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ANGLER RESPONSE TO HARVEST REGULATIONS IN MONTANA'S YELLOWSTONE RIVER PADDLEFISH FISHERY

ABSTRACT

A written, 15-question survey of anglers snagging for paddlefish (*Polyodon spathula*) was conducted at a popular fishing site on the Yellowstone River, Montana. Its purpose was to obtain opinions and preferences on specific regulations, including the reduction in the annual bag limit from two to one fish, catch-and-release fishing, and on the possible implementation of a harvest quota for the stock. Questionnaires were completed by 258 snaggers over the six-week (May 15-June 30) fishing season in 1994. Snaggers were split (30% for, 44% against) in their opinions on whether the reduction to a one-fish bag limit was justified, and whether the paddlefish stock would benefit from the reduced bag limit. Seventy-three percent of all respondents favored the opportunity to catch and release paddlefish. Support for a harvest quota was not strong but of the three quota options presented (Tag Limitation, Inseason Closure, and a Five-Year Quota), support was strongest for Inseason Closure (44%) followed by Tag Limitation (25%). Results of this questionnaire have been used in conjunction with stock assessments to reduce the bag limit and establish catch-and-release periods in the fishery.

Key words: paddlefish, Polyodontidae, Montana, fisheries management, Yellowstone River, fishing

INTRODUCTION

Although paddlefish (*Polyodon spathula*) snag fisheries exist in several states (Combs 1986), more information is needed on attitudes of snaggers toward harvest regulations (Scarnecchia et al. 1996a). Since the early 1960s, the paddlefish fishery on the Yellowstone River has supported an important recreational fishery on the Yellowstone River, Montana (Robinson 1966; Scarnecchia et al. 1996b). The fishery is centered at Intake, Montana, at a low-head irrigation-diversion dam 27 km downriver from Glendive (Rehwinkel 1978). Over the period 1962-1993, between 500 and 5,000 paddlefish have been harvested annually at Intake (Scarnecchia et al. 1996b).

A two-fish-per-person annual bag limit and mandatory retention regulations (i.e., prohibition of catch-and-release) were implemented in 1981 in response to concerns about mortality of mishandled, released fish (Elser 1986) and because of overcrowding of snaggers at the shoreline fishing sites. These regulations remained in effect until 1994 when an increase in mean age of the stock and an expanding fishery for the same migratory stock in North Dakota prompted the enactment of a one-fish-per-person annual bag limit in Montana (Scarnecchia et al. 1996b).

Several regulatory options have been considered for the Montana fishery, including catch-and-release fishing in conjunction with the one-fish bag limit. Catch-and-release has been used successfully in many fisheries for other species (Barnhart 1989), but has not been formally implemented anywhere for paddlefish. Release of snagged paddlefish is permitted,

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however, in other fisheries (Elser 1986), including the Missouri River in Montana above Fort Peck Dam. In addition, quotas on total catch were also considered as a harvest option. Quotas, often called Total Allowable Catches (TACs), have been used commonly and successfully in marine fisheries throughout the 1970s and 1980s (Gough 1993; Parsons 1993).

The concentration of paddlefish at Intake attracts numerous snaggers each May and June who can be surveyed regarding fishing regulations and management policies (Matlock 1991; Pollock et al. 1994). Our objective was to obtain information on attitudes and preferences of snaggers on three fishery management options: a one-fish bag limit, catch-and-release, and harvest quotas.

METHODS

Sampling Assumptions and Limitations

A 15-item self-administered questionnaire was administered to snaggers daily at Intake throughout the entire 1994 paddlefish snagging season (May 15-June 30). Although our preference would have been to query only one person per fishing party, low participation in snagging throughout much of the season made it necessary to survey all snaggers encountered. More than 95% of the snaggers approached were willing to spend the 5-7 minutes needed to complete the questionnaire. Non-responses were less than 1.5% for each question.

Because of a recent reduction in the annual bag limit combined with poor fishing in 1994, some snaggers probably avoided Intake entirely, resulting in a somewhat less disgruntled, more conservation-minded pool of respondents than would have been polled otherwise. For our study, the population of interest was defined as those licensed anglers who actually snagged for paddlefish at Intake, not the

larger number of persons who purchased licenses and tags but did not fish. Questionnaires were completed by 258 snaggers, or an estimated 49% of the estimated total number of paddlefish snaggers at Intake in 1994.

The Questionnaire

The first three questions sought information on the state of residence (Montana resident versus non-resident), age, and sex of the snagger. The next three questions sought information on their primary and secondary fishing sites, i.e., how often they snagged for paddlefish at Intake, in the Missouri River above Fort Peck Dam, or elsewhere. Three questions concerned the effects of reduced bag limit (from two to one fish per person per year); two of the three questions concerned effects on the paddlefish stock and on snagger participation and a third question asked if the reduced bag limit had been justified. One question assessed their attitude toward catch-and-release for the paddlefish fishery.

To insure that snaggers understood the three quota options, Tag Limitation, Inseason Closure and Five-Year Quota, we summarized the options briefly for them on the questionnaire before the pertinent questions on quota options. Under Tag Limitation, annual harvest would be limited in each state by limiting the number of tags sold. Under Inseason Closure, an annual quota would be set and an unlimited number of tags sold. The fishing season would be closed when the quota was reached. Under a Five-Year Quota, once the total quota had been reached, the fishery would be closed for the remainder of that five-year period. The Five-Year Quota could thus result in some years with no paddlefish snagging season.

The last two questions asked if snaggers would prefer to have their quota divided as a two-fish or one-fish bag limit. Finally, snaggers were asked to write any comments at the end of the questionnaire.

Responses were summarized and analyzed with a Chi-Square statistic according to age (age 34 years and younger versus 35 years and older), sex and state of residence (Montana resident versus non-resident). For all questions, $P=0.05$ was required for statistical significance.

RESULTS

Of the 258 snaggers who completed the questionnaire, 235 (91%) were male and 23 (9%) were female, 139 (54%) were younger than 35 years and 119 (46%) were 35 years or older, 154 (60%) were Montana residents and 97 (38%) were non-residents (2% unknown).

Most snaggers responding to questionnaires fished only at Intake (Table 1). More than one-fourth of the respondents had fished at Intake in each of the previous five years and most had fished there in more than one of the previous five years.

Table 1. Number of years over the period 1990-1994 that respondent had snagged paddlefish a) at Intake, b) in North Dakota, and c) in the Missouri River above Fort Peck Dam.

	Intake		North Dakota		Fort Peck	
	No.	%	No.	%	No.	%
Years fished during 1990-94						
None	NA	NA	227	88.0	230	89.1
One	87	33.8	10	3.9	17	6.6
Two	53	20.5	11	4.3	6	2.3
Three	28	10.9	7	2.7	3	1.2
Four	23	8.9	2	0.8	0	0.0
Five	67	26.0	1	0.4	2	0.8

NA= not applicable. All surveyed snaggers had fished at least once, i.e., the current year.

Snaggers were nearly equally split among all five response choices (Table 2) in their response to the statement "I would be less likely to return to Intake to fish for just one paddlefish than for two paddlefish." No significant differences were found according to age ($P=0.33$), sex ($P=0.91$), or state of residence ($P=0.14$).

Slightly more snaggers agreed than disagreed with the conservation value of the bag limit reduction (Table 2). This split response occurred even though the rationale for the reduction in the annual bag limit from two to one fish had been presented at public meetings in eastern Montana. No significant differences were found in this response according to age ($P=0.25$), sex ($P=0.93$), or state of residence ($P=0.26$).

Table 2. Percent responses to questions related to one fish bag limit and catch-and-release fishing. For responses, SD = strongly disagree, D= disagree, N = neutral, A=agree, and SA = strongly agree.

Statement	Response (%)				
	SD	D	N	A	SA
I am less likely to return to Intake to fish for just one paddlefish than to fish for two paddlefish. (N = 256)	18	20	20	21	21
I think the paddlefish population will benefit from the reduced bag limit. (N = 257)	17	20	20	25	18
The reduction in catch from two to one fish is justified. (N = 257)	24	20	26	18	12
I would like to see some catch-and-release opportunities at Intake. (N=258)	8	7	12	21	52

Snaggers were split equally on whether the reduction from two fish to one fish was justified (Table 2). No significant differences were found in this response according to age ($P=0.36$), sex ($P=0.99$), or state of residence ($P=0.08$).

Seventy-three percent of the snaggers supported catch-and-release; only 15% did not favor some version of a catch-and-release regulation. Although all types of snaggers tended to support catch-and-release, support was significantly stronger among younger (<35 years) snaggers than older (35 or more years) snaggers ($P=0.05$).

Support for no quota option was strong, but snaggers most favored Inseason Closure (Table 3). No significant differences in response to the Inseason Closure option were detected by age ($P=0.42$), sex ($P=0.96$), or state of residence ($P=0.94$).

Table 3. Percent responses to three quota options listed in Paddlefish Management Plan. For responses, SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree.

Statement	Response (%)				
	SD	D	N	A	SA
If the number of snaggers and their expected catch exceeded Montana's quota, I would favor a lottery drawing for paddlefish tags [Tag Limitation] (N = 251)	39	23	13	16	9
I would prefer that the season be closed each year when the quota is reached. [Inseason Closure] (N = 252)	25	14	17	26	18
I would prefer a five-year quota, even if it meant that the season might be closed entirely in some years. [Five-Year Quota] (N = 247)	49	22	15	8	6

Tag Limitation was the second choice; 25% of respondents agreed or strongly agreed with this option but more than 60% disagreed or strongly disagreed with it. No significant differences in response to Tag Limitation were detected by age ($P=0.94$), sex ($P=0.35$) or state of residence ($P=0.59$).

The Five-Year Quota option was preferred least; nearly half of the respondents strongly disagreed and 22% disagreed with it. Although no significant differences in response were detected by age ($P=0.44$) or sex ($P=0.28$), non-resident snaggers showed a much stronger and highly significant preference for this option than did Montana residents ($P=0.01$).

Snaggers were split on whether a two-fish or one-fish annual bag limit would be preferable under a quota system (Table 4). Thirty-eight percent of respondents agreed or strongly agreed with a one-fish limit under a quota system and 38% disagreed or strongly disagreed. No significant differences in response were detected by age ($P=0.52$), sex ($P=0.35$), or state of residence ($P=0.46$). Preference for a two-fish bag limit under a quota system was weaker than for a one-fish limit. Half (50%) of respondents disagreed or strongly disagreed with the two-fish bag limit under a quota system and only 29% agreed or strongly agreed. No significant differences in response were found by age ($P=0.27$), sex ($P=0.94$), or state of residence ($P=0.41$).

Table 4. Percent responses to one-fish and two-fish bag limits under a hypothetical quota system. For responses, SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree.

Statement	Response (%)				
	SD	D	N	A	SA
I would prefer to have Montana's quota divided up among snaggers so that each snagger's bag limit would be one fish. (N = 250)	21	17	24	26	12
I would prefer that Montana's quota be divided up among snaggers so that each snagger's bag limit would be two fish, even if it meant lower chances of successfully drawing for a tag. (N = 248)	28	22	21	19	10

The most common open-ended comments (total of 100 responses on 258 questionnaires) were recommendations for catch-and-release snagging (24 responses), a preference for a two-fish over a one-fish bag limit (19), and a preference for the one-fish bag limit (10).

DISCUSSION

Although Inseason Closure was the preferred option if a quota were necessary, none of the three quota options received strong support. Inasmuch as respondents were split on whether the reduced bag limit from two to one fish was justified and if the reduction would help the paddlefish stock, it is understandable that they would resist any effort to establish quotas. Support for quotas may also be lacking because the processed yield of paddlefish fillets is low (33.5%, including the less desirable red meat; Decker et al. 1991). For such interjurisdictional fisheries, however, quotas have a history of success (Gough 1993). According to Parsons (1993), "Catch quotas were chosen as a primary regulatory instrument because it was easier to implement national allocations under a system of catch quotas than under a system of effort limitations." With the coexisting fishery in North Dakota for this stock (Scarnecchia et al. 1996b), total harvest may be controlled best by allocating a quota of fish separately to each state.

The reason for the greatest support for the Inseason Closure option is probably a result of two factors. Inseason Closure would permit the purchase of paddlefish tags by all applicants, unlike tag limitation, and guarantee at least some fishing each year, unlike the Five-Year Quota. Although Tag Limitation is practiced for some big game mammals in Montana and other states, it has seldom been used for fish. A one-fish bag limit in combination with a tag drawing may not justify a trip to Intake.

From a management standpoint, several aspects of Inseason Closure would need to be addressed if it were implemented. Although it would be possible to monitor daily catches at Intake and at the Yellowstone-Missouri River confluence, which is the primary North Dakota fishing site, off-site

harvest, now estimated post-season, would have to be estimated inseason. Second, the prospect of inseason closure induces fishermen to fish as early in the season as possible (Parsons 1993). Such a shift might create crowding problems, especially in years of more successful fishing and resulting higher demand for tags. Third, this option would shift catch and effort to earlier in the season, making comparison with past years less appropriate. Because the quality and consistency of the historical data base are important to stock assessment, it would be preferable if the fishery were not altered greatly in its seasonal pattern.

Under Tag Limitation, historical catch rates of tag holders could be used to estimate probable catch, and the appropriate number of tags could be sold. The crowding and stock assessment problems created under Inseason Closure would not occur.

Snaggers preferred a one-fish bag limit to a two-fish bag limit under a quota system (Table 4). These responses seem to contradict the common open-ended comment (19 responses) that suggested a return to a two-fish bag limit. Our interpretation of their responses is that if the stock could withstand the pre-1994 management system of a two-fish bag limit, no quota, and unlimited tag sales, this would be the preferred approach. With a quota, however, a latent concern is evidently that the quota will be so low that many people will not be able to obtain tags. Thus, the opportunity to catch and keep one fish might be preferable to not drawing a tag at all.

A combination of the one-fish bag limit enacted in Montana in 1994 and the low spring discharge in the Yellowstone River resulted in an all-time low catch and effort at the Intake fishery in 1994. This reduction in catch and effort raises the question of whether a quota, which is considered undesirable by snaggers (Table 3), would be

necessary under present fishing interest and a one-fish bag limit.

The strong support (73% of respondents) for catch-and-release is interpreted as support for catch-and-release *in addition to* rather than *in place of* harvest. Since 1981, retention of snagged paddlefish on the Yellowstone River has been mandatory. In Montana, mandatory catch-and-release was first enacted in 1978 for trout (Salmonidae) on a stretch of the Madison River (Wells 1987); it has become common practice nationwide for warmwater, coldwater, and selected marine fishes since the 1980s (Barnhart and Roelofs 1977, 1987; Barnhart 1989).

Few of several thousand paddlefish landed at Intake during the period 1991-1994 and examined by us showed any overt signs of external damage from snagging. Some fish developed roundish, 1-3 cm diameter skin lesions, probably a result of sloughing of an imbedded hook. The most common form of damage was from boat propellers. Although other fish species have exhibited high stress levels, such as rainbow trout, *Oncorhynchus mykiss*; (Ferguson and Tufts 1992) and even disrupted spawning, as in smallmouth bass, *Micropterus dolomieu* (Kieffer et al. 1995) from hooking and handling, more information is needed on their potential effects on pre-spawning paddlefish.

Mandatory catch-and-release paddlefish snagging was enacted at Intake in 1995 for two six-hour periods per week during the May 15 to June 30 fishing season. At all other times, mandatory retention of paddlefish remained in force. Catch-and-release of each fish was monitored by trained state fishery personnel and excessive handling of paddlefish avoided. Snagged paddlefish were tagged immediately with jaw tags to provide information in the future on harvest rates and population abundances (Qualia 1987). In future years, effects of catch-and-release snagging will be

evaluated through inspections of recaptured fish and with searches for dead or distressed paddlefish. Results from this study are being used in conjunction with fish stock assessments (Scarnecchia et al. 1996b) to set harvest regulations for the fishery.

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