		8.33[a]	0.0039
N days fishing FW	26.87	24.26		3.87[a]	0.0493
Saltwater skill level		1.72	1.78	4.53[b]	0.0334
Saltwater experience (yrs)		18.36	19.35	3.43[a]	0.0642
N days fishing SW		18.58	26.91	39.64[a]	0.0001

[a]Analysis of variance (F-test).
[b]X^2 goodness of fit.
[c]Income categories: 1 = ≤ $10,000/year; 2 = $10,000–$19,999/year; 3 = $20,000–$29,999/year; 4 = $30,000–$39,999/year; . . . . . ; 10 = ≥ $100,000.

= 0.06). Anglers who fished in both waters rated their skill level in freshwater fishing significantly greater than that of freshwater-only anglers and significantly lower than that of saltwater-only anglers in their salt water fishing.

Anglers who fished only in fresh or salt water fished significantly more days per year in their respective waters than anglers who fished in both fresh and salt water. However, the group that fished in both fresh and salt water averaged around 42 days as compared to 26 days for those people who fished in only fresh or salt water.

Attitudes Towards Management Tools

There were significant differences among angler groups in mean level of support for 5 of the 7 fisheries management tools (Table 2). Minimum length limits, the most supported regulation, had higher support in fresh water than in salt water (even by those anglers who fished in both waters). Anglers who fished only in salt water supported maximum length limits more than those who fished only fresh water and those who fished in both waters. Anglers who fished in only fresh water supported maximum length limits less than did anglers who fished in both waters.

Anglers who fished both waters supported daily creel limits more than anglers who fished only in fresh water or salt water. All groups were similar with regard to support for gear restrictions. Restrictions of certain types of baits were viewed least favorably by saltwater anglers and most favorably by freshwater anglers. Anglers who fished in both supported bait restrictions in salt water more than those who

Table 2. Mean level of support for 7 fisheries management options for selected groups of Texas anglers. X^2 and P values are for the overall homogeneity between groups. FW denotes freshwater anglers only. AFW = freshwater questions for anglers who fish in both waters, ASW = saltwater questions for anglers who fish in both waters, SW = saltwater anglers only. (Four groups are considered because the anglers who fish in both waters answer the management options questions separately for both their fresh and saltwater experiences.)

	FW N = 2108	AFW N = 1396	ASW N = 1396	SW N = 946	Overall X^2	P
Releasing fish below a certain length (minimum size limit)	4.21[a]	4.23[b]	4.04[b]	4.05[a]	51.97	0.0001
Releasing fish above a certain length (maximum size limit)	2.99[ab]	3.22[b]	3.17[c]	3.42[ac]	88.65	0.0001
Being allowed to keep only a certain number of fish you catch in one day (daily bag limit)	3.93[ab]	4.02[ac]	3.90[cd]	3.75[bd]	36.55	0.0001
Prohibiting the use of certain types of sport fishing gear	3.49	3.51	3.47	3.40	6.82	0.0778
Prohibiting the use of certain types of bait	3.03[a]	2.99	2.95[b]	2.77[ab]	43.32	0.0001
A voluntary catch and release program	3.61	3.62	3.62	3.56	2.88	0.4100
A mandatory stamp to retain a specific species	2.57[a]	2.57[b]	2.74[b]	2.74[a]	27.28	0.0001

[abcd]Corresponding letters represent significant pairwise differences (P = 0.05).

fished in salt water only. Voluntary catch and release received almost equal support in all groups.

Saltwater anglers supported a fishing stamp to retain a species more so than freshwater anglers. Anglers who fished in both waters showed different levels of support for the stamp in fresh versus salt water with greater support in salt water. In fact, their levels of support for stamps in fresh and salt water equaled the support levels expressed by freshwater-only and saltwater-only anglers, respectively.

Discussion

Basic similarities in angler social and demographic characteristics were found between the present study comparing Texas freshwater and saltwater anglers and in the 1975 National Survey of Hunting, Fishing and Wildlife Associated Recreation (Arthur 1978). However, in contrast to Arthur (1978), the present study revealed significant differences among angler groups in support for specific regulatory measures. Familiarity with regulatory measures appears to be strongly associated with the support that anglers give to a specific measure, e.g., a maximum size limit is currently used for several species in salt water and support is greater for this management tool among anglers who spend time fishing in salt water.

Whereas Arthur (1978) reported no differences among angler groups in their attitudes toward management of the fisheries they participated in most frequently, we found several differences. Overall, freshwater anglers indicated greater support for various fisheries management tools than did saltwater anglers. Among anglers who fished in both fresh water and salt water, support for each management tool was generally greater when applied to fresh water. Exceptions to this pattern were in support for maximum length limits and a stamp to retain certain species. These management concepts are of relatively recent origin, have been primarily used in salt water in Texas, and freshwater anglers would have little or no experience with them. A third exception was for a voluntary catch and release. This management tool has its origins in fresh water, but enjoyed similar support by saltwater anglers because as a voluntary program it was uncontentious.

As with Arthur's (1978) analysis of the 1975 National Survey of Hunting, Fishing and Wildlife Associated Recreation, we found saltwater anglers to be the oldest and have the highest incomes. Arthur (1978) indicated that anglers who fished in cold water fished more frequently than anglers who fished in fresh water. We found anglers who fished in both fresh and salt water to have the highest overall fishing frequency. Fishing frequency was similar for anglers who fished in fresh water only and salt water only. Coincident with fishing frequency, and perhaps an indicator of higher avidity levels (Bryan 1979), anglers who fished in both fresh and salt waters are more likely to own boats, belong to fishing clubs, and participate in tournaments.

Management Implications

It appears that management tools are supported or opposed within a respective fresh water or salt water context based upon traditions. Where managers use tools

out of context, they should expect to meet angler resistance. For example, opposition was not expected when a closure was implemented in East Matagorda Bay in Texas (Matlock et al. 1988; Ditton and Fedler 1989; Peyton and Gigliotti 1989). Here, zero retention limits (catch and release only) were applied to spotted seatrout (*Cynoscion nebulosus*) and red drum. Because this tool had not been used previously to manage coastal fisheries in Texas, managers should not have expected saltwater anglers to readily adopt this management innovation.

To achieve more widespread acceptance of, and support for, management tools managers need to understand and apply strategies that encourage greater adoption and diffusion of "new ideas" among angler groups. For example, information regarding saltwater management tools could be diffused through opinion leaders in the saltwater angling community. This is based on the concept that transfer of ideas occurs most frequently between individuals alike in beliefs, values, education, and social status (Rogers and Shoemaker 1971). We would expect opinion leaders to encourage adoption of innovations among their peers. However, fisheries managers must also be patient when bringing new ideas to anglers. The history of worthwhile endeavors suggests a substantial time period before something new will be adopted (Stange 1981).

Research Implications

These results can serve as a baseline for comparison with future studies. Through time, it will be possible to determine, for example, if saltwater anglers continue to lag in support for particular management tools and, alternately, whether some of the relatively recent tools favored by saltwater anglers are adopted to a greater extent by freshwater anglers. Significant trends between angler groups can only be determined if studies like these are conducted on a regular basis. Also, time-series data should be useful to evaluate agency efforts to build support for particular management tools, such as a largemouth bass fishing stamp. Future work should explore the association between angler specialization level and support for certain management tools. Also, we need to know the extent to which the general patterns of support for management tools vary according to the species anglers prefer to catch.

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