Can Nature Conservation Justify Sport Fishing?

A. Dionys de Leeuw*

Anglers frequently justify their sport on the basis of nature conservation. According to this utilitarian equation, harming fish by angling is balanced by conservation of nature. To qualify as justification for angling, nature conservation must arise from and be connected to angling, a connection achieved by sport fisheries management. Management practices are, therefore, evaluated to determine if, on the whole, these practices are beneficial to nature and, if these benefits “outweigh” harms caused to nature by management and to fish by angling. Although not conclusive, according to this analysis, harms caused to nature by both sport fisheries management and to fish by angling “outweigh” angling related benefits to nature. Consequently, the justification of angling on the basis of nature conservation is dubious at best.

Also you should busy yourself to nourish the game in everything that you can, and to destroy all such things as are devourers of it.

— Dame Juliana Berners

I. INTRODUCTION

Angling, like other forms of sport hunting, requires justification. Angled fish have interests similar to hunted game. Anglers frequently justify their sport because it supports conservation of nature which benefits themselves and also fish populations,

* 4016 Yeo Street, Terrace, BC, Canada, V8G 2S9. With over twenty-five years of professional experience in sport fisheries and habitat management in British Columbia, Canada, de Leeuw is currently a retired biologist exploring the ethical implications of angling. He gratefully acknowledges helpful suggestions from Eugene Hargrove, two anonymous referees of this journal, Thomas La Point and Jack Weir, and comments from six reviewers of the author’s choice; James Ayers, Eugene Balon, Mark Beere, Jan Heggenes, Eric Parkinson, and Tom Reimchen. Editorial assistance from his wife Mary is, as always, greatly appreciated.


3 Harm to fish includes (a) killing them and (b) purposefully inflicting pain and suffering in them in order for anglers to have “sport” with them. An impressive body of evidence has been mounted strongly indicating pain, and the awareness of it in virtually all vertebrates, including fish. See de Leeuw, “Contemplating the Interests of Fish”; E. K. Balon, “Defending Fishes against Recreational Fishing: An Old Problem to be Solved in the New Millennium,” Environmental Biology of Fishes 57 (2000): 1–8; Australian and New Zealand Federation of Animal Societies, The Welfare of Fish and Aquatic Invertebrates (Melbourne: ANZFAS, 1992); S. C. Kestin, Pain and Stress in Fish (Bristol: Royal Society for the Prevention of Cruelty to Animals, 1994), which lists fifty references on the topic; G. Peters, “Schmerz und Streß bei Fischen,” Deutsche Tierärztliche Wochenschrift 95 (1988): 60–63; B. Ollenschlager, “Schmerzausschaltung bei Fischen,” Berliner und Muenchener Tierarztliche Wochenschrift 88 (1975):
ecosystems, and nature generally. A utilitarian perspective, it compares harming fish by angling on one side of the balance to benefits to nature through conservation on the other. This argument is of considerable importance as much of the history and content of environmental conservation is firmly rooted in wildlife/fisheries management. In this paper, I evaluate whether benefits conferred to nature through conservation, largely an empirical question, are sufficient to justify angling?

I begin by defining nature conservation as benefits to nature. These are then connected through sport fisheries management to angling. Management practices


5 Loftin, in “The Morality of Hunting” on p. 242 accepts Peter Singer’s “replaceability argument” Practical Ethics (Cambridge: Cambridge University Press, 1979). Vitali, “Sport Hunting,” p. 29, views anti-hunting sentiments “as potentially tragic because such misconceptions may lead to the banning of hunting and thus a major shift in our hemisphere-wide attempt at managing wildlife and fish populations and their habitats.” Both Loftus and Vitali fail to determine if benefits to nature actually occur from management and if these justify hunting.

are then evaluated to establish if, on the whole, negative and/or positive impacts to nature have resulted from these practices. I conclude by discussing some implications of my analysis. My perspective is largely North American, and I don’t address benefits to anglers here.

II. CONSERVATION, NATURE’S INTERESTS AND BENEFITS

Conservation, according to the Oxford English Dictionary, is the “preservation, esp. of the natural environment.” Conservation must impart some benefit to nature and, for a benefit to be meaningful at all, it has to have a positive influence or prevent a negative influence on an interest. Alternatively, harm is a negative or detrimental influence on an interest, or the aggravation of a negative impact on an interest. With nature, interests can be attributed to both individual and to classes of organisms. The attribution of interests only to individuals establishes survival requirements, among others, of individual organisms as the basic interest upon which all of nature’s interests rest. Interests of populations, ecosystems, and nature generally aggregate interests of individual organisms into groups. Attributing interests to classes, on the other hand, recognizes populations, species, ecosystems and the like as having interests of their own, distinct from any interests belonging to individuals. The functioning complexity of an intact biotic community is an interest of that community. The distinction between attributing interests to individuals or to classes, however, is not crucial to my analysis. What is crucial is the recognition of nature having interests that can be positively or negatively impacted and parallels Aldo Leopold where he concludes,

9 Taylor, Respect for Nature, p. 69, n. 5, concerning “species” and “classes,” which “have no good of their own, only their members do.” Harley Cahen, “Against the Moral Considerability of Ecosystems” Environmental Ethics 10 (1988):197.
11 Holism enlarges the scope of interest bearers to include groups or classes as done by Christopher D. Stone, Should Trees have Standing? Toward Legal Rights for Natural Objects (Palo Alto: Tiaga Publishing, 1988) and numerous other “deep,” “holistic” ecologists, including Aldo Leopold and his “think like a mountain” logic recently resurrected in a number of essays in J. Baird Callicott, ed., Companion to a Sand County Almanac (Madison: The University of Wisconsin Press, 1987) and in several works also by Callicott in this journal. Such a holistic view would not exclude individual interests. See, for example, Don E. Marietta, Jr., “Environmental Holism and Individuals,” Environmental Ethics 10 (1988): 251–58, but “must support the holistic functioning of an ongoing system.” Bryan G. Norton, “Environmental Ethics and Nonhuman Rights,” Environmental Ethics 4 (1982): 17–36; Holmes Rolston, III, Philosophy Gone Wild (Buffalo, N.Y.: Prometheus Books, 1989); and also his discussion on golden trout, in “Respect for Life: Counting what Singer Finds of No Account,” in Singer and His Critics, ed. Dale Jamieson (Malden, Mass.: Blackwell, 1999), pp. 247–68.
A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise.\footnote{12}{Aldo Leopold, “The Land Ethic,” in \textit{A Sand County Almanac} (New York: Oxford University Press, Press 1968), pp. 224–25.}

Conservation then, as I interpret it here, becomes beneficial actions toward nature that maintain or further the preservation of intact functioning populations, ecosystems, or biotic communities with their full complement of indigenous species. Actions harmful to nature, on the other hand, negatively impact, limit, or aggravate nature. I accept many ecosystems have been negatively impacted and altered to varying degrees. Throughout this essay, I use terms such as \textit{species}, \textit{populations}, \textit{ecosystems}, and \textit{biotic communities} to denote nature.

\section*{III. NATURE CONSERVATION FROM ANGLING}


Angling can be connected to nature conservation through contributions anglers make, in the name of their sport, to management decisions affecting numerous aspects of nature. First, one of the principle ways in which anglers affect these decisions is financially. Anglers pay a license fee and in addition to regular taxes, frequently pay a surcharge on equipment or fuel purchased.\footnote{14}{In British Columbia the Habitat Conservation Fund provided approximately $24 million to fund more than 1,500 projects provincially, \textit{Ministry of Environment, Lands and Parks News Release} (1 May 1995); \textit{B.C. Ministry of Environment, Habitat Conservation Fund, Annual Review, 1988, 1988-89 to 1991–92}. In the U.S. this is the Federal Aid in Sport Fish Restoration Act, or the Dingell-Johnson Act, and the Wallop-Breaux amendments to the Pitman-Robertson Act. \textit{Dingell-Johnson/Wallop-Breaux: The Federal Aid in Sport Fish Restoration Program Handbook} (Washington, D.C.: The Sport Fishing Institute, 2001). In 1995, of $327 billion, roughly $200 billion went to restoring sport fisheries. \textit{Sport Fish and Wildlife Restoration} (Washington, D.C.: U.S. Fish and Wildlife Service, Division of Federal Aid, 1995).}


Angler organizations also contribute to the management of fish and wildlife resources. Anglers donate funds and equipment to wildlife agencies and conservation organizations. They also provide habitat and funding for hatcheries, game farms, and other wildlife management programs.

of information and execution of field projects including creel surveys, tagging and fish population studies, as well as stream enhancement projects and innumerable other volunteer and paid work. Invariably these activities require permits from, or supervision by, government management staff. Third, anglers often affect environmental decisions by lobbying politicians or becoming politicians themselves. Anglers, by virtue of their numbers and economic influence, exert considerable political “clout” through sport fishing clubs, popular/scientific publications, letter writing campaigns, and through the tackle, guiding, and tourist industry. Fourth, angling is a recreational use of nature. Laws have been enacted to protect various components of sport fisheries such as fish and their habitats. Trails, road access, and wilderness are also maintained. Last, and perhaps most important, there is a very powerful connection of angling to nature conservation through provincial and state agency management staff who almost always also angle. Indeed, many became sport fisheries management professionals because they angle. There is, therefore, a very close connection between angling and decisions that impact nature.

All of the above contributions, however, should not be construed as conservation per se, as these can more appropriately be interpreted as the various linkages connecting angling, via implementation of sport fisheries management objectives, to nature. Such objectives almost always constitute management practices implemented by government staff acting within the prevailing political milieu on behalf of anglers’ interests. The only exceptions I can think of are privately owned fishing waters where the identical process occurs in microcosm. A discussion on how conservation flows from or is connected to angling, therefore, becomes a discussion entirely about sport fisheries management.

IV. ANGLING MANAGEMENT AND CONSERVATION

All sport fisheries management can be grouped into three broad activities: research, nature, and people management. Each activity is first described and then evaluated to determine its positive or negative impact on nature.

throughout North America has largely been maintaining hunting, angling and some trapping interests. Tober, Who Owns the Wildlife?


17 Fisheries Act, Canada, secs. 35 to 43, (R.S. Chapter F-14,S.1); B.C., Fish Protection Act (Bill 25, 1997).

18 In British Columbia, forty-two rivers or their reaches have been classified “to protect their unique fishing opportunities.” Freshwater Fishing Regulations Synopsis (Victoria: British Columbia Environment, 1996–97), p. 5. Rivers have been designated as “Heritage Rivers” for many reasons including angling. British Columbia’s Heritage Rivers System (Victoria, B.C.: Heritage Rivers Program, 1997). The Fish Protection Act (1997) protects the mainstream of at least fifteen rivers from hydropower dams and other impacts.

19 My own experience in British Columbia is that approximately 80 to 100 percent of all provincial fisheries management staff angle.
RESEARCH MANAGEMENT

Sport fisheries science aims to increase understanding of all aspects of the sport for the purpose of angling.20 Included here is all research on fish biology, such as fish population abundance and survival studies, determining mortality rates relative to catch strategies, and redistributing this knowledge through dissemination of information. Studies include inventory and sampling programs, catching and tagging fish, detailed age analysis, size frequency and growth and yield calculations to achieve optimum harvests and implement management objectives.21

Additionally, a large body of research has documented fish habitat requirements,22 information instrumental in developing standards, guidelines, and mitigation procedures for forest harvesting, agriculture, transportation, urban development, mining and hydropower projects.23 Stream enhancement and ecosystem restoration procedures have also benefited from this knowledge. Considerable information has also been generated on fish diseases, fish health, anesthetics for fish, and the interactions between various species of fish. Technological advancements in fish sampling and data manipulation techniques can also be included here. Understanding anglers is another research activity and includes creel surveys, angler preference and demographic studies.24 Besides formal studies by management organizations

20 Fisheries Review 39 (1994) and 40 (1995) lists 8,584 and 9,614 articles respectfully on aquatic plants and their control, culture and propagation, limnology and oceanography, physiology, genetics and behavior, natural history, parasite and diseases, pollution and toxicology, and research and management by roughly 4,500 authors in 1,600 journals throughout the world annually. See also Transactions of the American Fisheries Society, and Canadian Journal of Fisheries and Aquatic Sciences.


and research institutions, anglers themselves take great interest in many aspects of their sport such as entomology, fish behavior, and general nature study. Angling, therefore, not only generates an enormous amount of information on nature, it also creates an interest in nature.

Although sport fisheries research may guide conservation, it isn’t until this understanding is applied in some way that biotic communities have been impacted. The entire research component of the conservation argument cannot be used to justify angling, as pure knowledge does not, in and of itself, directly impact nature. Indirectly, however, improved understanding greatly influences how nature is impacted.

**Nature Management**

In this section I evaluate direct manipulation of nature resulting from: (1) food enhancement, (2) habitat enhancement/restoration, (3) population control, (4) fish culture, and (5) mitigation.

(1) Food Enhancement. Many techniques have been developed to improve growth and survival of fish in angling waters by increasing their food supply. Fish can be fed directly with a variety of feeds such as dried pellets or frozen shrimp distributed into lakes and streams, or indirectly by increasing nutrient levels. Phosphorous,
nitrogen, and other limiting nutrients can be added to aquatic ecosystems to increase primary production resulting in greater food supplies. Prey species have also been introduced into aquatic ecosystems to benefit predatory game fish. These methods intend to enhance sport fisheries, often with questionable results to anglers, and almost always at a cost to ecosystems.

Direct feeding and fertilization projects can be stopped and their impacts reversed. Doing so is virtually impossible when entire ecosystems have been altered by the introduction of non-indigenous prey. For instance, and much to the delight of anglers, opossum shrimp were introduced as food for trout and kokanee salmon into numerous lakes in the northern hemisphere. The almost immediate impact of these introductions was increased growth of fish as shrimp population abundance escalated. Success after success prompted managers to introduce shrimp into other lakes despite a lack of long-term studies on effects of these introductions. However, success was short lived, as vastly enlarged shrimp populations competed with immature salmon for food with disastrous results to salmon. Irreversibly reduced salmon abundance had far reaching negative impacts on bears, eagles, and a host of other organisms dependant on annual salmon migrations. Similar instances can be cited for fish introductions, rather than shrimp, as prey for game fish. To consider food supply improvements for game fish a positive ecological impact is, therefore, doubtful at best.

(2) Habitat Enhancement/Restoration. Game fish abundance can also be improved by habitat enhancement and by restoration of negatively impacted aquatic

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31 In 1912, rainbow smelt was introduced into Crystal Lake, Michigan, as forage for Atlantic salmon, from where it spread throughout the Great Lakes. Crossman, “Introduced Fresh Water Fishes,” p. 47. According to W. B. Scott and E. J. Crossman, *Freshwater Fishes of Canada*, Bulletin 184 (Ottawa: Fisheries Research Board of Canada, 1973), p. 316, introduction of rainbow smelt have negatively impacted lake trout. Other examples can be cited.
ecosystems. Aeration of lakes during critical low oxygen periods decreases the likelihood of fish kills, benefitting fish and anglers. Lake shore spawning beds and artificial reefs have also been constructed with considerable success. Falls, rapids, and other stream barriers impeding upstream migration of salmon and trout can be removed using explosives or by installing fish ladders. Frequently these upstream reaches are inhabited with non-migratory fish which are then replaced by invading species. On the other hand, resident populations may benefit from additional adult carcasses. Barrier removal projects of this kind also tend to homogenize fish populations rather than maintain discreet and separate subgroups.


They also displace localized food sources for a variety of predators which key in on such sites during fish migrations.39

Another enhancement/restoration technique consists of constructing spawning channels, placement of gravels, log jams, and rock-filled gabions in impacted streams.40 All are intended to improve the reproductive, nursery, and growing requirements of game fish.41 Such manipulations have been popular with fisheries managers, engineers, and anglers. Projects are site specific, almost maintenance free, and can be installed with the help of anglers. Small impoundments have also been created to release water into streams during low flow periods.42 In many cases these projects improve sport fisheries,43 at times with questionable results to non-game fish species. Moreover, there are numerous restoration/enhancement projects which benefit many organisms, despite their primary objective being improvement of sport fisheries.44 Overall, these procedures enhance, and more importantly restore, impacted ecosystems to their original state.45 In this way, a very positive and beneficial influence to the environment occurs.

(3) Population Control. Game fish abundance can also be improved by removal of predatory or competing species. Mammals, birds, and fish that feed on

*Society Monograph*, no. 6 (1992), p. 18. In some cases, barriers have been purposefully constructed to maintain genetic isolation between invading introduced and native resident populations. The importance of discreet populations is also discussed by M. F. Wilson, “Variations in Salmonid Life Histories: Patterns and Perspectives,” Research Paper PNW-RP-498 (Portland: Department of Agriculture, Forest Service, Pacific Northwest Research Station, 1997), p. 50.

39 When large numbers of migrating salmon congregate at barriers, fish ladders reduce fish availability for bears. Examples include fish ladders at Skutz Falls, on the Cowichan River, Vancouver Island, and the Mezidain River, a tributary of the Nass River. Numerous additional examples throughout British Columbia can be cited.


43 “The only report of a structure built to assist a non-game fish was from Wyoming, for the Endangered Kendall Warm Spring speckled dace.” Rinne and Turner, “Reclamation and Alteration as Management Techniques,” p. 222. See also Minckley and Deacon, *Battle against Extinction*, pp. 171–89, where preserves and refugia are discussed.


game fish can be selectively removed through shooting, trapping, chemical, and other means. Entire lakes and streams can be “poisoned” to eradicate existing and potentially competing fish so more valuable game fish can be re-introduced with excellent results for anglers. The unfortunate consequence has often been complete alteration of lake/stream ecosystems. In some instances extirpation of isolated populations of non-game fish species has resulted. On the other hand, natural populations can be rehabilitated by selectively eradicating alien species. Most often, this type of restoration takes place when competing fish negatively affect sport fisheries. “Therapeutic” removal of overabundant game fish, as in hunting, has, to the best of my knowledge, not been implemented. On the whole, to consider population control as ecologically benign is doubtful at best.

(4) Fish Culture. Hatcheries are an important component of sport fisheries management. All spawning, fertilization, egg incubation, hatching, fish growth, and health are artificially controlled. Cultured fish are released in angling waters

46 For historic evidence, see Berners in Treatise of Fishing with an Angle and Walton and Cotton, The Complete Angler or the Contemplative Man’s Recreation. Control of predators is less well documented for fish. My experience in British Columbia is that both bears and mergansers were, at least historically, frequently shot to protect spawning salmon, fry, and smolts. On the Skeena River, I have also encountered several dead seals riddled with bullet holes, all killed illegally, presumably to protect sport fisheries.


48 In British Columbia, at least one rare species of white fish was extirpated by such a “rehabilitation” project. J. D. McPhail and R. Carveth, A Foundation for Conservation: The Nature and Origin of the Freshwater Fish Fauna of British Columbia (Victoria: Queens Printer for British Columbia, 1993), p. 29; Rinne and Turner, Battle against Extinction, pp. 219–44.

49 Ibid.

50 Sigler and Sigler, Recreational Fisheries Management, pp. 171–88.


52 R. L. Welcomme, International Introductions of Inland Aquatic Species, lists 1,354 introductions of 237 species into 140 countries. Of these, “sport fishing has provided the second major motive for introduction with a relatively constant number of introductions per decade,” pp. 8–9. From 1985 to 1991, well over a billion fish were stocked in the U.S. through Federal Aid in Sport Fish Restoration Programs, and accounted for 14.5 percent of all expenditures from this program. From 1989 to 1993, $27 million (two percent) were expended on salmonid hatchery related projects, only one percent on habitat related projects, J. McGurrin, C. Ubert, and D. Duff, “Use of Cultured Salmonids in the Federal aid in Sport Fish Restoration Program,” in Uses and Effects of Cultured Fishes in Aquatic Ecosystems American Fisheries Society Symposium 15 (1995), pp. 12–15.
as catchables in put-and-take fisheries or as juveniles to grow naturally into larger fish. Anglers benefit by establishment of new fisheries where natural fish production is low, has been reduced, or is not possible. Overfished wild stocks can be augmented to provide more bountiful sport fisheries. Although benefits to anglers may be substantial, a number of questionable ecological consequences result from this practice.

First, parking areas for staff, visitors, and equipment, as well as space requirements for buildings and raceways, replace ecosystems. Water diversions and energy requirements to run the operation also affect nature negatively. Second, the interests of fish are negatively affected in hatcheries. Third, there are potentially long-term negative genetic impacts to wild fish populations. Hatchery fish are not subjected to natural selection. In the wild, natural selection “weeds out” debilitating traits. In hatcheries, these are incorporated into the population by artificially reducing deaths in fish. When cultured fish mate with wild counterparts, hatchery maintained traits become part of the wild (hybrid) population. Such hybrids no longer have the naturally selected-for genetic attributes to adequately survive in the wild. Continuing to take hybrids as a brood source (these are indistinguishable from wild fish) compounds the problem. Fourth, in hatcheries, where fish are kept at high densities, disease is a continuous threat. Epidemics are controlled by frequent and constant treatment. Once released into the wild, however, pathogens can spread to wild fish.

Fifth, hatchery fish, when released into natural ecosystems, compete


with wild fish populations, many of which have declined substantially as a direct consequence of competition with hatchery introductions.  

A fish culture protagonist could argue hatcheries are good, recruiting more anglers, resulting in increased conservation. This logic fails on several accounts.  

1) Although it may be possible to demonstrate increased angler use in hatchery augmented waters, demonstrating this increase for the entire angling population is difficult. Angling is now less popular than it used to be despite fish culture.  

Hatcheries tend to improve success rates of anglers and to concentrate their distribution. Total angler abundance is not affected, at least not positively. (2) The very assumption of angling resulting in conservation is what is being examined in this essay. Accepting this assumption without substantiation for the specific case of hatcheries is to make a claim based on ignorance. (3) Artificial enhancement of game fish populations may create a false expectation in anglers of aquatic ecosystems. Rather than accepting some waters to be naturally fish poor, rivers and lakes are expected to provide fish in abundance. Anglers are drawn to stocked waters with their focus on catching their limit. The relationship of respect for nature that angling as a sport is meant to foster is diminished. Erosion of this relationship is exacerbated because fish, the very core of the angling experience, have been artificialized. Fish culture, therefore, drives a wedge between anglers and the wildness of nature, ultimately to the detriment of all angling and nature.  

Despite some use of hatcheries in restoration projects, fish culture on the whole cannot be considered a positive biological influence. On the contrary, there are substantial negative impacts to both aquatic and terrestrial ecosystems.

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(5) Mitigation. Included here are all management actions that reduce the severity of, or cause to become less harsh or hostile, potential impacts from industry, resource extraction projects, urban and agricultural developments, and similar activities. Mitigation measures include statutory protection of fish and their habitats, and maintaining “aesthetic” qualities of angling. I exclude compensation here as this invariably consists of an enhancement/restoration practice already described.

Numerous laws protect fish and their habitats. In British Columbia, Canada, for instance, both federal and provincial legislation protect habitat requirements for various fish species supporting food, commercial and sport fisheries. Guidelines have been developed to maintain water quality, aquatic habitats, riparian areas, and entire drainages.

Aesthetic values of sport fishing, guiding, and associated tackle and recreational industries also play a significant role in supporting conservation. Increasingly, wilderness areas, heritage rivers, and classified waters have reduced development, limited access, and restricted resource exploitation, which are beneficial to numerous organisms in addition to game fish.

Streams, lakes, ponds, and wetlands, core ecosystems on which innumerable animals and plants depend, are, furthermore, enjoyed by anglers while pursuing their sport. A very beneficial impact to both aquatic and terrestrial ecosystems is, therefore, realized by this management practice.

PEOPLE MANAGEMENT

In this section I discuss laws regulating (1) angling and (2) competing fisheries. Excluded are laws, already discussed, protecting habitats for fish and anglers.

(1) Regulating Angling. Rules affecting angling can be either “soft” or “hard.” Soft rules anglers impose on themselves as a code of ethics for their sport. Anglers

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63 The *Fisheries Act* (Canada) and *Fish Protection Act* (British Columbia, 1997).


may release their catch while taking fish is permitted; they can restrict their sport to fly fishing while bait fishing is allowed and more productive; and they can report poachers and habitat violators to enforcement officers. Although important, I do not further discuss soft rules here. They are often personal and difficult to define, and when they are definable, “soft” rules ultimately rest on “hard” rules.

Hard rules are government enforced, clearly defined, sport fishing regulations anglers must abide by and are a major component of sport fisheries management. There are, roughly, two types: (a) rules protecting sporting aspects of angling, and (b) those that protect fish.

(a) Regulations that maintain sporting qualities of angling prohibit snagging, trapping, netting, chumming, using certain baits, spearing, etc., to catch fish. They do not affect what, where, when, or how many fish can be taken. Since the method itself, rather than the number of fish taken, has largely no impact on aquatic ecosystems or species assemblages per se, no benefit or cost to nature can be associated with regulations pertaining strictly to the method of angling.

(b) Regulations that protect fish, on the other hand, establish bag limits, seasonal and area closures as well as species and size restrictions. Game fish frequently play a significant role in establishing and structuring predator-prey and other relationships in aquatic and terrestrial ecosystems. An unregulated fishery could, over time, decimate game fish populations with negative impacts to these ecosystems. Maintaining natural abundance of game fish by regulating the catch could be regarded as a positive affect on nature and as justification for the sport. Unfortunately,

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69 Ibid.

regulation of the sport fishery cannot be claimed as justification for angling. By imposing limitations on themselves, anglers in effect, reduce the negative impact of themselves on their own sport, an entirely circular and self-referential argument at best.

(2) Regulating Competing Fisheries. With many stocks nearing depletion, competition for fish is inevitable. Anglers could justify their sport by lobbying for greater protection of stocks threatened by commercial, food, and other fisheries. This argument is plausible when game fish populations require protection, and/or incidental species are also protected.

If a competing fishery threatens a sports fish population, and anglers intervene effectively to reduce this threat, then a species has clearly been afforded increased protection. When anglers restrict large-scale net fisheries that catch (or more properly, mine) not only squid or tuna, but also game fish, turtles, sharks, porpoises, and a host of other incidentally caught species,71 significant protection of a variety of species occurs. Anglers, in collaboration with many environmentalists, can legitimately claim such restrictions as beneficial to marine species and ecosystems. This justification becomes increasingly obscure when some portion of the threatened population continues to be fished by anglers.

V. CONCLUSIONS

If, despite the perhaps limited and arbitrary nature of my analysis, this review has merit, then the combined effects of angling management overall, do not clearly indicate a positive impact on nature. Research does not directly impact nature, regulating angling is a circular argument, while food enhancements, population control, and fish culture generally impact nature negatively. However, there are considerable beneficial impacts on nature resulting from habitat protection/restoration, regulation of other fisheries, and mitigation. When harm to fish by angling is included, sport fishing becomes increasingly unjustifiable on the basis of nature conservation. To justify angling, sport fisheries management must increase its positive, as well as decrease its negative, impacts on nature. These must outweigh harms caused to fish as a result of angling, a project not without its challenges.

First, all fish culture activities, food enhancement projects, and many population control programs could be severely restricted with the immediate result of reducing game fish abundance, thereby conflicting directly with sport fishing interests.

Second, many fish and wildlife programs are funded by revenues generated from the sale of angling and hunting licenses and from surcharges on equipment

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purchased to pursue these sports. Reduced fish abundance would inevitably recruit even fewer anglers to fund management programs. Fisheries management professionals, many of whom also angle, may find their programs, employment, and recreation at risk. There is, therefore, a strong incentive for them to continue making decisions favoring anglers rather than nature.

Third, the complex problem of significantly reducing sport fisheries management actions that impact nature negatively could be side-stepped by increasing efforts to reduce society’s harm to nature. This maneuver shifts sports fisheries management’s conflict with itself and anglers to one with society generally. Escalation of protective and restoration actions beneficial to species and ecosystems increases conflict with many of society’s projects that negatively affect nature.

The obstacle confronting all of sport fishing then is primarily to sacrifice the interests of anglers for the interests of nature. Unless steps are taken to meet this challenge, it will be difficult to justify angling on the basis of nature conservation.