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Barbed Hook Restrictions in Catch-and-Release Trout Fisheries: A Social Issue

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Abstract.—We summarized results of past studies that directly compared hooking mortality of resident (nonanadromous) salmonids caught and released with barbed or barbless hooks. Barbed hooks produced lower hooking mortality in two of four comparisons with flies and in three of five comparisons with lures. Only 1 of 11 comparisons resulted in statistically significant differences in hooking mortality. In that instance, barbless baited hooks caused significantly less mortality than barbed hooks, but experimented design concerns limited the utility of this finding. Mean hooking mortality rates from past lure studies were slightly higher for barbed hooks than barbless ones, but the opposite was true for flies. For flies and lures combined, mean hooking mortality was 4.5% for barbed hooks and 4.2% for barbless hooks. Combination of test statistics from individual studies by gear type via meta-analysis yielded nonsignificant results for barbed versus barbless flies, lures, or flies and lures combined. We conclude that the use of barbed or barbless flies or lures plays no role in subsequent mortality of trout caught and released by anglers. Because natural mortality rates for wild trout in streams commonly range from 30% to 65% annually, a 0.3% mean difference in hooking mortality for the two hook types is irrelevant at the population level, even when fish are subjected to repeated capture. Based on existing mortality studies, there is no biological basis for barbed hook restrictions in artificial fly and lure fisheries for resident trout. Restricting barbed hooks appears to be a social issue. Managers proposing new special regulations to the angling public should consider the social costs of implementing barbed hook restrictions that produce no demonstrable biological gain.

Numerous investigators have questioned whether the use of barbless hooks results in fewer post-release mortalities than barbed hooks. In his pioneering study of hooking mortality, Westerman (1932) did not use statistical tests but concluded that barbless hooks were superior to barbed hooks in reducing hooking losses for brook trout *Salvelinus fontinalis*. However, authors of all subsequent field studies on resident (nonanadromous) salmonids (hereafter referred to as trout) have found no significant differences in hooking mortality between barbed and barbless hooks (e.g., Hunsaker et al. 1970; Falk et al. 1974; Titus and Vanicek 1988).

Four past reviews of hooking mortality literature have addressed the barbed versus barbless question and produced conflicting conclusions. In two separate qualitative reviews with results from the above studies and additional unpublished data sets, Wydoski (1977) and Mongillo (1984) concluded that the use of barbless hooks does not reduce hooking mortality and that restrictions prohibiting barbed hooks cannot be justified biologically.

More recently however, Taylor and White (1992) summarized most of the same data sets using analysis of covariance in a quantitative procedure they called meta-analysis. Typically, in meta-analysis, test statistics (e.g., *t*-values) from multiple studies, often with conflicting results, can be combined mathematically in a quantitative review (Jarvinen 1991; VanderWerf 1992). Meta-analysis decreases the rate of type II error and increases the power to detect statistical differences (Rosenthal 1991; Miller and Pollock 1994). Using a different approach, Taylor and White (1992) concluded that a statistically significant difference in hooking mortality occurs when the two hook types are used to catch resident trout. A more recent qualitative review (Muoneke and Childress 1994) also concluded that the use of barbless hooks reduces hooking mortality, but much of their discussion focused on adult anadromous salmonids in ocean troll fisheries.

There appears to be renewed interest in regulations prohibiting use of barbed hooks. In Oregon, a proposal to require barbless hooks for all stream fishing, regardless of species sought, was recently considered but subsequently abandoned (R. Temple, Oregon Department of Fish and Wildlife, personal communication). In Idaho, barbed hook restrictions were adopted in 1996 for new catch-and-release fisheries in 700 additional stream kilometers, and more are being considered for 1998. Based primarily on Taylor and White (1992), five Arkansas waters with new regulations enacted in 1994 include a barbed hook restriction (J. Stark, Arkansas Game and Fish Commission, personal communication).

The increasing use of this management restriction at such a widespread level warrants close scrutiny, especially given the differences in conclusions of past reviews. While reading Taylor and White (1992), we realized that several past studies comparing barbed and barbless hooks were not included in their analyses. In addition, our review of their methods generated questions about their over-all approach to meta-analysis. As a result, we rexamined the barbed versus barbless hook question by using the more common approach to meta-analysis described above.

Regardless of the data set analyzed, statistically significant results do not necessarily imply real-world significance (Gold 1969). An assessment of the magnitude of association among variables, and hence, its true importance, must still be made in some manner besides a statistical test (Cohen 1965). Taylor and White (1992) note that despite their finding of statistical significance, the differences between average barbed and barbless mortality rates in past studies were small and must be put in biological context by fishery managers. Schill (1996) discusses the need to convert mortality rates from typical hooking studies into population exploitation rates and to consider natural mortality rates when developing restrictions for special regulation waters. We are aware of no study that discusses the merits of barbed hook restrictions at the population level.

We summarize results of all past efforts in which hooking mortality rates of resident trout caught on barbed and barbless hooks were compared in side-by-side trials. We then combine test statistics of these studies using meta-analysis in a quantitative review. We subsequently examine the strength of the relation between barbed versus barbless hook use and hooking mortality by calculating effect sizes (Cohen 1988; Rosenthal 1991). Last, we consider the biological significance of barbed hook restrictions at the population level.

Methods

Individual Study Summary

References cited in past hooking study reviews (Wydoski 1977; Mongillo 1984; Taylor and White 1992; Muoneke and Childress 1994) were used as initial reference sources. We reviewed references in all relevant papers, and conducted computerized literature searches to identify newer material. Our intent was to locate all prior studies of resident trout in which barbed and barbless hooking mortality rates for a given gear type (e.g., flies) were estimated in the same study.

Seven applicable studies were located (Westerman 1932; Thompson 1946; Hunsaker et al. 1970; Falk et al. 1974; Dotson 1982; Titus and Vanicek 1988; T. Bjornn, University of Idaho, personal communication). The Titus and Vanicek (1988) experiments consisted of three separate trials (June, July, and September) in which the two hook types were compared. Hooking mortality in the July trial was thought by the authors to be strongly influenced by elevated water temperatures, and these fish experienced a fivefold increase in mortality above the rates recorded for both June and September trials. Therefore, the July trial was evaluated separately. Thus, two comparisons of hook types were made from the single Titus and Vanicek (1988) study. Also, several of the above studies included barbed and barbless comparisons for both flies and lures, increasing the total number of direct hook comparisons available to 11.

Meta-analysis combines test statistics from previous studies, but statistical tests were not conducted in all 11 hook comparisons. In addition, the low mortality associated with both hook types in most past studies and resultant cell frequencies were often too small to meet assumptions of chi-square analysis (Zar 1974). We developed raw databases for each individual comparison and analyzed the data in SYSTAT (Wilkinson 1990) using binomial tests (Zar 1974). Results were considered significant at $P < 0.05$.

Meta-analysis

Test statistic combinations.—The test statistics (Z-scores) obtained from binomial tests of the 11 direct comparisons were combined by meta-analysis. Several meta-analytic techniques were compared to examine the consistency of results (R. Rosenthal, Harvard University, personal communication). First, the Stouffer method of adding Z-scores was used (Kirby 1993):

$$Z_M = \frac{\sum_{i=1}^{k} Z_i}{\sqrt{k}},$$

where Z_M = overall Z-score of the meta-analysis, Z_i = Z-score of binomial test for study i, and k = number of studies. In this method, Z_i is assigned a positive or negative direction based on the hypothesized outcome of the comparison (Rosenthal 1991). In our analyses, Z-scores from studies in which barbless hooks resulted in lower hooking mortality were assigned positive values.

The second approach used to combine the studies was the Edgington (1972) method of testing mean P. We used the equivalent but simpler formula of Rosenthal (1991):

$$Z_M = (0.50 - \bar{P})(\sqrt{12k}),$$

where $\bar{P}$ = average one-tailed probability value of all individual binomial tests, taking note of which tail the outcome P-value falls in, and Z_M and k are as defined above.

Rosenthal (1991) and Glass (1976) cautioned against excluding lower-quality studies from meta-analyses because of potential investigator bias in excluding studies that conflict with their expectations. Thus, the data of Thompson (1946) were included although the trout species was not identified. In addition, one of the comparisons by Westerman (1932) involved two slightly different hook sizes (number 5, barbed, and number 6, barbless), and hook sizes were not provided for the other trial. All three of these comparisons were included in the analyses despite some concern about their design.

Possible effects of these design concerns on our conclusions was evaluated in a third meta-analytic approach that used the weighted-Z method. We assigned half as much weight to the Westerman (1932) and Thompson (1946) studies and compared meta-analysis results to those in which all studies were assigned equal weight (Rosenthal 1991). This method was also used to examine the influence of sample size on meta-analysis results. The formula of Mosteller and Bush (1954) was used to add weighted Zs; total study sample sizes and a subjective quality rating were considered independently as weighting variables. Thus, separate test statistics were calculated for the two weighting approaches with the equation

$$Z_M = \frac{\sum_{i=1}^{k} w_i Z_i}{\sqrt{\sum_{i=1}^{k} w_i^2}},$$

where w_i = either the total sample size or the subjective quality rating (2 for high quality or 1 for low quality) as the weight for study i, and Z_M, Z_i, and k are as defined above.

With the above formulae, test statistics were combined for all past studies evaluating bait-, fly-, and lure-caught fish, separately. Because most special regulation waters typically restrict bait and permit the use of both flies and lures, results of all studies that used either of the latter two gear types were also combined. Resultant Z_M-scores for these combinations were evaluated for significance by using one-tailed P-values (Rosenthal 1991). Meta-analysis results were considered significant at $P < 0.05$.

Effect size calculations.—To estimate the magnitude or strength of the relation between hook type and hooking mortality found in past studies, effect sizes for individual studies were calculated by using the formula of Rosenthal (1991):

$$r_i = \frac{Z_i}{\sqrt{N_i}},$$

where r_i = standard Pearson product-moment correlation coefficient for study i, N_i = number of fish in study i, and Z_i is as previously defined.

SYSTAT was used to transform signed rs from individual studies into normalized Fisher's Z_rs (Kirby 1993). We calculated mean Z_rs for the same gear types described above for the test statistic combinations (bait, lure, fly, fly and lure) and subsequently calculated weighted mean Z_rs, based on sample sizes of individual studies (Rosenthal 1991):

$$\bar{Z}_r = \frac{\sum_{i=1}^{k} (N_i - 3)Z_{ri}}{\sum_{i=1}^{k} N_i - 3},$$

where $\bar{Z}_r$ = weighted mean Z_r, Z_{ri} = Fisher's Z_r for study i, and N_i is as previously defined.

A weighted evaluation of study quality on effect size was also obtained by substituting either a 2 or a 1 as a weighting variable instead of $N_i - 3$. Unweighted and weighted mean Z_rs were transformed back to mean Pearson product-moment ($\bar{r}$) with the following formula (Kirby 1993):

$$\bar{r} = \frac{e^{2Z_r} - 1}{e^{2Z_r} + 1}.$$

Resultant effect size estimates, both for individual studies and gear types, were evaluated with the guidelines of Cohen (1988).

Results

Individual Study Summary

In general, differences in hooking mortality attributable to use of barbless or barbed hooks were quite small in individual studies. Based on statistical tests made by the original authors and our

TABLE 1.—Summary of past hooking mortality studies directly comparing barbed versus barbless hooks. Sample sizes are in parentheses; statistical significance ($P < 0.05$) is denoted by an asterisk.

Study and trial	Gear type[a]	Species[b]	Source	Percent hooking mortality (*N*) for: Barbed hooks	Barbless hooks	Original significance test (χ^2, 2-tailed)[c]	Binomial test, *P* (one-tailed)	Effect size[d] (*r*)
Titus and Vanicek (1988)								
Jun, Sep trials	Lures	Cutthroat trout	Wild	1.9 (104)	2.4 (124)	OTG	0.40	0.02
Jul trial	Lures	Cutthroat trout	Wild	48.1 (52)	35.3 (51)	OTG	0.09	0.13
Hunsaker et al. (1970)	Lures	Cutthroat trout	Wild	2.7 (113)	6.0 (100)	NS	0.11	0.08
	Flies	Cutthroat trout	Wild	4.0 (75)	3.3 (60)	NS	0.42	0.02
Falk et al. (1974)	Lures	Lake trout	Wild	6.9 (72)	7.0 (57)	NS	0.49	<0.01
Bjornn (1975)[e]	Lures	Cutthroat trout	Hatchery	2.4 (209)	1.2 (166)	NT	0.20	0.04
	Flies	Cutthroat trout	Hatchery	0.4 (256)	0.8 (264)	NT	0.29	0.02
Thompson (1946)	Flies	Unknown		5.9 (51)	5.0 (60)	NT	0.42	0.02
Dotson (1982)	Flies	Cutthroat trout	Hatchery	0.0 (105)	1.0 (105)	NS	0.16	0.07
Westerman (1932)								
1930 trial	Bait	Brook trout	Hatchery	10.5 (200)	9.5 (200)	NT	0.37	0.02
1932 trial	Bait	Brook trout	Hatchery	7.0 (200)	3.0 (300)	NT	0.02*	0.09

[a] All lures had treble hooks.
[b] Cutthroat trout *Oncorhynchus clarki*; lake trout *Salvelinus namaycush*.
[c] OTG = original author test included other test groups, no test statistic available for barbed versus barbless only; NS = not significant; NT = not tested statistically by original author.
[d] Standard Pearson product-moment correlation.
[e] T. C. Bjornn, University of Idaho, unpublished data.

own binomial tests, only one comparison was statistically significant (Table 1). In a bait trial (Westerman 1932), mortality associated with barbed hooks was significantly greater than mortality attributable to barbless hooks ($P = 0.02$).

The strength of the relationship between barbed or barbless hook use and mortality was weak in individual studies. Calculated effect sizes, expressed as standard Pearson product-moment correlation coefficients (r), were low (Table 1). Only one of these values slightly exceeded 0.10, a lower guideline bound suggested by Cohen (1988) as evidence for a small association among variables.

The graphical summary of past studies comparing barbed to barbless hooking mortality revealed equivocal results (Figure 1). In six comparisons, use of barbed hooks resulted in greater mortality, whereas barbless hooks resulted in higher mortality in the remaining five. Barbed hook use resulted in lower estimates of hooking mortality in two of four fly comparisons and in three of five lure comparisons. Use of barbed hooks resulted in higher mortality in both cases in which bait was used.

Calculation of weighted mean mortality rates obtained from studies that compared the two hook types directly also revealed equivocal results. Mean hooking mortality rates for lure studies were slightly higher for barbed hooks; the opposite was true of flies (Table 2). For flies and lures combined, mean hooking mortality was 4.5% for barbed hooks and 4.2% for barbless hooks.

Meta-analysis

Combination of individual study statistics by four meta-analysis approaches did not change the above results. Comparison of barbed and barbless hooking mortality for studies combined by gear type yielded nonsignificant Z-scores with P-values ranging from 0.22 to 0.28 for flies and from 0.37 to 0.40 for lures (Table 3). Differences due to hook type in fly and lure studies combined were also nonsignificant ($P = 0.34–0.44$). Trout caught on barbless bait hooks experienced statistically lower mortality rates than those caught on barbed bait hooks ($P = 0.03–0.04$), but the discrepancy in sizes of the barbed and barbless hooks that were compared limits the utility of this finding. In addition, weighting the studies by quality or sample size did not affect calculated P-values appreciably (Table 3).

Based on correlation coefficients, the use of barbed or barbless hooks appeared to play virtually no role in determining mortality of fish. Effect sizes (correlation coefficients) for the various gear type meta-analyses were quite low for fly and lure combinations (Table 4). None of these values ap-

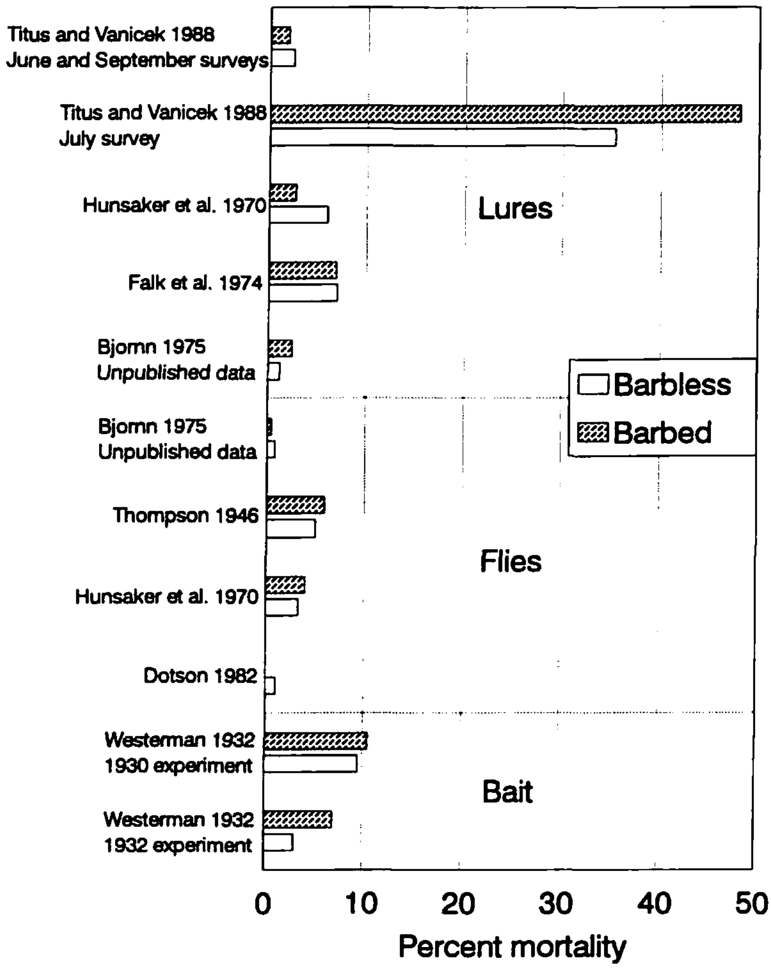

FIGURE 1.—Summary of all past trials comparing hooking mortality of resident trout caught with barbed versus barbless hooks.

proached the 0.10 guideline value of Cohen (1988) as evidence for a small relationship. Weighting by study quality or sample size produced minimal change in resultant effect size estimates.

Discussion

Our results agree with the qualitative literature reviews of Wydoski (1977) and Mongillo (1984), both of whom concluded that there is no biological basis for barbed hook restrictions on artificial flies and lures. In five out of nine individual trials, hooking mortality rates for barbed flies or lures were less than rates for barbless hooks.

TABLE 2.—Weighted mean rates of hooking mortality for barbed versus barbless hooks based on past trials.

Gear	Number of trials	Hooking mortality (%) for: Barbed	Barbless
Lures	5	7.3	6.6
Flies	4	1.4	1.7
Bait	2	8.8	5.6
Flies or lures	9	4.5	4.2

This finding conflicts with the conclusions of Taylor and White (1992), but we have difficulty accepting their conclusions. These authors used raw data (proportions) from individual studies in their analysis. Rosenthal (1991) cautions against this approach, citing past examples of flawed meta-analyses with paradoxical findings. Meta-analysis normally involves a process of combining summary test statistics from individual studies (e.g., Jarvinen 1991). Taylor and White (1992) did not use this approach, either for the barbed versus barbless hook comparisons or for other facets of their analyses (e.g., treble versus single hooks).

TABLE 3.—Comparison of P-values obtained by four meta-analysis techniques that combined barbed versus barbless hooking mortality trials by gear type. Statistical significance ($P < 0.05$) is denoted by an asterisk. See text for descriptions of combination methods.

		Method of combination			
Gear	N	Stouffer	Mean P	Weighted (N)	Weighted (quality)
Lures	5	0.38	0.37	0.40	a
Flies	4	0.28	0.25	0.22	0.24
Bait	2	0.04*	b	0.03*	a
Flies or lures	9	0.44	0.42	0.34	0.42

[a] Not tested; no difference in quality ratings within the group being tested.
[b] Test not appropriate given N = 2.

TABLE 4.—Comparison of mean effect sizes or correlation coefficients (r) obtained by three meta-analysis methods that combined barbed versus barbless hooking mortality trials by gear type.

		Combined effect sizes		
Gear	N	Mean r	Weighted mean r (N-3)	Weighted (quality)
Lures	5	0.015	0.008	0.015
Flies	4	0.014	−0.023	−0.019
Bait	2	0.055	0.060	0.055
Flies or lures	9	0.002	−0.007	−0.001

More importantly, we are concerned about the basic biological approach used by Taylor and White (1992) to compare results from the various trials. In their bait analyses, they summarized data from 23 barbed baited hook trials nationwide and compared those data to results from only 2 barbless bait trials at a single Michigan hatchery (Westerman 1932). They report a wide disparity in mean hooking mortality between barbed (33.5%) and barbless bait hooks (8.4%). However, the authors ignore that Westerman (1932) compared barbed to barbless hooks for the same species directly at the same site and found much smaller differences in mortality (Table 1). Barbless hooks were not investigated in any of the remaining 21 bait trials at other locations nationwide. Thus, other factors frequently shown to affect hooking mortality, such as varying water temperatures, species, etc., could easily have confounded their analysis. For a more detailed discussion of these concerns, see Turek and Brett (1997).

The same limitation is present in the other barbed versus barbless gear comparisons of Taylor and White (1992). Sixty-nine estimates of barbed hooking mortality for fly or lure trials were compared to estimates for only 8 barbless trials in a few of the same locations. Meta-analysis is not intended to overcome such spatial and temporal differences. In our review, we only summarized past trials in which both hook types were compared directly in trials at the same locations and times.

Results from the only two trials comparing barbless and barbed hooks with bait (Westerman 1932) and our subsequent test statistic combination via meta-analysis both suggest possible merit to the use of barbless hooks by bait anglers releasing trout. However, the use of different-sized barbed and barbless hooks in that work is problematic, as well as is the fact that the only two trials were conducted at the same hatchery. In addition, test fish were small and hooks used in this study were large relative to most hooking studies, perhaps explaining the unusually low mortality rate observed in the two trials, regardless of hook type. Additional studies with baited hooks should be conducted; existing data are insufficient for any firm recommendations regarding barbless hooks and bait.

In the individual studies we reviewed, statistical power (Peterman 1990) to detect significant differences in mortality was likely low given sample sizes and observed mortality differences. However, having sufficient power to detect a statistical difference is only relevant if a difference is large enough to be meaningful at a practical level (Cohen 1965; Gold 1969). Weighted mean hooking mortality rates for the nine barbed versus barbless trials involving artificial flies or lures were quite similar at 4.5% and 4.2%, respectively. We questioned whether reducing hooking mortality by 0.3% could possibly be important in wild trout populations given that annual natural mortality rates in trout streams typically range from 30% to 65% (Schill 1996; D. J. Schill, unpublished data).

To address this question Schill and Scarpella (1995) used the MOCPOP population simulation program (Beamesderfer 1991; Beamesderfer and North 1995). We examined differences in a variety of hypothetical salmonid populations in which all trout large enough to be captured by anglers are caught one, three, and five times annually with either of the two hook types. The modeling approach considered a wide range of growth rates and natural mortality scenarios typical for wild trout stocks in streams, along with the mean hooking mortality rates for barbed and barbless artificials reported above. Even when all individual fish were caught five times annually, a barbed hook restriction had little effect on populations. Numbers of trout in the simulated populations fished exclusively with barbless hooks averaged only about 1.5% higher for catchable-sized trout (>154 mm total length, TL) and 5% higher for quality-sized trout (>305 mm TL) than when all trout were caught with barbed hooks.

There is some potential for misinterpreting these simulation results. Our meta-analytic findings indicate the 0.3% difference in barbed versus barbless artificials is not statistically significant, i.e., they are not "real," or in any event, not large enough to be detectable. The completion of subsequent studies could easily result in a combined fly and lure average where barbless hooks produce slightly greater average mortality. This is currently the case in past fly-only comparisons in which mean barbless hook mortality is greater than that for barbed (Table 2). The simulation results reported above are only an exercise assuming a statistical difference actually exists where one presently does not. In this hypothetical exercise, results indicate that the benefits from barbed hook restrictions would be so small as to clearly be undetectable by the angling public, even in the most heavily fished scenarios. Given these modeling observations, results of the meta-analysis, and individual studies summarized above, we view barbed hook restrictions as a social issue.

Many anglers and some fishery managers may have difficulty accepting this perspective. In the first hooking mortality study, Westerman (1932) stated that barbless hooks are "the most sportsmanlike and humane manner of taking trout, one which should have real appeal to the practical Yankee as an economic proposition in abating waste." This attitude remains firmly entrenched in the minds of some fishery managers who dispute the results of the past hooking studies. They believe that, from a common sense perspective, barbless hooks are easier to remove from trout and, therefore, should reduce mortality.

However, implementing a barbed hook restriction without biological justification assumes there is no cost to the agency for enacting such regulations. This may not be the case. Schill and Kline (1995) estimated that 75% of barbed hook violations on two Idaho waters with such restrictions were made by individuals who usually comply with the regulations but occasionally forget to flatten their barbs down. If barbless hooks do not reduce hooking mortality significantly and citations are written to largely honest anglers, the animosity generated by such enforcement may be counterproductive to fishery agencies (Schill and Kline 1995). In Idaho during 1994, 20% of all angling violations (534 citations and warnings) were written for barbed hook violations (T. McArthur, Idaho Department of Fish and Game, unpublished data). The potential to generate unnecessary hostility from a sizeable group of anglers is real, especially if it spreads to family members, neighbors, and friends as a result of a citation. Social and financial costs to management agencies could become important over time.

A geographical inventory of special regulations also calls into question the biological necessity for barbed hook restrictions. Schill and Scarpella (1995) conducted a nationwide telephone survey of state agencies managing trout populations to determine the consistency of barbed hook restrictions. Of 37 states with special regulation trout waters, 22 (59%) reported having no barbed hook restrictions. Results also indicated that these restrictions were applied with some apparent regionalization, but inconsistencies were common. For example, fisheries in Yellowstone National Park and western Montana are widely regarded by many anglers as the finest trout fishing in the world, yet barbed hook restrictions have never been implemented on waters in these two geographic areas (D. Vincent, Montana Divisions of Fish, Wildlife and Parks and R. Gresswell, U.S. Forest Service, personal communications). Clearly, barbed hook restrictions are not needed for high-quality trout angling.

Conclusions

We conclude that, based on existing biological data, barbed hook restrictions are not justified for resident salmonid fisheries. Managers considering or proposing new special regulations to the angling public should consider the possible social costs of implementing a restriction that produces no demonstrable biological gains. Further, we suggest that existing barbed hook restrictions be reconsidered and that the restrictions be removed where anglers support such change. As Behnke (1987) suggested, unnecessary angling regulations should be eliminated to avoid the loss of agency credibility. Anglers who support the use of barbless hooks can do so voluntarily. Although existing data suggest little biological basis for use of barbless hooks, there are several reasons why anglers may want to use them. For example, barbless hooks can be removed from trout mouths and angler ears more easily, making the process less stressful to anglers in both instances and making it possible for them to resume fishing more quickly.

Whereas elimination of barbed hook restrictions may be warranted, rapid removal of the restrictions could create social and political problems for agencies. Many trout anglers are almost evangelistic in their support for various regulations (Jackson 1989), and barbed hook restrictions are certainly perceived as crucial for quality trout angling by a segment of the angling community. Such fervent support is not likely to be abruptly altered by the results of our study. It often takes 20 years for new research results to be filtered through fishery managers and to become common sense to anglers (Loftus 1987). Those anglers who currently view barbed hook restrictions as a requirement for good fishing will need time and perhaps additional studies before they will be convinced to change their perception. The first step in the process of eliminating unnecessary barbed hook restrictions on existing waters should begin with efforts to inform and educate the public (including proponents and detractors of barbless hooks) about the lack of biological support for them based on existing information.

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