

ANGLERS' BELIEFS ABOUT TAG-AND-RELEASE PROGRAMS

Maureen P. Donnelly

Assistant Professor, Department of Leisure Management & Tourism, University of New Hampshire, Durham, NH 03824

Jerry J. Vaske

Associate Professor, Department of Resource Economics & Development, University of New Hampshire, Durham, NH 03824

Scientific research and the popular literature have emphasized the biological value of tag-and-release fishing. Relatively few publications, however, have examined the anglers' beliefs about the importance of this activity. This paper summarizes sport fishermen's behavior and attitudes related to tag-and-release programs. The data were collected from three sport fishing forums, a shark tournament, and a mailed survey to offshore marlin and tuna anglers. Almost all participants believed that tag-and-release fishing is important for conservation and research. The primary reasons for not participating were lack of knowledge about existing programs and who to contact, not wanting to be bothered with tagging, and concern about how the data are used. The findings suggested that education and incentives may significantly increase participation in tag-and-release programs.

Fish tagging programs have existed for a number of years. Tags typically have a serial number and instructions for returning the tag to the tagging agency. Monetary rewards are sometimes offered to encourage participation (Dell 1974). At a minimum, individuals who tagged the fish are informed by the agency when one of their tags is returned. This feedback provides additional incentive for participating in the program.

The popularity of tag-and-release fishing has increased dramatically. This growth can be partially attributed to the decline in fish stocks resulting from increased angling pressure and decreased water quality. Size limits and bag regulations have also contributed to the number of anglers who return caught fish to the water. In addition, tag-and-release efforts fit well with an increasing conservation awareness. Anglers can still enjoy their activity, while helping to maintain healthy fish stocks.

Both the scientific and popular literature have stressed the biological value of tag-and-release. The existing research emphasizes two major areas. Some research has concentrated on the tag-and-release process itself; examining such things as the effectiveness of different types of tags, and the factors related to hooking stress. Other studies have used the data obtained from returned tags to estimate growth and mortality rates.

Relatively few publications have considered the social aspects of tag-and-release fishing. The goal of this paper is to summarize sport fishermen's behavior and attitudes related to tag-and-release fishing. More specifically, the objectives are to: 1) assess angler involvement in the programs, 2) evaluate the perceived effectiveness of tag-and-release practices, 3) determine perceptions of the importance of the activity as a

conservation measure, and 4) identify ways to encourage future participation.

Biological Effects of Tagging

The impacts of tag-and-release on fish growth and mortality rates are complex. Numerous interrelated variables such as hook type, water temperature, anatomical hooking site and fish size influence this relationship, and the responses of fish are divergent even within a single species.

Additional complications arise because the findings from some biological studies do not always coincide with popular beliefs. Many anglers fish with barbless hooks, for example, because they believe that captured fish are easier to release. Other anglers prefer barbed hooks because they believe that fish are not hooked as deeply, and are less likely to be injured. The available empirical evidence indicates that there is no difference in mortality rates of fish caught on barbless and barbed hooks (Hunsacker and others 1970, Falk and others 1974, Bjornn 1975), and that the effect of hook type on fish survival is often related to other variables. Research comparing single barbless, treble barbless and treble barbed hooks (Titus and Vanicek 1988), found differential mortality among hook types was apparent *only* during high water temperatures. In this instance, the highest losses (59%) occurred with fish caught with single barbless hooks. Other investigations suggest that fish mortality is higher when single hooks as opposed to treble hooks are used (Klein 1965, Warner 1976, 1978).

Independent of hook type, other studies have found a relationship between water temperature and hooking mortality. Titus and Vanicek (1988), for example, show that for trout caught with lures, mortality was less than 1.5 percent at water temperatures between 5.5 to 15.5 degrees Celsius, but rose to nearly 50 percent as the temperature approached 21 degrees. Similar relationships have been noted for black bass (Bennett and others 1989) and large mouth bass (Schramm and others 1985). For those fish who did survive the tag-and-release process, the higher the water temperature, the more delayed their recovery (Wydoski and others 1976).

The anatomical site of hooking also influences mortality rates. Warner and Johnson (1978) found higher mortality rates for Atlantic salmon which were hooked in the esophagus as opposed to the jaw or mouth. Fish who bled after hooking were also more likely to die than fish who did not bleed.

Research findings on the impacts of size and age of fish on hooking mortality are mixed. In one study, the mortality of legal sized salmon was not significantly different from that of sub-legal salmon, nor were there differences in mortality of different age groups (Warner and Johnson 1978). Wydoski and others (1976), on the other hand, found that hooking imposed greater stress on larger than on smaller hatchery rainbow trout.

Contradictory results were also found for the effects of tagging on growth rates. Studies of lake trout (DeRoche 1963), walleyes (Smith and others 1952), redfish (Kelly and Barker 1963), and haddock (Jensen 1963) suggest that tagging impedes growth. The longer the tagged fish lived, the more retarded was their growth. These studies suggest that tags may have a signal effect, in that they startle live prey on which the tagged fish are attempting to feed. Tags may also interfere with the swimming abilities of fish. Contrary results were obtained by Jensen (1967) in a comparison of the growth rates of tagged and untagged cod fish. The tags had little effect on the growth of cod. It was hypothesized that the larger, robust cod can compensate for the attached tag better than the smaller species.

The suitability of different kinds of tags has also been studied. Eames and Hino (1983), for example, examined tag loss rates for different types of tags on Chinook salmon and found the tag-loss rates were low (2%-5%) for each tag tested (Floy anchor tags, machine- and hand-implanted coded-wire tags, modified Carlin and Swedish trailer tags). In a comparison of the Atkins streamer and Monel metal jaw tags, streamer tags were evaluated as unsatisfactory for long-term population studies, but were satisfactory for short-term river studies. The former judgment stemmed from the streamers' poor retention rates and considerable injury to the fish (MacGrimmon and Robbins 1979). Jaw tags, on the other hand, were effective for long-term ecological studies, because they had a high retention rate and caused little injury to fish. Neither tag proved effective for obtaining reliable growth rate data on smallmouth bass.

Davis (1959) found that bass tagged with streamers were recaptured less selectively by gill nets than those with Petersen tags. The streamer tag was also more durable, more legible, and less subject to physical and chemical change than either type of spaghetti tag. Contrary to MacGrimmon and Robbins (1979), the streamer tag was selected as the most satisfactory of the four tags tested.

Overall, the biological research shows no uniform or consistent relationship between tagging and fish growth and mortality. The type of hook used can influence survival, but the death rates are greater and recovery is slower in warmer waters. Some studies suggest that tagging results in greater stress for larger than smaller fish, whereas other investigations show no difference. Conversely, the growth rate of larger fish is less effected by tags than smaller fish. Summarizing the suitability of tags is difficult because the studies compared different types of tags and there is no clear pattern of findings. The complexity of this issue, when coupled with the divergent biological findings, highlights the difficulties in educating anglers about the importance of tag-and-release.

Social Research

A successful tag-and-release program requires three elements: 1) anglers must believe the technique benefits fish populations, 2) anglers must be willing to tag fish, and 3) even if they are not involved in tagging programs, anglers must return the tags they find on their catch. Most previous social research has focused on the last criteria; the percentage of anglers who return tags and the reasons for not engaging in this behavior.

During routine creel surveys, for example, the U.S. Fish and Wildlife Service secretly implanted fish tags into fish that had already been caught (Matlock 1981, Green and others 1983). In both investigations, less than a third of the implanted tags were returned. The return rates for some species (e.g., flounder, sea trout and red drum) were significantly higher than for other species (e.g., sheepshead, black drum and Atlantic croaker). A follow-up survey with a sample of these anglers, asked individuals to specify why they had not reported their tags (Matlock 1981). Failure to report the tag was most often a result of failure to find the tag.

Dell (1974) looked at tag returns by type of tag (Carlin dangler, Petersen disk, and Floy anchor pendant). Rewards of \$1.00 for each disk and \$10.00 for each dangler tag returned were offered during the first year of the study. No reward was offered for tags from fish released in the following year. Returns were generally the same for the three types of tags, however, more tags were returned when a reward was offered.

The study reported here builds on the previous social research by examining the all three criteria for a successful program. Anglers' beliefs about tag-and-release fishing, their reported participation in tag-and-release programs, as well as the reasons for not engaging in this behavior are investigated.

Methodology

Data for this paper were collected from three different sources. On-site surveys were administered to all individuals participating in three sportfishing forums held in New Hampshire, New York and Virginia during 1989. The survey was also distributed at a Fishermen's Magazine Shark Tournament in New Jersey during that same year. Finally, the identical questionnaire was mailed to offshore marlin and tuna fishermen in Virginia. A total of 378 surveys were completed.

The four-page questionnaire assessed anglers' participation in and beliefs about tag-and-release programs. Specific items addressed:

- * years participating in tagging programs
- * number of fish tagged and tags returned
- * species of tagged fish caught
- * problems with tagging programs
- * benefits of being involved in tag-and-release
- * reasons for not trying tag-and-release
- * ways to encourage tag-and-release

Results

About a third (38%) of the anglers participated in tag-and-release programs (Figure 1). Among the participants, 25 percent had been involved with a program for only 1 or two years, while nearly a third each fell in the 3 to 5 (31%) and 6 to 10 (28%) year participation categories. Sixteen percent had done tag-and-release for more than 10 years.

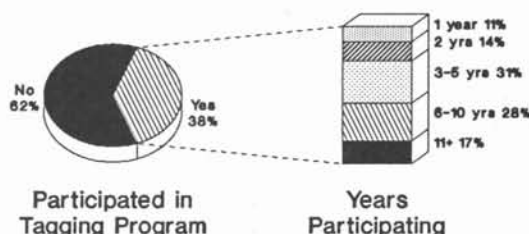


Figure 1. Years participating in fish tagging programs.

The National Marine Fisheries Service (NMFS) Cooperative Gamefish Tagging Program, and the NMFS Cooperative Shark Tagging Program were the two most popular programs (43% and 33%, respectively). Fifteen percent listed the American Littoral Society program, and 2 percent specified Tag-a-Tuna.

Anglers were asked how many fish they had tagged since joining a program (Figure 2). Only 3 percent reported tagging no fish. A third had tagged between 1 to 10 fish, about a quarter between 11 to 30, and about a fifth between 31 to 50 fish. Twenty-seven percent had tagged more than 50 fish.

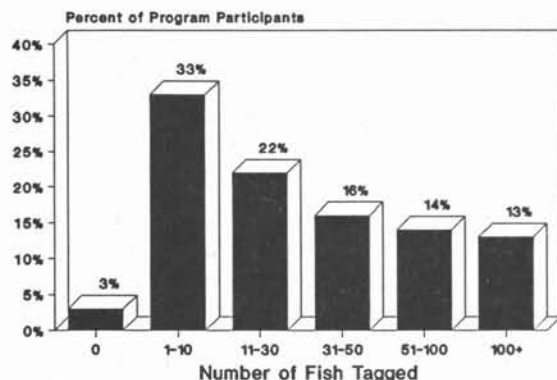


Figure 2. Number of fish tagged.

Each of the tagging programs notifies participants when a fish is returned with their tag. Sixty-one percent of the individuals who had tagged fish had none of their tags returned (Figure 3). A quarter (28%) had received back 1 to 5 of their tags, and 11 percent reported returns of more than 5 tags.

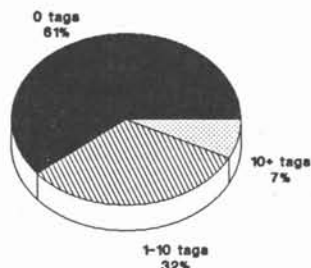


Figure 3. Number of tags returned.

Most participants (61%) had not encountered problems with their tagging program. For those who had difficulties, a quarter (26%) complained about inadequate instruction on tagging procedures (Table 1). Almost as many felt that either their tags had not worked well (23%) or the tagging apparatus had caused problems (21%). Nineteen percent had received slow feedback from the program or had problems getting new tags. Only one individual did not know who to contact for more tags.

Table 1. Types of problems encountered with tagging programs.

Types of problems encountered	Number of Respondents	Percent of Respondents
Inadequate instruction on tagging procedure	16	26%
Tags not working well	14	23
Problems with tagging apparatus (not tags)	13	21
Slow feedback, problems getting new tags, not enough tags	12	19
Not sure of survival of fish	6	10
Don't know who to contact for more tags	1	1
Total	62	100%

All respondents were asked about the types of tagged fish they had caught (Figure 4). Thirty-seven percent of those who responded had never caught a tagged fish. Tagged sharks and striped bass were caught most often (18% and 14%, respectively). Under a tenth reported catching tagged tuna, billfish and flounder.

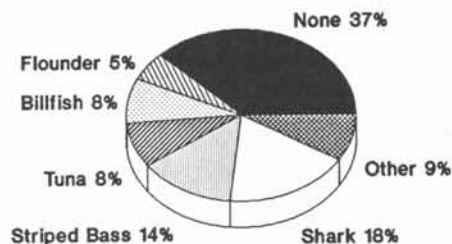


Figure 4. Species of tagged fish caught.

Nearly all (83%) of the individuals who had caught a tagged fish reported returning the tag. Of the 25 individuals who had trouble returning tags, 36 percent lacked knowledge or training in the tagging process (Table 2). Sixteen percent did not understand the importance of tagging and equally as many expressed concern over what happens with the data from tagged fish. A small number of respondents thought the programs were not effective (8%), wanted more incentives (8%), or simply lacked interest in participating (8%). Only one individual was unaware of existing programs.

Table 2. Problems which inhibit returning tags.

Problems which inhibit returning tags	Number of Respondents	Percent of Respondents
lack of knowledge or training in tagging process/techniques	9	36%
lack of understanding of the importance of tagging	4	16
concern over what happens with the data	4	16
believe programs not effective	2	8
lack of interest	2	8
need for incentive to return tags	2	8
lack of awareness of existing programs	1	4
too many different tag programs	1	4
Total	25	100%

General Beliefs About Tagging Programs

Non-participants were asked why they were not involved with tag-and-release programs. Although nearly half (49%) were aware of tagging programs, they did not know who to contact (Table 3). Eight percent each either did not know tagging programs existed or did not want to be bothered with tagging.

Seven percent were concerned about injuring fish, while a equal number questioned how tagging data are used. A small percentage of non-taggers were uncomfortable tagging fish, caught too few or too small fish to tag, or kept all their catch for personal consumption.

Table 3. Reasons for not trying tag-and-release.

Reasons for not trying tag-and-release	Number of Respondents	Percent of Respondents
Knew programs existed but did not know who to contact	131	49%
Did not know tagging programs existed for anglers	22	8
Fish for fun/don't want to be bothered with tagging	22	8
Concerned about injury to fish	19	7
Concerned about how tagging data are used	19	7
Not comfortable with tagging fish/too awkward	13	5
Not enough/too small fish caught	10	4
Keep catch for personal consumption	9	4
Do not fish for big gamefish	7	3
Too much trouble to keep up with tags & record data	7	3
Haven't sent for tags	4	2
Other	3	1
Total	266	100%

Almost everyone (99%) believed that there are benefits associated with becoming involved in tag-and-release. Education was seen as the most viable approach for encouraging more tag-and-release fishing (Table 4). These education efforts should include information on existing programs, the benefits of the programs, the status of fish stocks, and procedures for obtaining tags and handling fish. Twenty-two percent of the respondents believed incentives would increase participation. About a tenth felt more information on how the data are used would increase involvement, while increasing tag availability was mentioned by 6 percent.

Table 4. Ways to encourage tag-and-release fishing.

Ways to encourage tag-and-release	Number of Respondents	Percent of Respondents
Improve education and exposure for program	186	62%
Encourage tagging through incentive programs	65	22
Explain results of the tagging program	27	9
Make tags readily available	17	6
Other	6	2
Total	301	101%

Conclusions and Recommendations

Although the sample for this investigation was admittedly small, the findings suggest a number of issues for tagging agencies to consider. Most of the individuals who completed the survey were participants in either a sportfishing forum or a fishing tournament. One might expect to find a higher level of participation in tag-and-release programs among this sample when compared to the general angler population. While almost all recognized the benefits of tag-and-release, only a third of this group participated in a program. This suggests that additional promotional efforts are needed if participation is to increase.

Most participants reported no problems with their tagging programs. For those who had experienced problems, inadequate instruction on tagging procedures, ineffective tags, problems with the tagging apparatus and problems with getting new tags were cited most often. Each of these concerns are under the purview of the tagging agency, and therefore, can be improved upon.

Regardless of the anglers' involvement in a tagging program, most individuals reported returning tags from the fish they caught. Lack of knowledge about tagging procedures, the importance of tagging, and what happens with the tagging data were listed as reasons for not returning the tags. These findings again suggest that increased education efforts may stimulate greater participation.

Four of the five primary reasons for not participating in a tagging program were related to lack of knowledge about 1) existing programs, 2) who to contact, 3) proper procedures for tagging fish, and 4) how the data are used. Promotional information distributed where licenses are sold or through fishing supply outlets could increase anglers' knowledge and address these questions.

Finally, relatively inexpensive rewards (e.g., certificates, pins, hats) may increase participation in programs as well as the return of tags. Even simple acknowledgement of tag returns has been shown to provide an incentive for continued participation. Regardless of the reward structure, it appears that tagging agencies can increase the effectiveness of their programs by promoting their efforts through education and incentives.

Literature Cited

- Bennett, D. H.; Dunsmoor, L. K.; Rohrer, R. L.; Rieman, B. E. 1989 Mortality of tournament-caught largemouth and smallmouth bass in Idaho lakes and reservoirs. *California Fish and Game*. 75: 20-26.
- Bjornn, T. C. 1975 The St. Joe River cutthroat fishery - A case history of angler preference. Annual Conference Western Association State Game Fisheries Commission. 55: 187-194.
- Davis, W. S. 1959. Field tests of Petersen, streamer, and spaghetti tags on striped bass, *Roccus saxatilis* (Walbaum). *Transactions American Fisheries Society*. 88: 319-329.
- Dell, M. B. 1974. Tag returns and movements of rainbow trout (*Salmo gairdneri*) and rainbow-steelhead trout released in the Lake Washington system. *Transactions American Fisheries Society*. 2: 250-254.
- DeRoche, S. E. 1963 Slowed growth of lake trout following tagging. *Transactions American Fisheries Society*. 92: 185-186.
- Eames, M. J.; Hino, M. K. 1983. An evaluation of four tags suitable for marking juvenile chinook salmon. *Transactions American Fisheries Society*. 112: 464-468.
- Falk, M. R.; Gilman, D. V.; Dahlke, L. W.. 1974. Comparison of mortality between barbed and barbless hooked lake trout. Environment Canada, Fisheries and Marine Service, Resource Management Branch. Technical Report Series No. CEN/T-74-1. 28pp.
- Green, A. W.; Matlock, G. C. 1983. A method for directly estimating the tag-reporting rate of anglers. *Transactions American Fisheries Society*. 112: 412-415.
- Hunsacker, D.; Marnell, L. F.; Sharpe, F. P. 1970. Hooking mortality of Yellowstone cutthroat trout. *Prog. Fish Culture*. 32: 231-235.
- Jensen, A. C. 1963. Further field experiments with tags for haddock. *Int. Comm. Northwest Atlantic Fisheries*. 4: 194-203.
- Jensen, A. C. 1967. Effects of tagging on the growth of cod. *Transactions American Fisheries Society*. 96: 185-186.
- Kelly, G. F.; Barker, A. M. 1963. Effect of tagging on redfish growth rate at Eastport, Maine. *Int. Comm. Northwest Atlantic Fisheries*. Special Publication No. 4. 210-213.
- Klein, W. D. 1965. Mortality of rainbow trout caught on single and treble hooks and released. *Prog. Fish Culture*. 27: 171-172.
- MacCrimmon, H. R.; Robbins, W. H. 1979. Suitability of jaw and Atkins streamer tags for marking smallmouth bass, *Micropterus dolomieu*. *Transactions American Fisheries Society*. 108: 499-501.
- Matlock, G. C. 1981. Nonreporting of recaptured tagged fish by saltwater recreational boat anglers in Texas. *Transactions American Fisheries Society*. 110: 90-92.
- Schramm, H. L.; Haydt, P. J.; Bruno, N. A. 1985. Survival of tournament-caught largemouth bass in two Florida lakes. *North American Journal of Fisheries Management*. 5: 606-611.
- Smith, L. L. JR.; Krefting, L. W.; Butler, R. L. 1952. Movements of marked walleyes, *Stizostedion vitreum*, in the fishery of the Red Lakes, Minnesota. *Transactions American Fisheries Society*. 81: 179-196.
- Titus, R. G.; Vanicek, C. D. 1988. Comparative hooking mortality of lure-caught lahontan cutthroat trout at Heenan Lake, California. *California Fish and Game*. 74: 218-225.
- Warner, K. 1976. Hooking mortality of landlocked Atlantic salmon, *Salmo salar*, in a hatchery environment. *Transactions American Fisheries Society*. 105: 365-369.
- Warner, K. 1978. Hooking mortality of lake-dwelling landlocked Atlantic salmon, *Salmo salar*. *Transactions American Fisheries Society*. 107: 518-522.
- Warner, K.; Johnson, P. R. 1978. Mortality of landlocked Atlantic salmon (*Salmo salar*) hooked on flies and worms in a river nursery. *Transactions American Fisheries Society*. 107: 772-775.
- Wydoski, R. S.; Wedemeyer, G. A.; Nelson, N. C. 1976. Physiological response to hooking stress in hatchery and wild rainbow trout. *Transactions American Fisheries Society*. 5: 601-606.