Fisheries

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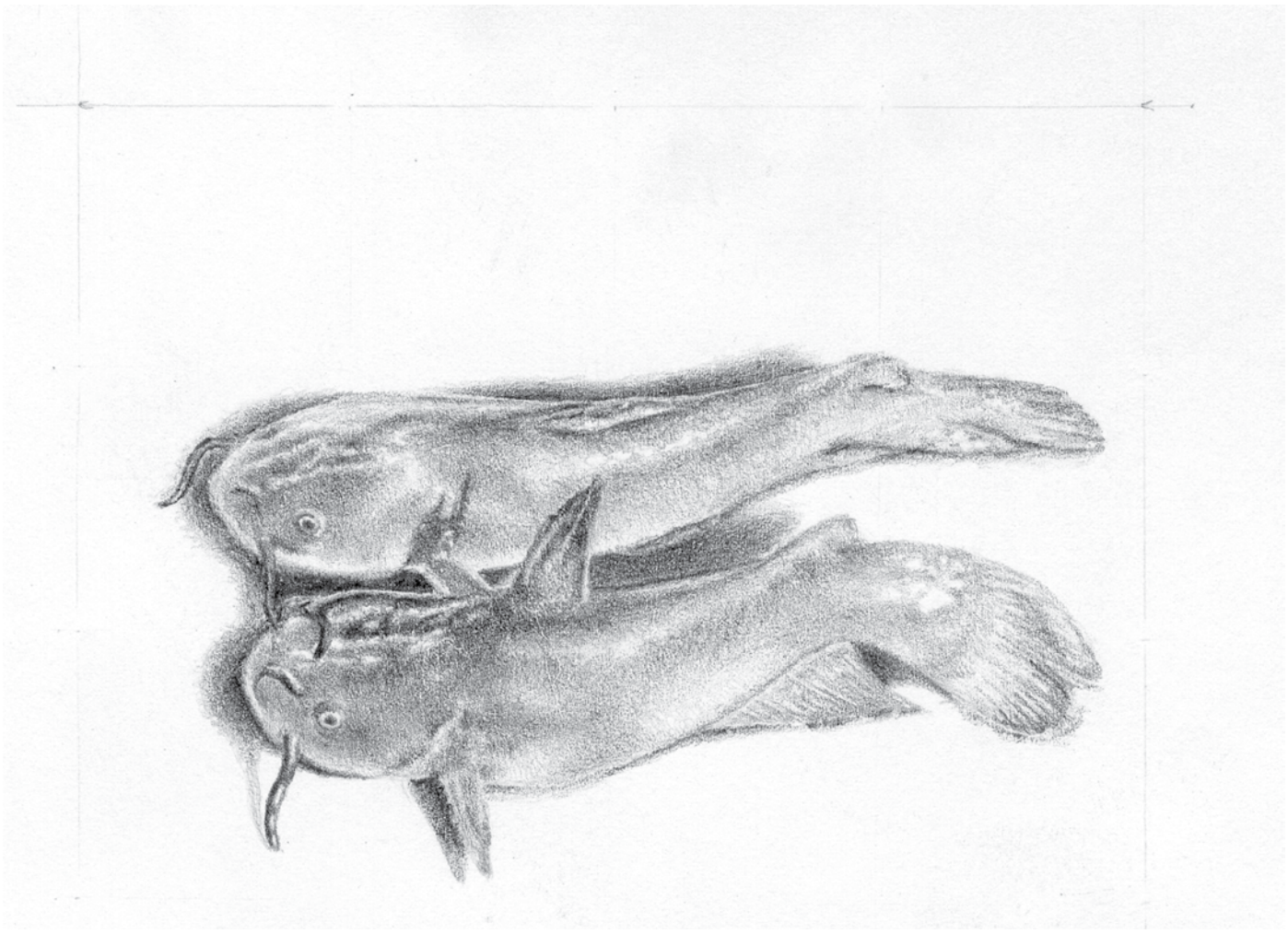

A Primer on Anti-Angling

A Global Code of Practice for Recreational Fisheries

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Management: More Than Just Managing Fish

A Call for Help – Expecting Endangered Species

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Contents

148 Atlantic Sturgeon
Photo credit: NOAA

Cover illustration: "Bullheads," by artist Robert T. Jackson (Department of Landscape Architecture, Mississippi State University), from Donald C. Jackson's newest book, Wilder Ways (University Press of Mississippi, 2012).

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The American Fisheries Society (AFS), founded in 1870, is the oldest and largest professional society representing fisheries scientists. The AFS promotes scientific research and enlightened management of aquatic resources for optimum use and enjoyment by the public. It also encourages comprehensive education of fisheries scientists and continuing on-the-job training.

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Our International Connections

Bill Fisher, President

AFS President Fisher may be contacted at: wlf9@cornell.edu

I have wanderlust. It's genetic. My dad had it, and my sister also has it. I've traveled across North America and visited five of the seven continents (still have Africa and Antarctica to go). I really enjoy visiting new places, experiencing new cultures, smelling new smells, tasting new foods, and meeting new people. Travel is truly a sensory experience, and some of the most stimulating, challenging, and fun experiences of my life have come from attending international conferences. Being a fisheries professional has provided me with many of these international travel opportunities and experiences, including attending the five International Symposia for Geographic Information Systems/Spatial Analyses in Fishery and Aquatic Sciences, and connected me to fisheries professionals and students throughout the world. What a privilege and a joy.

AFS currently has over 900 international members from 64 countries. That's approximately ten percent of the total AFS membership. Nearly two-thirds of these members are from Canada, and of the remaining 63 countries, only 10 countries have more than 10 members. AFS has members in all continents (except Antarctica) that are involved in fisheries issues. This global diversity in membership allows all of us to better understand how fisheries are managed worldwide and assess threats to fisheries resources. Our strategic plan *AFS 2020 Vision* described a future where world-wide fisheries production is optimized and sustained while structural and functional conditions of marine, freshwater, and estuarine ecosystems are maintained.

This far-reaching vision challenges us to think and work globally with other fisheries societies that have mutual goals and objectives. AFS is one of many fisheries societies, a few of which include the Asian Fisheries Society, Australian Society for Fish Biology, Fisheries Society of the British Isles, Japanese Society of Fisheries Society, South African Association for Marine Biological Research, and World Aquaculture Society. In fact, many of these societies are members of the World Council of Fisheries Societies, of which AFS is a member. The Council is organizing the 6th World Fisheries Congress in Edinburgh, Scotland, May 7–11, 2012. The theme of the Congress is *Sustainable Fisheries in a Changing World.* AFS members have organized two symposia at the Congress: "Fish and fisheries responses to changing natural and emerging anthropogenic challenges" and "Inland fisheries: biodiversity, food security and the need for ecosystem management." A delegation from AFS including President-elect John Boreman, First Vice President Bob Hughes, Gus Rassam, and me, along with several other members will be attending the Congress.

Beyond our meetings, AFS serves its international members in a variety of ways. There are two sections dedicated to international members and issues. The International Fisheries Section was established to support and promote worldwide fishery education, organizational, and research efforts; increase the awareness, cooperation, interests, needs, and contribution of fisheries professionals worldwide; and assist with the international exchange of information, including the technical advice among fishery workers. The current president of the section is Felipe Amezcua, a professor of fisheries at the Universidad Nacional Autonoma de Mexico in Sinaloa, Mexico. The International Fisheries Section has been involved in helping lead and organize all the previous World Fisheries Congresses, and it administers the Carl R. Sullivan International Endowment Fund that provides a one-year membership to a non-North American fisheries scientist. The Canadian Aquatic Resources Section was established in 1991 to provide a forum for discussion of Canadian aquatic resource issues and the future of the fisheries profession in Canada, and to facilitate an expansion of AFS services to Canadian members. The Canadian Section offers student travel awards to attend the AFS annual meeting and the annual Canadian Conference for Fisheries Research. Other AFS sections that have a strong international presence and membership are the Early Life History Section, with members from 24 countries outside North America; the Physiology Section, which will be hosting the Tenth International Conference on the Biology of Fish in Madison, Wisconsin, July 15–19, 2012; and the Fish Health and Fish Culture sections. Finally, there are several international chapters including the Mexico Chapter, which will be hosting the 2014 Annual Meeting of the Western Division of AFS; the Atlantic International Chapter that is comprised of the five eastern Canadian provinces and three New England American states; and the Washington-British Columbia Chapter.

I suspect many of you did not know the extent to which AFS has branched out to connect with fisheries professionals across the world. The recent decision to use Taylor and Francis to publish our journals is another way we have expanded our global network. We are seeking more interest and submissions to our journals from international fisheries scientists. There will likely be more opportunities for AFS to connect with international fisheries scientists as we update our website and web services to better connect AFS members and other fisheries professionals. I'm excited to be a member of "international" AFS and look forward to satisfying my wanderlust for new places, people, cultures, and fish cuisine.

Government Management

Reorganization of US Agencies Looming?

President Obama recently announced a plan to move the National Oceanic and Atmospheric Administration (NOAA) — the US agency responsible for managing weather satellites, atmospheric sciences, and coastal and marine fisheries, and similar functions— from the Department of Commerce to the Department of the Interior (DOI), which is responsible for agencies dealing with the national parks system, public land management, fish and wildlife services, and biological and geological scientific research, among others. Proponents of the move argue that having NOAA in the DOI would be logical because of the overlap in many of the functions they perform. Lisa Brown, executive director of the Government Reform Initiative at the Office of Management and Budget said, "By consolidating NOAA into Interior, we will strengthen our stewardship and conservation efforts and enhance scientific resources." Some critics of the proposed move argue that given its many responsibilities and different sections, NOAA should become an independent agency altogether. NOAA comprises 60% of Commerce's budget, which gives it a certain amount of leverage and independence within Commerce that could be undermined if NOAA moves to DOI. Some conservation groups fear that potential conflicts may arise between the two agencies' mandates should the move take place. As Miyoko Sakashita, oceans director at the Center for Biological Diversity, argued, "Moving the agency that oversees the health of our oceans and sea life to the same agency that permits offshore drilling is courting trouble."

Tuna Photo credit: NOAA

Sources: Newspaper, press releases and agency releases

Endangered Species Act

Atlantic Sturgeon Listed Under the Endangered Species Act

Atlantic sturgeon Photo credit: NOAA

The National Marine Fisheries Service (NMFS) announced its final decision to list five distinct population segments of Atlantic sturgeon under the Endangered Species Act (ESA). The Chesapeake Bay, New York Bight, Carolina, and South Atlantic populations of Atlantic sturgeon will be listed as "endangered," while the Gulf of Maine population will be listed as "threatened." Once abundant in the wild, Atlantic sturgeon were vastly depleted in the late 19th century. Despite a decade-old ban on fishing Atlantic sturgeon, the fish continue to get caught accidentally in commercial gill nets. They are also hit by vessels, and their spawning habitats are disrupted due to dam blockages, dredging, etc. Both listings become effective April 6, 2012.

Sources: NOAA press releases

Read more: Moyer, G. R., J. A. Sweka, and D. L. Peterson. 2012. Past and present processes influencing genetic diversity and effective population size in a natural population of Atlantic sturgeon. Transactions of the American Fisheries Society 141:56-67.

AFS Policy Statement — #27 Conservation of Imperiled Species and Reauthorization of the Endangered Species Act of 1973: The ESA is one of the most influential environmental laws in existence. Its primary stated purpose is to prevent anthropogenic extinctions of species by conserving the ecosystems "upon which endangered species and threatened species depend." (fisheries.org/afs/docs/policy_27f.pdf)

Biodiversity

Pressures on Biodiversity Increasing

Olympic Coast National Marine Sanctuary Photo credit: NOAA

Some scientists from University of Copenhagen, and other European Union researchers, along with some policy experts who participated in a conference on biodiversity at the University of Copenhagen, concluded that conserving the world's species and ecosystems might be a larger and more imminent problem than mitigating the negative effects of global climate change. As Carsten Rahbek, Director for the Center for Macroecology, Evolution and Climate, University of Copenhagen, declared, "The biodiversity crisis – i.e., the rapid loss of species and the rapid degradation of ecosystems – is probably a greater threat than global climate change to the stability and prosperous future of mankind on Earth. There is a need for scientists, politicians, and government authorities to closely collaborate if we are to solve this crisis." Two prior unrelated studies lend further evidence that confirms this assessment. One study found that, whereas human-driven CO2 emissions will have serious long-term negative effects on species loss, massive land-use change occurring in tropical countries in the near future may cause even greater species loss and habitat destruction. The second study found that immediate preservation of plant biodiversity provides a crucial buffer to the negative effects of climate change and desertification in dry lands. Although estimates vary, approximately 30,000 species go extinct every year. According to the research presented at the Copenhagen meeting, five mass extinction events occurred over the course of the Earth's history – the last taking place over 65 million years ago. Some scientists conclude that we are presently in the midst of the world's sixth mass extinction event, which is caused by competition for the world's limited resources, and exacerbated by the negative effects of global warming that has already caused extreme habitat degradation and severe losses within ecosystems. Conference participants discussed the establishment and future work of the UN Intergovernmental Panel for Biodiversity and Ecosystem Services (IPBES). The IPBES will work with the Convention on Biodiversity and the UN Environment Programme on Biodiversity to help find solutions to the world's biodiversity problems.

Sources:
- news.ku.dk/all_news/2012/2012.1/biodiversity/
- plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.0050157
- and other news releases

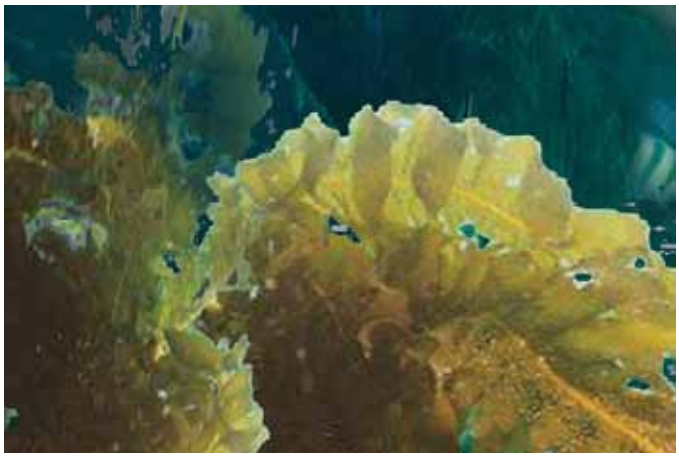
Read more: Meador, M. R., and D. M. Carlisle. 2009. Predictive models for fish assemblages in eastern U.S. streams: implications for assessing biodiversity. Transactions of the American Fisheries Society 138:725-740.

AFS Policy Statement — #29 Biodiversity: Although human-altered ecosystems are not inherently bad, we must recognize that many existing ones are not sustainable, nor are the human cultures and technologies they support. Without fundamental changes in policies and environmental ethics consistent with the above, biodiversity will continue to deteriorate. Fishery managers must begin to make that message clear. (fisheries.org/afs/docs/policy_29f.pdf)

Commercial Aquaculture

Invasive Seaweed Has Commercial Potential

Scientists affirmed that *Undaria pinnatifida (Undaria)* — also called Japanese kelp, a highly invasive form of seaweed classified as one of the top 100 global invasive species — is actually rich in iodine, calcium, iron, magnesium, potassium, amino acids, omega3, and antioxidants, which makes the seaweed attractive for its potential nutritional benefits. AUT University (Auckland University of Technology) researcher Lindsey White argues that *Undaria* should be cultivated commercially in New Zealand and marketed for its curative powers, as fish food, and as food for human consumption. "There are only a few places



Undaria pinnatifida (Undaria) Photo credit: Dan Kenan

in the world where *Undaria* is grown," said Dr. White. "There's already a $400 million market for *Undaria*, and [i]n 2001, China harvested about 802 million tonnes of *Undaria*. . . . If New Zealand can contribute even a little bit of that, it would be a positive contribution to our economy." Due to an increasing awareness of the seaweed's marketable attributes, New Zealand's Agriculture and Forest Ministry recently legalized commercial farming of the seaweed primarily in geographic areas where it already grows on and overtakes the multitude of mussel farm lines found in fisheries across the country. Mussel farmer Bruce Hearn welcomed the Ministry's recognition of the seaweed's commercial potential. "The rules were stupid in the first place when they said you couldn't farm it," argued Mr. Hearn, who found eight tons of the seaweed growing on his commercial mussel lines in this year alone. Now, instead of discarding the seaweed at harvest, or trying other methods of extermination, Mr. Hearn – and fisheries farmers – like him have the option to sell the *Undaria* for commercial import and export.

Sources:
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- msn.co.nz/technologynews/8405896/seaweed-biofuel-secrets-unlocked.
- stuff.co.nz/marlborough-express/news/6287511/Seaweed-farming-made-legal

Read more: Walker, A. B., and D. L. Berlinsky. 2011. Effects of partial replacement of fish meal protein by microalgae on growth, feed intake, and body composition of Atlantic cod. North American Journal of Aquaculture 73:76-83.

AFS Policy Statement — # 22 Commercial Aquaculture: The American Fisheries Society supports the continued development of commercial aquaculture as an important source of food, potential fisheries enhancement, and business opportunity. (fisheries.org/afs/docs/policy_22f.pdf)

Implementing Best Science Available

NOAA Deepwater Horizon Archive and Gulf Spill Restoration Websites

Oiled waste on the beach in Port Fourchon, Louisiana
Photo credit: NOAA

The National Oceanic and Atmospheric Administration's (NOAA) Deepwater Horizon Archive website houses enormous amounts of publicly released information relating to all the events before, during, and after the 2010 Deepwater Horizon Spill. Emergency responders, fishermen, and government officials used much of the archival data for the immediate emergency response to the 2010 Spill in the Gulf of Mexico. The Archive website contains various reports about all the events leading up to the Spill and its aftermath, scientific reports on the affected wildlife and ecosystems, and it provides a detailed history of the response and cleanup efforts undertaken by governments, private companies, and communities. "Good science underpins everything we do at NOAA, and our scientists worked tirelessly during the spill to monitor the oceans, coasts, and skies. Much of that mission-critical information is now available in this library," said Dr. Jane Lubchenco, NOAA Administrator. The website stores archives of oil trajectory forecasts, fishery closure, and opening maps, 129 reports on affected fish, marine mammals, reptiles, and birds, along with educational resources, videos, and fact sheets aimed at contributing to public awareness about the 2010 spill and how to respond to a similar future disaster. NOAA's Deepwater Horizon Archive works in conjunction with another NOAA website concerning all the Gulf Spill Restoration efforts that contain innumerous documents, fact and media releases, reports, videos, damage assessments, oil spill information, all with information concerning early, ongoing, and long-term Gulf restoration plans. The site also explains how to take part in the restoration planning process. NOAA's Deepwater Horizon Archive website is located at noaa.gov/deepwaterhorizon/ and NOAA's Gulf Spill Restoration website is located at gulfspillrestoration.noaa.gov/.

Sources: NOAA press releases and fact sheets

Read more: Cathcart, C. N., and E. M. Broder. 2011. Students' angle: the Gulf Oil — spill what it means to the Gulf and the future of fisheries biology students. Fisheries 36:36-37.

Shark Fin Ban

Outlawing the Shark Fin Trade

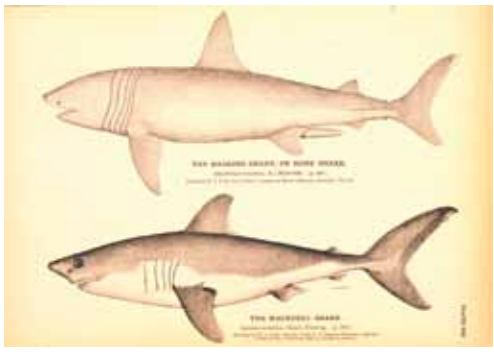


Figure from NOAA's Historic Fisheries Collection
Photo credit: NOAA

Virginia and Maryland are the first East Coast states to propose legislation completely banning the international shark fin trade. The desire for shark fins, a delicacy found in a Chinese soup that sells for $200 per bowl in the US, has led to the wholesale slaughter of tens of millions of sharks each year. In January 2012, Delegate Mark Sickles introduced a bill (HB 1159) before the Virginia General Assembly that would ban the shark fin trade throughout the state. A violation of the ban is a class 1 misdemeanor punishable by $2,500 and/or less than a year in jail. In February 2012, Maryland lawmakers followed suit by introducing legislation in both Maryland's House (HB 393) and Senate (SB 465) that would outlaw the sale, trade, distribution, or even possession of raw, dried, or processed shark fins. Penalties for violations of the ban are fines ranging from $5,000 for the first offense, and up to $50,000 for repeat offenders. The Shark Conservation Act of 2010, signed into federal law in 2011, prohibits any person from shark finning, otherwise known as cutting the fins off a shark at sea, and from possessing, transferring, and landing shark fins (including the tail) that are not "naturally attached to the corresponding carcass." However, federal law does not prohibit importation of shark fins into the US from other countries with laxer rules about shark finning. Beth Lowell, campaign director of Oceana, asserted, "The shark fin trade is driving some shark species to extinction." When Virginia's and Maryland's proposed legislation becomes state law, they will be joining Hawaii, Northern Mariana Islands, Guam, California, Washington, and Oregon – all states with similar laws.

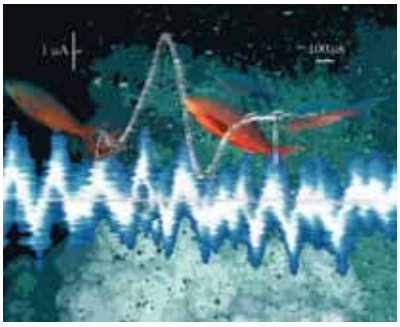
Sources:
- wildaid.org/news/state-virginia-proposes-shark-fin-ban
- oceana.org/en/news-media/press-center/press-releases/maryland-joins-east-coast-movement-to-ban-shark-fin-trade
- articles.baltimoresun.com/2012-02-02/features/bal-md-eyes-shark-fin-ban-20120202_1_shark-products-shark-fin-shark-species.

Read more: Walsh, W. A., K. A. Bigelow, and K. L. Sender. 2009. Decreases in shark catches and mortality in the Hawaii-based longline fishery as documented by fishery observers. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 1:270-282. DOI:10.1577/C09–003.1.

AFS Policy Statement — #31b Management of Sharks and Their Relatives (Elasmobranchii): The AFS encourages the development and implementation of management plans for sharks and rays in North America. Management practices including regulations . . . [that] should err on the side of the health of the resource rather than short-term economic gain. (fisheries.org/afs/docs/policy_31bf.pdf)

About AFS

Deep-Sea Fish Sounds in the Wild



Oceanic sound waves
Photo credit: Dan Kenan

Francis Juanes and Rodney Rountree, both University of Massachusetts-Amherst fish biologists—along with their fellow researchers—conducted the first survey in 50 years of deep-sea fish sounds, which includes the first evidence of sounds of fin, humpback, and pilot whales, dolphins, and at least 12 other sounds belonging to other species. Employing a simple deep-water hydrophone, the team recorded 24 hours of sounds from 2,237 feet below the North Atlantic. Previously, scientists failed to record deep-sea fish sounds in their natural habitat due to a dearth in scientifically adequate yet low-cost recording technology. "Our study was the first where we purposely went out and did that," said Rountree. Rountree, Juanes, and commercial fishermen collaborated to create the low-cost hydrophone. The recordings indicate that many deep-sea fish make sounds to communicate with each other, and different fish sounds possess distinctive meanings or functions. "We think work to describe underwater sounds is extremely valuable," explained Rountree. "The importance of sound in the ecology of both freshwater and marine systems is poorly understood." Juanes and Rountree also plan to conduct passive acoustic fish sound surveys in freshwater ponds, rivers in New England, and commercial fishing areas in the Gulf of Mexico. In so doing, they will gather more fish noises in order to definitively ascertain whether various aquatic species, found both in the ocean and freshwater, actually communicate with one another.

Sources:
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- umass.edu/newsoffice/newsreleases/articles/145365.php.
- msnbc.msn.com/id/46171218/ns/technology_and_science-science/t/deep-sea-fish-recordings-reveal-grunts-quacks/#.TziB-1Fsj8s.

Timothy Ramirez Appointed to the California Central Valley Flood Protection Board

On January 27, 2012, California Governor Edmund G. Brown Jr. appointed AFS member Timothy Ramirez, 45, to the Central Valley Flood Protection Board. Board members provide a vital public service – one that increased in importance after passage of the Central Valley Flood Protection Act of 2008 that required the Board to incorporate an integrative approach to flood management impacting the Board's entire decision-making process. The new, more holistic approach considers specific factors ranging from the Board's flood control responsibilities to issues of how environmental stewardship and sustainability should factor into the Board's planning process. "Native fishes have always been a factor to consider in flood management," said Ramirez. He noted that now that "the State is taking a more integrated approach to this planning, it is recognizing the benefits of improved flood management for Central Valley river ecosystems."

Sources:
- cvfpb.ca.gov/members/index.cfm
- gov.ca.gov/news.php?id=17392

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A New Employee at AFS

Kevin Lynch has joined the American Fisheries Society as the new Policy & Development Coordinator. Kevin has over 20 years of work experience in the private and public sectors, including stints at the US Department of Agriculture, US Department of Justice, US Department of Commerce, and Thomson Reuters. He most recently worked for the D.C. Lottery as a Sales Manager. In that capacity, he was responsible for managing a citywide territory of 450+ lottery agents and a team of Sales Coordinators. Kevin received his B.A. from Princeton University and a J.D. from Georgetown University. He resides in Rockville with his wife and two sons. He enjoys playing and watching sports, traveling, and spending time with family and friends. Kevin may be contacted at klynch@fisheries.org.

A Primer on Anti-Angling Philosophy and Its Relevance for Recreational Fisheries in Urbanized Societies

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Tara Teel

Department of Human Dimensions of Natural Resources, Colorado State University, Fort Collins, CO 80523-1480

ABSTRACT: *In some industrialized countries, recreational fishing has come under moral pressure. To understand potential ramifications, we first describe three dominant philosophies of human–animal interactions (i.e., animal welfare, animal liberation, and animal rights). We contend that, as long as fishing and handling practices are as fish friendly as possible, most animal welfare perspectives can easily accommodate recreational fishing in its present form. In contrast, animal liberation and animal rights philosophies tend to reject recreational fishing. On the hypothesis that economic development is conducive to the emergence of pro-animal values in the wider public, it can be assumed that anti-angling sentiments resonating strongly with animal liberation/rights thinking might increase. Examples from opinion surveys covering a range of countries show that about 25% of people already morally question recreational fishing for sport. Coupled with the supposed shift in pro-animal values, this public sentiment might foster the implementation of regulations similar to those already seen in some European countries, which are imposed to constrain popular recreational angling practices such as the use of live baitfish or the release of legally harvestable fish. Increasing anti-angling sentiments bolstered with arguments from animal liberation and rights can thus have far-reaching consequences for recreational fisheries.*

El abecé de la filosofía de la no-pesca con línea y su relevancia para la pesca recreativa en sociedades urbanizadas

RESUMEN: *en algunos paises industrializados, la pesca recreativa se ha topado con presiones de índole moral. Para comprender las potenciales implicaciones de esto, en el presente trabajo se describen tres filosofías dominantes acerca de la interacción animal-humano (i.e. bienestar animal, liberación animal y derechos de los animales). Sostenemos que a medida que las prácticas de pesca y manipulación de organismos sean tan amigables hacia los peces como sea posible, la mayoría de las posturas con respecto al bienestar de los animales pueden fácilmente dar cabida a la pesca recreativa tal y como se lleva a cabo hasta ahora. Por el contrario, las filosofías de liberación animal y de los derechos de los animales, tienden a rechazar la pesca recreativa. Bajo la hipótesis de que el desarrollo económico conlleva la generación de valores en pro de los animales por parte del público, puede asumirse que los sentimientos que van en contra de la pesca con línea, típicos del pensamiento de liberación/derechos animales, pudieran incrementarse. Se exponen ejemplos basados en sondeos de opinión aplicados en diversos pueblos, que muestran que cerca del 25% de la gente ya se cuestiona sobre la moralidad de la pesca recreativa como actividad deportiva. En paralelo al supuesto cambio hacia los valores en pro de los animales, este sentimiento público pudiera fomentar la implementación de regulaciones similares a las observadas en algunos lugares de Europa; regulaciones que se imponen para limitar las prácticas populares de pesca recreativa tales como el uso de carnada viva o la liberación de peces legalmente pescables. Por lo tanto, el aumento en la expresión de los sentimientos en contra de la pesca con línea, reforzados con los argumentos relacionados a la liberación y los derechos de los animales, pueden tener consecuencias muy importantes para las pesquerías recreativas.*

INTRODUCTION

In the last two decades there has been a distinct increase in the moral debate concerning recreational fishing (reviewed by Arlinghaus 2008; Arlinghaus and Schwab 2011). The two most frequently voiced objections to recreational fishing are that (1) the pursuit of fish is not a life-supporting necessity for the angler in the developed world; and (2) the angler causes pain and suffering to fish as sentient beings. As to the first issue, almost all human activities can be questioned on the basis of necessity, because necessity is mainly about values. Yet for this very reason a solution to this question is outside the scope of natural science. In contrast, the issue of pain and suffering in fish is amenable to scientific analysis (Arlinghaus et al. 2009). There has recently been a spate of high-profile papers suggesting that

nociception—coupled with advanced levels of consciousness and therefore pain perception and the ability to suffer in a mammalian sense—is indeed a plausible concept in fish (Chandroo et al. 2004; Huntingford et al. 2006; Sneddon 2006, 2009; Braithwaite 2010). Such science proves useful for those advocacy groups who assure the public that "fish have feelings, too" (one of the slogans of People for the Ethical Treatment of Animals [PETA]). If one accepts the assumption that fish can feel pain consciously, or are capable of suffering, and if one believes that avoidance of suffering is a key ethical goal, then the practice of recreational fishing may be perceived as cruel (de Leeuw 1996; Balon 2000; Olsen 2003). Recreational fishing becomes morally even more unacceptable if a second ethical perspective is added: that one shall not intentionally play with food for unjustified reasons (the necessity argument; Aas et al. 2002). If these two moral aspects merge, the ethical pressure on recreational fishing is strong enough to justify constraints on popular practices or even the banning of some of them (Arlinghaus et al. 2009).

Society defines its moral norms depending on the contemporary zeitgeist, which usually changes over time. It seems that in many contemporary societies, wildlife- and animal-related social values and norms are in flux, moving toward perspectives that are less supportive of the toleration of recreational fishing and hunting or other human uses of animals (e.g., research with animals) in their traditional forms. Indeed, some industrialized societies have already experienced bans on popular recreational fishing practices such as tournament fishing involving total catch and release (Meinelt et al. 2008), use of live baitfish (Berg and Rösch 1998), or voluntary catch-and-release fishing of legally harvestable fish (Arlinghaus 2007), based on the argument that the degree of pain and suffering caused to the fish is not justified if it is only captured for the angler's pleasure. But these developments may be perceived by those who object to recreational angling on moral grounds as only intermediate steps. Indeed, abolition of recreational fishing might be the ultimate goal, as has been suggested by the agendas of certain established European political parties or advocacy groups (e.g., PETA). These views enjoy enormous political support in some countries, and animal protection concerns related to recreational fishing have thus entered political agenda in some regions of the urbanized world.

Moral censure of recreational fishing usually evokes a defensive reaction from those who happen to fish recreationally or depend on recreational fishing for survival (e.g., recreational fishing industry). Arguments may be put forward on either a general or a very specific level. On a general level, one could plausibly argue that recreational fishing, like American football, cruising with pleasure cars, cross-country running, parachuting, and countless other leisure activities in affluent societies, is unrelated to human survival needs; yet such practices produce social and economic benefits of considerable magnitude, worth enough in themselves to justify the activity. In addition, recreational fishing, like recreational hunting, is of social worth inasmuch as it also produces ecological benefits by protecting and enhancing wild fish stocks (LaChat 1996; Rose 2007). Such perspectives, however, cannot entirely discount the issue of intentional infliction of pain and suffering on fish; if this is thought as highly undesirable and the benefits of recreational fishing are not considered to be important enough, the jury might still vote against recreational fishing.

On a specific level, the reaction to the threat of constraining recreational fishing on moral grounds may be to question the validity of the arguments voiced by those with radical anti-angling viewpoints (Herzog 1993; LaChat 1996). One could claim that fish lack the capacity for pain and suffering (Rose 2002, 2003, 2007; Newby and Stevens 2008a, 2008b) and argue that if there is no ability to experience pain or to suffer, then there cannot be cruelty; this dispenses with cruelty as a moral concern. But one needs to consider that there is a strong case made for the view that fish feel pain and that this view enjoys considerable support in parts of the scientific community (e.g., Braithwaite 2010). Even though the evidence is still inconclusive and indeed questioned by some (e.g., Rose 2007), one could always bring forward the "benefit-of-the-doubt" argument, which holds that in the face of scientific uncertainty one should treat fish as if they would experience pain in a similar way to humans (Sneddon 2006). The alternative perspective is that, given the fact that the "fish feel pain" hypothesis is by no means universally accepted (e.g., Rose 2007; Arlinghaus et al. 2009), restrictions on fishing practices based on acceptance of it seem unjustified and questionable.

A comprehensive analysis of the background, history, and future of opposition to recreational angling will help to understand the underlying debate and foresee potential consequences for recreational fishing. We attempt to present such an analysis in the present article by reviewing the emerging hypothesis on increasing anti-angling sentiment in postindustrialized, highly urbanized countries and by putting this hypothesis into the context of philosophical standpoints related to human use of animals. We then review the opinions of the public in certain countries on the morality of recreational fishing and give examples of how pro-animal social norms may influence the acceptability of certain recreational fishery practices. We end by outlining some management and policy implications.

THE HISTORICAL AND ACADEMIC PHILOSOPHICAL CONTEXT

The first fishing hooks date back c. 50,000 years, whereas the systematic questioning of animal use, which in more recent years has come to include concerns about fishing practices (e.g., Webster 2005; Arlinghaus et al. 2009), is hardly 50 years old (Fraser 2008). Today we can distinguish three different lines of philosophical argument in the context of human use of animals, each with different implications for recreational fishing. A brief review of these three standpoints follows to provide the needed context (see Arlinghaus, Cooke, Lyman, et al. [2007]; Arlinghaus, Cooke, Schwab, et al. [2007]; Arlinghaus et al. [2009]; and Arlinghaus and Schwab [2011] for details).

Animal welfare in philosophical usage holds that the use

of animals is morally acceptable in principle. This perspective, however, also entails the moral obligation to care for animals, to prevent cruelty, to reduce suffering, and to look critically at how animals are used. Animal welfare ideas originate from a range of philosophical backgrounds; this makes it challenging to demarcate their origin clearly. Irrespective of the origin, all who subscribe to an animal welfare view agree that animals may be used for human ends, but this always entails an obligation to attend to the well-being of animals (Table 1).With regard to recreational fishing, this means that almost all practices are considered acceptable as long as the fisher cares for the welfare of the fish in the capture process; for example, using suitable handling or holding methods when fish are captured and released or when they are held prior to consumption or to facilitate a rapid kill (Cooke and Sneddon 2007; Arlinghaus et al. 2009). This line of argument resonates strongly with common sense, but we should be aware that the phrase "animal welfare" is often used loosely and may also entail ideas that, strictly speaking, belong in the philosophical origin of animal liberation or animal rights (as described in more detail next).

Animal liberation, the philosophy and movement "invented" by Peter Singer (1990), offers a radically different perspective (Table 1; Arlinghaus and Schwab 2011). It rests on two pillars: suffering and speciesism. According to Singer, the capacity to suffer means that a being has interests, and equal suffering signifies equal interests, as well as equal moral consideration. The second pillar, speciesism, "is a prejudice or attitude of bias in favour of the interests of members of one's own species and against those of members of other species" (Singer 1990, p. 6). Like racism and sexism, speciesism must be "condemned" (Singer 1990, p. 6). Thus, moral choices must not be based on species membership.

TABLE 1. Implications of animal welfare, animal liberation, and animal rights concepts for the socially accepted interaction of humans with fish. Animal liberation information is derived from Singer (1990) and animal rights from Regan (1983); animal welfare information is taken from several different sources. What is shown here is a pragmatic animal welfare approach based on the idea that recreational fishing is a legitimate human activity in principle (Arlinghaus et al. 2009); animal welfare is nevertheless important in terms of shaping how recreational fishing is conducted to minimize potential welfare impairments. (Modified from Arlinghaus, Cooke, Lyman, et al. 2007; Arlinghaus et al. 2009.) Footnotes highlight some areas for improved fish welfare.

	Animal welfare	Animal liberation	Animal rights
Fish have intrinsic value	Unclear	No	Yes
Fish have rights	No	No	Yes
Duties to fish	Yes	Yes	Yes
Catch, kill, and eat	Yes[a]	No	No
Regulatory catch and release	Yes[b]	No	No
Voluntary catch and release	Yes[b]	No	No
Fisheries management	Yes[c]	No	No
Use of animals (food, work, manufacture, pleasure, science)	Yes[d]	No	No

[a]Rapid killing process is advisable (Davie and Kopf 2006).
[b]Preferred action is adoption of practices that reduce welfare impairments; for example, through appropriate choice of gear and handling (Arlinghaus, Cooke, Lyman, et al. 2007; Cooke and Sneddon 2007; Arlinghaus 2008; European Inland Fishery Advisory Commission 2008).
[c]Best practice would demand promoting methods with the least possible welfare impact; e.g. in the context of stocking (European Inland Fisheries Advisory Commission 2008).
[d]For example, in science, following national research protocols for animal care is demanded.

Singer believes that fish feel pain (Singer 2010) and he takes a dim view of anglers, as this quotation shows: "Surely it is only because fish do not yelp or whimper in a way that we can hear that otherwise decent people can think it a pleasant way of spending an afternoon to sit by the water dangling a hook while previously caught fish die slowly beside them" (Singer 1990, p. 172). Animal liberation is in the philosophical tradition of utilitarianism. Utilitarianism focuses on the consequences of actions. An action is right when it brings about more pleasure than pain—there is thus no right or wrong, good or bad, as such; it all depends on the benefit–cost trade-off in terms of pleasure versus pain. Therefore, recreational angling might be perceived as good or bad depending on how one judges the benefits it provides (mainly pleasure to humans) versus the costs it produces (mainly pain for fish). In principle this leaves a back door open to allow for recreational fishing. In practice, however, it certainly has no place as far as ardent anti-anglers—inspired by Singer's philosophy—or by Singer himself—are concerned.

For some scientists in the field of fish and fisheries, pain and suffering of fish are central ethical concerns. Their reasons for focusing on pain and suffering might be completely different from those of Singer; the practical consequences, however, can be very similar (Arlinghaus, Cooke, Lyman, et al. 2007; Arlinghaus et al. 2009). For example, after examining the evidence for pain and suffering in fish and concluding that fish probably can experience these mental states, the German animal behavior scientist Würbel (2007) stated that whether angling as an activity conducted for pleasure is to be further tolerated must be renegotiated. The Brazilian fish biologist Volpato (2009) expressed the resulting conclusion more explicitly by saying that "the imposition of discomfort in activities solely for human pleasure (e.g., recreational fishing and aquarism) is unacceptable, and Webster (2005) judged that a catch-and-release event would traumatize an individual fish to such a degree that for fish "welfare" reasons it would be better to kill the fish rather than to preserve its life by releasing it.

Peter Singer is hailed as "the father of animal rights," but although he frequently uses the term, he does not believe in rights. Singer understands the notion of rights merely as a "convenient political shorthand" in "the era of thirty-second TV news clips" (Singer 1990, p. 8). In colloquial use, however, "animal rights" denotes both animal liberation and animal rights, and we also use the term here to cover both meanings, except where we talk specifically about one or the other, because the consequences of animal liberation and animal rights philosophies tend to be identical for recreational fisheries practice despite the fact that they have different philosophical origins (Table 1).

The most influential animal rights philosopher is Tom Regan. In his groundbreaking book *The Case for Animal Rights,* Regan (1983) distinguishes between moral agents and moral patients. The moral agent is the normal human adult who is

able to make informed, rational moral decisions. A moral patient, on the other hand, does not possess the necessary mental faculties for moral decisions. Human (e.g., baby) and animal moral patients are incapable of right or wrong actions; they can only be at the receiving end of moral decisions (Regan 1983). A common quality of moral agents and patients is that they are "subjects-of-a-life," and this quality entitles them to the right not to be harmed (Regan 1983). The subject-of-a-life criterion is fulfilled when a number of individual requirements are met, such as the ability to develop and express higher-order mental states (e.g., beliefs, desires, perception, memory, a sense of the future, emotional life, ability to initiate action, psychophysical identity over time) and to experience individual welfare (Regan 1983). In recent years some of these "higher-order" mental states have also been attributed (at least casually) to fish by some contemporary fish behavioral biologists and fish neurobiologists (e.g., Chandroo et al. 2004; Huntingford et al. 2006; Sneddon 2006, 2009; Braithwaite 2010). Of course, scientists have to use available words and concepts to talk about the cognitive abilities of fish, so the overlapping of words on the part of some contemporary fish biologists with the subject-of-a-life criterion is probably coincidental. Rose (2007) and Arlinghaus et al. (2009) have nevertheless argued against the uncritical attribution of concepts from human psychology to fish because many concepts lack construct validity and are not proven. Whether or not these concepts are valid is not too important to Regan in the context of judging the morality of recreational fishing: "Even assuming birds and fish are not subjects-of-a-life, to allow their recreational or economic exploitation is to encourage the formation of habits and practices that lead to the violation of the rights of animals who are subjects-of-a-life" (Regan 1983, p. 417). Any recreational use of fish is therefore out of the question for Regan-style animal rights philosophers (Table 1), not because of the ability of fish to feel pain or suffer per se but because of the violation of their rights.

Because of their uncompromising consequences for recreational fishing, both animal liberations in the spirit of Singer and animal rights in the nature of Regan can be classified as anti-angling perspectives (Arlinghaus 2008; Arlinghaus and Schwab 2011). Animal liberation and animal rights ideas have enjoyed enormous popularity in the last two decades. Both Singer and Regan are contemporary philosophers whose writings have influenced hundreds of other writers who promote pro-animal ideas in universities and up to the highest political levels: national governments, bioethics committees, international organizations, and commissions advising policy makers on pertinent issues involving human–animal interaction. In this way, academic philosophy sooner or later helps to shape the regulations concerning the use of animals; further evidence for this assertion will be seen below.

ARE THE MORAL NORMS RELATED TO THE USE OF WILDLIFE AND FISH CHANGING ACROSS THE GLOBE?

How are society's views on animal use changing over time, and how much is the change influenced by elements of one or more of the three philosophies outlined above? In past centuries, concern for animal well-being was confined to literate and political elites, not least because the individuals in question were socially and economically in a position to be involved in such matters. In the last 50 years concern for animals found a broader base because it became part of the environmental and social reform movement (Fraser 2008) and because more and more people could afford to be concerned. We think that it is no coincidence that concern for the welfare of animals is thriving in the most developed and affluent Western societies (initially in European countries such as Germany, the UK, Switzerland, Norway, The Netherlands, and, more recently, in the United States). To dismiss affluence as a decisive factor in the degree and intensity of public concern for animals, including fish, as Lawrence (2008) seems to suggest, would mean to ignore a substantial part of past and present reality. Affluence is certainly not the only precondition, but it is an important one when considering how animal (including fish) welfare is perceived by the wider public. In light of these developments, one can predict that in affluent societies moral pressure on recreational anglers and hunters will increase and social acceptance of these activities will probably decrease.

To investigate scientifically whether—and in what ways—views on wildlife (including fish) may be changing over time with urbanization and industrialization, Manfredo and Teel (Teel et al. 2005; Manfredo 2008; Manfredo et al. 2009) have introduced a social–psychological classification scheme based on the concept of "wildlife value orientations." This framework consists of cognitive networks of basic beliefs that are organized around values and provide contextual meaning to those values in relation to wildlife. Wildlife value orientations are assumed to play an important role in explaining individual variation in wildlife-related behavior and attitudes. A survey-based application of this concept in the U.S. public identified two main orientations: (1) a utilitarian wildlife value orientation (recently relabeled "domination"; Manfredo et al. 2009), representing a view that wildlife should be used and managed primarily for human benefit; and (2) a mutualism wildlife value orientation, viewing wildlife as capable of relationships of trust with humans, as if part of an extended family, and as deserving of rights and caring. (Note that the term "utilitarian" in this context is not to be confused with the philosophical notion of utilitarianism as used by Singer [1990]; see previous section.) Those with a strong mutualist orientation are more likely to engage in welfare-enhancing behaviors toward fish and wildlife and less likely to support actions and practices resulting in death or harm to fish and wildlife (Manfredo 2008). Mutualists are also more likely to view fish and wildlife in human terms, with human personalities and characteristics—a person-related trait also known as "anthropomorphism." In contrast, those with a strong utilitarian/domination orientation are more likely to prioritize the human well-being over fish and wildlife in their attitudes and behaviors (Manfredo 2008). They are also more likely to find justification for treatment of fish and wildlife in utilitarian terms and to rate actions that result in death or harm to fish and wildlife as acceptable. Wildlife value orientations have proven effective in explaining considerable variation in

attitudes toward hunting and fishing, as well as actual participation in these activities (Fulton et al. 1996; Teel et al. 2005; C. Riepe and R. Arlinghaus unpublished data). Those with a utilitarian orientation are more supportive and more likely to engage in hunting and fishing than those with a mutualist view of the wildlife resource. Value orientations have also been shown to be important predictors of anglers' normative beliefs about stewardship behavior (Bruskotter and Fulton 2008).

Because wildlife value orientations have been shown to help explain the attitudes and behaviors of humans, their impetus for the social acceptability of recreational fishing is worth examining in light of the supposed shifts in values in industrialized societies. Manfredo (2008) and Manfredo et al. (2009) have argued that an intergenerational shift from utilitarian to mutualist wildlife value orientations is already occurring in the United States, and probably also in other modern societies, in response to societal changes that have impacted the living conditions in which today's generation is being brought up. This shift is tied to an increase in economic productivity, which has lessened the importance of subsistence needs and elevated the emphasis on self-realization. This changing need structure in affluent societies, influenced by the human's intrinsic tendency to anthropomorphize—that is, to ascribe human traits to wildlife, including fish—sees wildlife emerging no longer as simply a food source or threat to human safety but as a potential source of companionship and as part of one's social group. In addition, urbanization has created a context in which people interact less directly with wildlife (and are therefore less likely to be exposed to dangerous encounter situations or to engage in hunting or fishing), which results in an increasing alienation of large parts of society from direct contact with nature and animals (Miller 2005). Therefore, learning about wildlife occurs largely through media and other social mechanisms rather than through direct experience. Together with the spread of computer games and mass communication these developments have resulted in a loss of interest in direct interaction with nature and wildlife ("videophilia"; Pergams and Zaradic 2006).

Societal-level changes in modern life have thus provided the impetus for a rise in mutualist views toward wildlife and contributed to a social environment much less tolerant of traditional activities of consumptive interaction between humans and wildlife, such as recreational fishing and hunting. In support of this hypothesis, Manfredo et al. (2009) conducted an analysis using data from a 19-state study in the United States revealing a strong relationship between state-level modernization variables (i.e., income, education, urbanization) and wildlife value orientations. An example of their findings is shown in Figure 1, which depicts a strong linear relationship between the percentage of mutualists in a state and the number of people residing in urban areas. Though longitudinal data will be needed to explore this issue more fully, the findings are consistent with the notion that urbanization and other modernization factors may be contributing to a societal-level shift in human value orientations regarding wildlife and fish in the United States and possibly elsewhere in postindustrialized countries (Manfredo et al. 2003, 2009). Given the documented relationship between wildlife value orientations and wildlife-related attitudes and behaviors, a continuation of past trends could result in a sustained increase in anti-angling and anti-hunting attitudes in the United States, because mutualists share values and attitudes similar to animal liberation and animal rights philosophies, largely opposing the extractive use of wildlife and fish (Manfredo et al. 2003; see also Table 1 and previous section). There is some evidence that this rise in opposition to traditional forms of recreation has already occurred and is influencing the public's views and consequent actions against hunting and fishing in the United States. For example, Minnis (1998) reported that prior to 1972 there was just one anti-hunting/anti-trapping ballot initiative in the United States. In the 1990s, however, 14 initiatives were brought forward, of which 9 passed. In addition, Organ and Fritzell (2000) found that an increasing number of students with anti-hunting attitudes have been attracted to university courses in wildlife management in recent years. Also consistent with the value orientation shift discussed here in the context of recreational fishing, Kellert (1976), in a review of American newspaper accounts between 1900 and 1976, documented a decrease in utilitarian attitudes toward wildlife. This trend is also reflected in declining numbers of people engaged in consumptive outdoor recreational activities such as hunting and recreational fishing in much of North America (Gray et al. 2003; U.S. Fish and Wildlife Service 2006). These changes in societal thought and behavior, should they continue, will probably have an impact on future social acceptance of recreational fishing (or some of its practices, such as tournament fishing) in the United States and other modern countries.

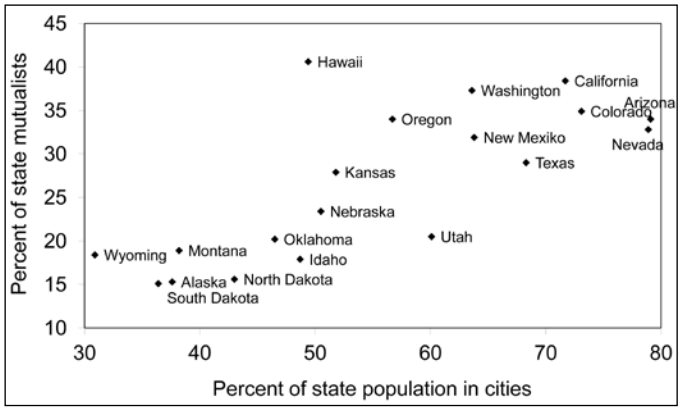

Figure 1. Percentage mutualists by urbanization across U.S. states (modified from Teel et al. 2005).

HOW DO CONTEMPORARY SOCIETIES VIEW THE USE OF FISH COMPARED TO THE USE OF OTHER ANIMALS?

Though the philosophies of animal welfare, liberation, and rights may be a useful way of classifying philosophical positions about animal use (Table 1), they may not distinguish the public's values as neatly as we suppose. Rather, individual viewpoints regarding the treatment of animals, including fish, fall somewhere between animal welfare and animal rights positions (Signal and Taylor 2006; Hutchins 2007), whereas elements of the animal liberation position seem to merge conceptually into the rights ideology. For example, when members of the animal

rights community assessed themselves on a rating scale as adhering either to a typical animal welfare position or to a more radical animal rights position, Signal and Taylor (2006) found that those tending toward the rights position held significantly stronger protectionist attitudes toward the treatment of animals than those on the welfare side of the continuum. In addition, all members of the animal rights community taken together, regardless of their philosophical orientation, tended to hold more protectionist attitudes toward animals than the general population. Indeed, getting involved with the animal rights movement often entails a more extreme stance (Herzog 1993). According to a recent survey among U.S. residents (Responsive Management and the National Shooting Sports Foundation 2008), however, the general population is far more willing to endorse the animal welfare than the animal rights position.

Not only is there a wide range of attitudes regarding animal treatment, but these attitudes often have a specific context (e.g., species related). For example, it has been found that using animals in education or medical research is more acceptable to most members of society than using them in product-testing research or for manufacture of clothing (e.g., fur coats). In addition, the nonlethal use of animals, as in dog shows or horse racing, tends to be more acceptable than using animals in a way that will cause severe injuries or death, as in dog fighting, bull fighting, hunting, or fishing (Driscoll 1992, 1995; Wells and Hepper 1997; Wuensch and Poteat 1998). The acceptability of various forms of hunting and fishing is also dependent on the underlying motives of the hunter/fisher and the methods used in the chase (e.g., consumptive motives like hunting for meat are more accepted than nonconsumptive motives such as hunting for sport; Kellert 1996; Responsive Management and the National Shooting Sports Foundation 2008). Studies of recreational fishing have produced similar results (see below).

The context-specific nature of attitudes regarding treatment of animals is also evidenced by differences across the types of animals under consideration. For example, it is considered more acceptable to use small rodents or invertebrates in animal research than it is to use dogs, cats, or nonhuman primates. Along a sociozoological continuum (Sandøe and Christiansen 2008), fish have been found to fall somewhere between cats and monkeys, on the one hand, and cockroaches and leeches on the other (Driscoll 1992; Hagelin et al. 2003). Similarly, when investigating the extent to which humans assign a wide array of mental capacities such as intention, morality, pain, or suffering to a variety of animals, fish were consistently reported to rank in the middle or at the bottom of the list of animals (Eddy et al. 1993; Rasmussen et al. 1993; Herzog and Galvin 1997). These lists basically reflected the phylogenetic order of animals. In a recent study from Germany (Riepe and Arlinghaus 2012), a similar pattern was observed, but 66% of over 1,000 randomly surveyed residents believed that a trout could feel pain, and 48% believed that a trout could suffer. Using a slightly different approach, with respondents judging 33 animals along six evaluative dimensions (e.g., useful vs. useless, lovable vs. unlovable), Driscoll (1995) identified three major clusters of animals with ratings that were consistently less reflective of biological taxonomy and more of the role the animals play in human life. For instance, trout were allocated to the same cluster as chickens and earthworms, all of which are useful to humans (e.g., food, improving the soil), whereas sharks joined mosquitoes and rats in another cluster of animals perceived as dangerous, not very useful, and not very lovable either.

Thus, the type of animal under consideration, along with its perceived characteristics and usefulness to humans, is an important determinant of attitude variability within society. It is important to make a distinction between the characteristics of the animal (e.g., whether or not it is perceived as valuable) and the attribution of human characteristics to animals (e.g., whether animals are perceived to be capable of moral reasoning). Both can strongly influence how humans feel about the use of animals. Anthropomorphic thinking is a person-related trait that is believed to have evolved naturally in the human species to facilitate hunting abilities (Kennedy 1992; Mithen 1996; Manfredo 2008). The tendency toward anthropomorphic thinking is generally expressed in a way that promotes a sense of social connectedness with, and caring for, animals (Katcher and Wilkins 1993; Serpell 2003; Vining 2003).

Anthropomorphism is highly correlated with the perception of similarity between humans and animals. The more humans perceive an animal as similar to themselves or to humans in general, the more they tend to assign cognitive abilities or the capacity to experience pain to that animal and the more uncomfortable they feel at the thought of using the animal for food (Eddy et al. 1993; Plous 1993). Thus, it is no surprise that there is a "tendency for people to feel more sympathy for mammals than for fish and birds" (Pallotta 2008, p. 162). Anthropomorphism and perceived similarity between humans and animals have been found to be positively correlated with attitudes toward animal rights (Wuensch et al. 1991), priorities for saving endangered species (Plous 1993), and pro-animal welfare attitudes (Herzog and Galvin 1997), whereas a negative relationship was demonstrated as regards support for other types of animal use (Knight et al. 2004). Because not all people attribute the same characteristics to the same type of animal to the same degree, there is systematic between-subject variance in this trait (Herzog and Galvin 1997), and thus between-individual variance in the degree of anthropomorphism is to be expected.

From the above one can hypothesize that the more a fish or a fish species is perceived to exhibit mental and cognitive abilities similar to those of humans, and the more it is thought of as useful and likeable, the more negative the attitude of the public toward practices that interfere with the welfare of the individual fish will be. So far, fish have been found to be offered less "moral protection" than other species of wildlife or pets or charismatic mammals in most social–psychological studies conducted on this topic. This, however, does not mean that the treatment of fish in the context of recreational fishing is any less relevant to the public than, say, hunting of charismatic mammals, as the following discussion will show.

ATTITUDES OF THE PUBLIC TOWARD RECREATIONAL FISHING IN VARIOUS URBANIZED SOCIETIES

The background reviewed so far is of particular relevance if it affects the attitudes of the public toward recreational fisheries. This can best be revealed by looking at recent surveys about how the public thinks and feels about recreational fishing and selected practices, such as catch and release, that have come under increasing scrutiny by those who are keen advocates of protecting the welfare of fish against humans in light of the hypothesis that fish may suffer in the process of fishing (de Leeuw 1996; Balon 2000; Huntingford et al. 2006). Unfortunately, most of this research is cross-sectional and lacks a longitudinal perspective. But looking at the beliefs and attitudes prevalent in different countries on the subject of fishing can still be helpful, illustrating how anti-angling attitudes influenced by animal liberation and animal rights philosophies are established in many postindustrialized societies worldwide. The results (shown below) from the most important survey-based studies conducted in various industrialized countries provide empirical evidence.

Austria

A majority (>50%) of 722 randomly selected non-anglers surveyed by telephone in Austria agreed that recreational fishing is a reasonable and healthy leisure activity, providing an important contribution to the conservation of aquatic ecosystems (Kohl 2000). About a fifth (22%) of respondents, however, agreed with the statement that "recreational fishing constitutes cruelty to animals." Similarly, about one fifth thought that recreational fishing disturbs the ecological balance and that recreational anglers do not care enough about nature and are only interested in an abundant fish harvest.

Germany

There are two recent studies looking at how recreational fishing is perceived by the German public. In 2002, 57% of a random sample of 323 telephone-interviewed people agreed that recreational fishing is a reasonable leisure activity, whereas 21% disagreed (Arlinghaus 2004). In 2008, however, the percentage of people agreeing with the idea that recreational fishing is a reasonable activity dropped to 35% in a study involving face-to-face interviews with over 1,000 randomly selected German residents (Riepe and Arlinghaus 2012). In 2002, 26% indicated that recreational fishing should be constrained in its scope, and 27% felt that recreational fishing means unnecessary cruelty to animals (Arlinghaus 2004). Figures from 2008 mirrored these findings (Riepe and Arlinghaus 2012). In addition, in 2008 a third (35%) of respondents agreed with the statements that "fish are suffering unnecessarily due to recreational anglers" and that "catching and releasing fish during recreational fishing constitutes unnecessary cruelty to animals." Almost one fifth of the German public (19%) agreed with the statement that "recreational fishing should be abolished because of anglers' cruelty to animals" and 15% indicated that they would take part in a ballot on banning recreational fishing. Finally, about a quarter (26%) thought that there is a pressing need to improve issues of animal welfare in Germany, despite recreational fishing being already heavily constrained and regulated for animal welfare reasons (Arlinghaus 2007).

The 2008 study by Riepe and Arlinghaus (2012) also showed interesting patterns relating to the perceived morality of selected recreational fishing practices. Most people (61%) found recreational fishing with the intention of eating the fish morally acceptable, but 10% found catch-and-eat fishing to be immoral. When asked about the morality of selected fishing practices from a fish welfare perspective, perceptions varied depending on which angling practice was under consideration (Figure 2). Though only about 20–30% of the public regarded retention of fish in keep nets, stocking bodies of water with harvestable fish for immediate capture by anglers (put-and-take fishing), and voluntary catch and release of harvestable fish as immoral, for other practices the respective figures were as follows: 57% for use of live baitfish, 65% for non-harvest-oriented competitive fishing events, and 87% for killing fish by hypoxia (rather than rapid kill; see Davie and Kopf 2006). The public was also asked in the 2008 survey to evaluate various types of catch-and-release practices. Twenty-one percent of those surveyed considered selective harvesting with voluntary catch and release to be immoral, and 40% felt that total catch and release was unethical. The results as a whole showed that recreational fishing and some of its practices are viewed negatively by a large proportion of German society, which might explain in part why recreational fishing in this country is already so heavily regulated in favor of animal welfare (Arlinghaus 2007).

England and Wales

Simpson and Mawle (2005) compared surveys from three time periods (2005, 2001, and 1997) in England and Wales, reporting that across all time periods most people viewed recreational fishing positively. For example, in 2005 71% (73%, 2001; 75%, 1997) agreed with the statement that "angling is an acceptable pastime." Close to a majority (53, 46, and 54%) agreed with the statement that "anglers care for the environment." There was less certainty among the public about whether "angling is a cruel pastime." About a quarter (24, 24, and 27%) agreed with this statement, around half (47, 52, and

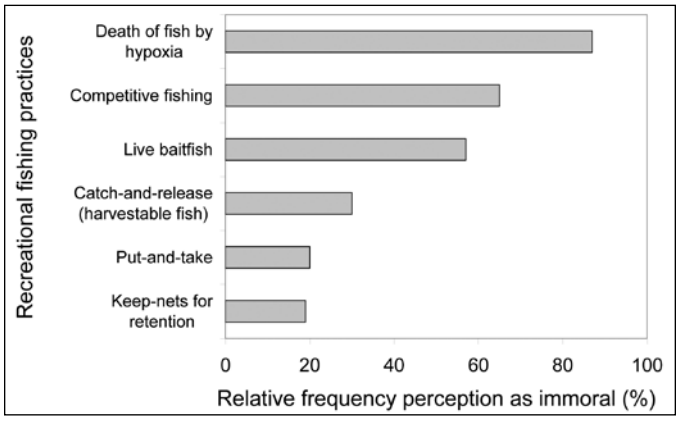

Figure 2. Percentage of the public aged 14 and older in Germany perceiving selected recreational fishing practices as somewhat or very unacceptable. Data are from 1,042 randomly selected people resident in Germany surveyed in 2008 (Riepe and Arlinghaus 2012).

52%) disagreed, and 26% (24% and 18%) were indifferent. Results reported by Simpson and Mawle (2005) suggested that young people (12–16 years old) still hold positive attitudes toward fishing in general, though less positive than those of adults (and less positive in 2005 than in 2001).

Finland

Recreational fishing is very popular in Finland, with participation rates at about 40% of the population (Toivonen 2008). From a fish welfare perspective, public discussion has mainly taken place on the topic of voluntary catch and release of legally harvestable fish. Mikkola and Yrjölä (2003) conducted a survey of 2,371 Finnish residents, of whom 43% were anglers. About 50% of all respondents, as well as half of all non-angling recreational fishers (i.e., those employing gill nets rather than rod and reel) included in the sample believed that catch and release constitutes unnecessary harassment of fish, and 20% of all recreational anglers responding to the survey thought that voluntary catch and release of legally harvestable fish should be forbidden (Mikkola and Yrjölä 2003). About half of all non-angling fishers thought that there should be a ban on catch and release. This negative image of catch-and-release fishing probably reflects the tradition in Finland of subsistence-type fishing (Salmi and Ratamäki 2011). Indeed, only 30% of Finnish anglers practice voluntary release of some fish, and only 4% release all of the fish they capture (total catch and release).

United States

Of the countries represented here, recreational fishing participation in the United States ranks second after Finland in terms of numbers of people involved. Despite recent declines in recreational fishing (U.S. Fish and Wildlife Service 2006), the activity remains highly visible in public and political discourse and is regularly featured in the media. It therefore comes as no surprise that about 90% of Americans approve of legal fishing and support using fish for food (Driscoll 1995; Phillips and McCulloch 2005; T. Teel and M. J. Manfredo, unpublished data). Opinions changed, however, when the focus was on recreational fishing for sport (Figure 3). Though in the less urbanized states of Alaska, North Dakota, South Dakota, and Idaho about 20% of the public agreed that angling for sport is cruel, slightly higher percentages (25–30%) were documented for the more urbanized states of Colorado and Arizona. The results suggest that in the United States levels of anti-angling sentiment are consistent with those reported in other postindustrialized countries such as Germany, where stringent regulations on recreational fishing have already been put in place.

As the above compilation of surveys reveals, in some postindustrialized and highly urbanized societies a sizeable proportion of the public (roughly 25%) perceives certain forms of recreational fishing as cruel and as "playing with fish for no good reason" (Aas et al. 2002). In view of the (presumed ongoing) shift from utilitarian to mutualist wildlife value orientations that goes with modernization, it is likely that this proportion will increase in postindustrialized societies in the future.

IMPLICATIONS OF MORAL OPPOSITION TO RECREATIONAL FISHING FOR FISHERIES REGULATIONS

The animal suffering-centered arguments popularized in philosophical literature, especially the writings of Singer (1990), and reflected in public opinion as reported above have been institutionalized in the legislation of some European industrialized countries. These examples show that regulation constraining common recreational angling practices, inspired by fish welfare/liberation/rights ideals or a cocktail of anti-angling arguments, can indeed become reality. For example, the concept of the dignity of animals, including fish and their intrinsic value in the spirit of Regan (1983), was included in the new Swiss Animal Welfare Act of 2008. The act makes the intention of voluntary catch-and-release fishing an offense because it is in conflict with the dignity of the fish and its presumed ability to suffer and to feel pain. A similar ruling had already been in force in Germany since the 1980s, in which, based on a combination of arguments related to inherent value and fishing practices thought to induce pain and suffering, activities such as voluntary catch and release, use of live baitfish, use of keep nets, and tournament fishing were partly (keep nets), implicitly (voluntary catch and release; Arlinghaus 2007) or explicitly (tournament fishing, use of live baitfish, in some states voluntary catch and release; Berg and Rösch 1998; Meinelt et al. 2008; Arlinghaus 2007), banned. Similarly, put-and-immediate-take fishing is found unacceptable because the only justified reason for going fishing is to capture fish as food, and thus legally sized fish must not go through a further catch process after stocking. Anglers also have to take a course in the proper handling of fish before being allowed to obtain an angling licence (von Lukowicz 1998). The argument runs that it is legally acceptable to go fishing only if one has the intention to catch fish for food (Arlinghaus 2007). Thus, if recreational fishing provides sufficiently high benefits (in terms of harvest and nutrition for the individual), it is deemed acceptable in Germany; otherwise, it is not (e.g., tournament fishing where the benefit is pleasure only is not considered a justified reason to

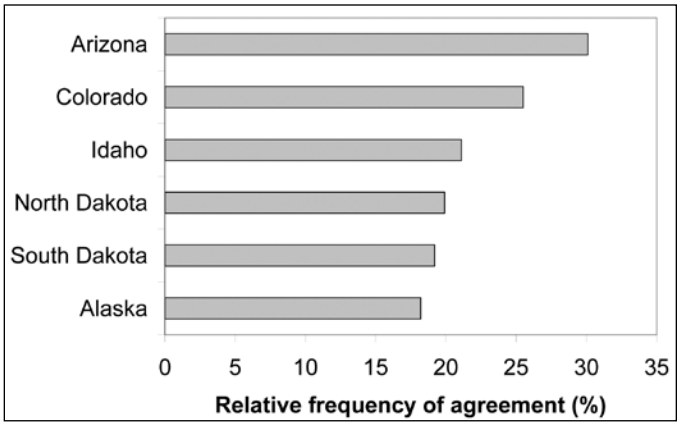

Figure 3. Percentage agreement with the statement (item) "Catching fish for sport is cruel" in six U.S. states. Data are from a representative survey on wildlife value orientations published by Manfredo et al. (2003), but item-specific results presented here were not published in this source.

inflict pain on fish). Wider economic benefits created by angling are usually not considered a sufficient justification—it all boils down to the individual benefits experienced by the angler, and here food provision is currently the only acceptable reason (Strubelt 2010).

Although the German regulation may at first sight be considered straightforward (all fishing practices that do not fulfill subsistence needs, including voluntary release of harvestable fish, are considered illegal), there remains substantial regulatory uncertainty that creates confusion and conflict (Arlinghaus 2007). In addition to the legal difficulty of proving the intention of an angler in a court case (Niehaus 2005) there could be other problems: what if an angler had intentionally targeted a particular fish species for household consumption and would therefore release a fish that did not belong to the targeted species (i.e., bycatch)? This release might be considered acceptable according to the perspective of some public prosecutors in Germany (Drossé 2003), but others might judge differently. A similar catch-and-release event, with identical biological consequences for the individual fish, would be considered legal if conducted mandatorily (e.g., when releasing legally undersized fish), but if a legally harvestable fish is released voluntarily by an angler who intended to do so before starting the fishing day, this would be deemed illegal. The reason for this apparent inconsistency is that, for moral reasons, it is the intention of the angler and the resulting cost–benefit trade-off in terms of food versus fish pain that matters, not the mere biological consequences for the fish per se (Arlinghaus et al. 2009; Arlinghaus and Schwab 2011). Similarly, in Germany tournament fishing with catch and release is prohibited today, but this does not mean that tournament-like fishing has ceased to exist. In fact, the community of recreational fishers interested in meeting to determine a "winner" has simply renamed the way such fishing operates, justifying the meeting and joint fishing for small, overabundant cyprinids with the reason to remove fish for ecological reasons rather than for fun (Meinelt et al. 2008). Obviously, legal uncertainty remains, which may create confusion. Irrespective of this ongoing discussion, legally speaking, suffering-based arguments, as in the case of Germany, or dignity- and suffering-based arguments, as in the case of Switzerland, have resulted in a situation where the intention of the angler is of paramount importance when judging whether an activity such as catch-and-release fishing or tournament fishing is deemed ethically permissible (sensu Olsen 2003). If fish were not sentient and did not suffer, there would be, at least on the face of it, no moral issue whatsoever in Germany and Switzerland; this is classical animal liberation reasoning in the spirit of Singer (1990; see Table 1). So the question of whether fish can indeed feel pain or suffer is of paramount philosophical and legal importance. It is maybe for this reason that the question of fish pain is so hotly debated in fisheries literature (Rose 2007; Sneddon 2009).

It is important to note that the level of protection afforded to fish does not, strictly speaking, depend on the ability of fish to feel pain, as argued elsewhere in detail (Rose 2007; Arlinghaus et al. 2009). Only in animal liberation philosophy, and to some degree in animal rights philosophy, as well as in current legislative texts in Switzerland and Germany is the judgment of the immorality of recreational fishing contingent on the ability of fish to feel pain or to suffer. Possibly, the German and Swiss lawmakers needed a criterion to demarcate between the level of protection afforded to various taxa, and pain perception stood out as a reasonably justified criterion. However, even if fish would not suffer or feel pain consciously during the process of angling, regulatory bodies and anglers concerned with their welfare may still offer them some level of protection, because some take the view that angling-induced physiological disruption, injury, or behavioral impairment of fish is alone important enough to justify protective action (Arlinghaus et al. 2009). Addressing harm as much as possible through proper handling and practice is the position of the so-called pragmatic approach to fish welfare (Arlinghaus et al. 2009), which rests on objectively measurable outcomes in fish and argues for reducing negative endpoints in fisheries practice (such as physiological change or behavioral impairment) as much as is feasible. A pragmatic view of fish welfare would thus seem to be a more comprehensive standpoint than a suffering-centered perspective in the spirit of Singer (Arlinghaus et al. 2009). The pragmatic approach to fish welfare, however, is not without its detractors and is sometimes misinterpreted as justifying any treatment of fish (e.g., Volpato 2009). At the moment the suffering-centered view seems to enjoy greater support from those who dislike recreational fishing on moral grounds, presumably because the implications are potentially more severe in terms of constraints imposed on the activity (Arlinghaus et al. 2009). For example, the Committee on the Environment, Public Health and Food Safety of the European Parliament in Brussels started working on a proposal by the European Commission for a new directive on "Protection of the Environment through Criminal Law." Among the proposed amendments to the draft was Amendment 34, which would have made "pleasure hunting and poaching" a criminal offense (Buitenweg and Breyer 2008). The amendment was rejected in the political negotiations, but the episode shows that the idea of a ban has reached the highest political level. The same political forces that advocate a ban on hunting also promote a ban on recreational fishing.

But even if mutualist value changes influence pro-animal policies and regulations, it must be recognized that there are very different approaches to dealing with emerging pro-fish welfare viewpoints in different societies. It is by no means a natural law that constraints on recreational fishing practices will necessarily follow if social values with regard to wildlife become more mutualistic. The management and treatment of voluntary catch and release of legally harvestable fish is a good example. Though in some countries, due to the influence of the suffering-based argument, this practice is forbidden (Switzerland) or not tolerated (Germany), and in others it is disputed (e.g., Finland; Salmi and Ratamäki 2011), England and Wales have recently passed a by-law limiting the take of coarse (i.e., non-salmonoid) fish from freshwater fisheries, even though these countries probably have the most advanced and radical pro-animal welfare and pro-animal rights lobbies. Thus, the killing of fish is strongly constrained in England and Wales, and the release of legally harvestable fish is prohibited in Swit-

zerland. Both policies are intended to address aspects of fish welfare, yet the motivation in each case is different. In England and Wales the issue is to protect fish from overharvesting, whereas in Switzerland the priority is to ensure that anglers behave ethically, going out on a fishing trip with the sole intention of bringing fish home for dinner.

To compare such contrasting outlooks might be perceived as skewed, but it can well be explained. First, the active fish welfare debate in England and Wales has its roots in aversion to the use of animals in research; the consideration of fish welfare in the context of other human uses, such as fishing, is a relatively recent arrival. Second, recreational fishing is politically well supported in England and Wales, whereas in Switzerland and Germany anglers are less effectively organized, politically weaker, and overall enjoy less political support. Therefore, though bids to curtail practices such as catch and release (Branson and Southgate 2008) do not receive wide political support in the UK, they fall on fertile ground in Switzerland and Germany. These contrasting solutions to common difficulties indicate the paramount importance of history and culture and also of the lobbying and political support of the recreational fishing sector, which can strongly influence the development of pro-animal welfare ideas and their legal implications for common fisheries practices.

CONCLUSIONS AND IMPLICATIONS

With the rise in mutualist value orientations in postindustrialized societies, there is a possibility that extremist positions (or elements thereof) influenced by animal liberation or animal rights arguments might find their way into nongovernmental organizations, science, politics, and, ultimately, legislation. Such a development is particularly challenging for recreational fishers when it occurs where they have little political support. Without sufficient support, radical claims portraying anglers as cruel sadists who play with fish for no good reason (see Arlinghaus et al. [2009] for a detailed account) can be rhetorically effective. Powerful intervention is needed to counterbalance such tendencies in a society where hunting and fishing are becoming less prominent and where an increasing percentage of the public has lost contact with wildlife and nature (Manfredo 2008). The most important strategies may be to (1) develop an appreciation of potentially conflicting viewpoints and try to understand them; (2) strengthen political support and lobbying; (3) address practices that are hard to reconcile with contemporary fish welfare ideas (e.g., engage in rapid kill rather than letting a fish die slowly by hypoxia); and (4) repeatedly remind the public and political decision makers about the various benefits that recreational fishing offers. Yet despite all of these measures, it is likely that the changes in social values will lead to more negative attitudes toward recreational fishing practices in the future. Compared to other historical and epoch-making events (man landing on the moon, the Berlin Wall falling, etc.), a future ban on recreational fishing (or certain connected practices) in postindustrialized societies is not as unlikely as it may at first sound. A ban can also happen in piecemeal fashion, and in fact it does, as the examples from Switzerland and Germany have shown. In these countries, the legal prerequisites for abolition of recreational fishing are already in place. In Germany an angler needs a "reasonable reason" to be allowed to fish recreationally and thereby intentionally inflict pain and suffering on the supposedly sentient fish (Arlinghaus 2007). Currently, the legally accepted reasonable cause is personal fish consumption, and anglers must have the intention to harvest before casting (Arlinghaus 2007). It may only need a willing and able public prosecutor and some judges with anti-angling sentiments to further the case by asking, "Is recreational fishing reasonable, irrespective of the intention of the angler?" One might be inclined to say, "It is never going to happen here," which might have been what the Swiss angling community thought before voluntary catch and release was banned by law in 2008. Obviously, this development was probably facilitated by poor political support in the recreational fisheries sector, but it also exemplifies how a particular social climate that is concerned with the (suffering-defined) welfare of fish targeted by recreational anglers can have immediate implications for fisheries practice, including constraints on the set of tools available to fisheries managers for managing and conserving wild fish populations.

The future for recreational fishing is changing, as is the public's interest in, and support for, this activity. This creates a challenging environment for fishery managers. In this article, we have highlighted the important roles of philosophy, culture, and societal change in shaping the public's views on wildlife, as well as their attitudes toward recreational fishing. Judging by the evidence reviewed, we would expect that recreational fishing practices such as tournament fishing, live-baiting, etc., will be faced with increasing public scrutiny. Dealing with the emerging conflicts cannot be achieved solely by objective social and natural science, because the underlying discussion is moral in orientation and is largely based on ideology. By paying attention to the issues and developments presented in this article, the fisheries profession can, however, take on the challenge proactively. Further social science research will be needed to examine whether the presumed global shift in wildlife value orientations is indeed happening along with postindustrialization and modernization and what the likely consequences of this shift will be for the fisheries profession. Irrespective of this, what is required is effective outreach and increased investment in educating the public about the realities of fishing, in terms not only of social and economic benefits but also of what we currently know about the cognitive and emotional abilities of fish and the determinants of their behaviors. This would help to maintain a reasonable and scientifically credible knowledge base more resistant to biased media reports and political lobbying by those who dislike fishing on moral grounds.

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Benefits and Risks of Adopting the Global Code of Practice for Recreational Fisheries

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ABSTRACT: *Recreational fishing constitutes the dominant or sole use of many fish stocks, particularly in freshwater ecosystems in Western industrialized countries. However, despite their social and economic importance, recreational fisheries are generally guided by local or regional norms and standards, with few comprehensive policy and development frameworks existing across jurisdictions. We argue that adoption of a recently developed Global Code of Practice (CoP) for Recreational Fisheries can provide benefits for moving recreational fisheries toward sustainability on a global scale. The CoP is a voluntary document, specifically framed toward recreational fisheries practices and issues, thereby complementing and extending the United Nation's Code of Conduct for Responsible Fisheries by the Food and Agricultural Organization. The CoP for Recreational Fisheries describes the minimum standards of environmentally friendly, ethically appropriate, and—depending on local situations—socially acceptable recreational fishing and its management. Although many, if not all, of the provisions presented in the CoP are already addressed through national fisheries legislation and state-based fisheries management regulations in North America, adopting a common framework for best practices in recreational fisheries across multiple jurisdictions would further promote their long-term viability in the face of interjurisdictional angler movements and some expanding threats to the activity related to shifting sociopolitical norms.*

El sábalo americano de la costa del Riesgos y beneficios de adoptar un código global de prácticas para pesquerías recreativas

RESUMEN: *las pesquerías recreativas constituyen el uso dominante, y a veces el único, de diversas poblaciones de peces, particularmente en ecosistemas dulceacuícolas en pueblos occidentales industrializados. No obstante, a pesar de su importancia social y económica, la pesca recreativa es comúnmente regulada por normas y estándares locales o regionales, con marcos políticos y de desarrollo poco comprensibles y una comunicación inter-jurisdiccional deficiente. En este trabajo se argumenta que la adopción de un Código Global de Prácticas (CGP), de reciente creación, para pesquerías recreativas puede ofrecer beneficios útiles para el tránsito de la pesca recreativa hacia la sustentabilidad a escala global. El CGP es un documento voluntario, especialmente diseñado para las prácticas y temas relativos a la pesca recreativa, por lo que complementa y extiende el Código de Conducta de la Pesca Responsable elaborado por La Organización de las Naciones Unidas para la Alimentación y la Agricultura. El CGC para pesquerías recreativas describe los estándares mínimos, ambientalmente amigables, éticamente apropiados y socialmente aceptables en las prácticas y manejo de la pesca recreativa. Si bien muchas, si no es que todas, las previsiones presentadas en el CGC ya comienzan a tratarse en la legislación pesquera nacional y en las regulaciones estatales de manejo en los Estados Unidos de Norteamérica, la adopción de un marco común que defina las mejores prácticas en las pesquerías recreativas a través de diversas jurisdicciones, promoverá aun más su viabilidad a largo plazo. Tal promoción se está dando de cara a movimientos inter-jurisdiccionales en pro de la pesca con línea y de amenazas crecientes a la actividad que están relacionadas al cambio en las normas sociopolíticas.el sábalo americano representa una invasión nociva o una introducción benéfica.*

INTRODUCTION

The importance of recreational fishing as a leisure activity emanates from the 16th and 17th centuries and was popularized by Izaak Walton's "The Compleat Angler, or Contemplative Man's Recreation," first published in 1653 (Pitcher and Hollingworth 2002). Recreational fishing is now highly developed and pursued by large numbers of people around the world, primarily to meet nonessential, yet relevant, human needs (Arlinghaus and Cooke 2009) but also to supplement diets. Recreational fishing also generates significant employment in terms of angler expenditure–dependent jobs (Cowx 2002; Ditton 2008). Despite the importance of recreational fisheries globally, the sector is constantly challenged by a need to adapt to social and ecological change (e.g., declining participation in some areas of the world, Gray et al. 2003; U.S. Fish and Wildlife Service

[USFWS] 2006; increasing anti-angling sentiments in some countries, Arlinghaus, Cooke, Lyman, et al. 2007; Arlinghaus, Cook, Schwab, et al. 2007). To assure sustainable development of recreational fisheries, some degree of action is needed at all levels of jurisdiction and across many recreational fisheries (Post et al. 2002; Cowx and Arlinghaus 2008).

Recreational fisheries are the predominant or sole user of most freshwater fish resources in developed countries, rapidly expanding in transitional economies (e.g., Domarkas and Radaityté 2008; Shen 2008; Zakariah 2008), and is an integral component of coastal fisheries in all industrialized countries (Coleman et al. 2004; Ihde et al. 2011). However, the overall importance of recreational fisheries is often overlooked or underappreciated in the wider political arena in many countries (Arlinghaus et al. 2002). Fundamental conflicts exist over the use of water and access to resources (Cowx 1998; Arlinghaus 2005; Cowx et al. 2010), and there is often intrasectoral competition between the fisheries subsectors (e.g., between the commercial and recreational fishing, and even aquaculture; Arlinghaus 2005). In addition, although recreational fishing is often regarded as less damaging to aquatic ecosystems than commercial fishing, recreational exploitation can have various direct and indirect impacts on fish and fish populations (Post et al. 2002; Cooke and Cowx 2006; Lewin et al. 2006) and, indeed, structure entire aquatic ecosystems (Roth et al. 2007, 2010). In addition, on moral grounds the issue of fish welfare has gained momentum in some countries, particularly in Europe, and recreational angling is increasingly being questioned based on the argument of the unnecessary infliction of pain and suffering to fish (Huntingford et al. 2006; Arlinghaus, Cooke, Lyman, et al. 2007; Arlinghaus, Cooke, Schwab, et al. 2007; Arlinghaus et al. 2009). Concerns over fish welfare perhaps have the greatest potential to disrupt recreational fisheries, because some advocates are beginning to question the general legitimacy of recreational fishing (de Leeuw 1996). Long-term viability and sustainable development of recreational fisheries will benefit from addressing these and other issues (Cooke and Cowx 2006; Lewin et al. 2006; Cowx et al. 2010).

Given the high social, economic, and ecological benefits of recreational fisheries, development of a code of practice could make an important contribution toward their long-term sustainability (Cowx and Arlinghaus 2008). To this end, the European Inland Fishery Advisory Commission (EIFAC)—a regional fisheries body within the Food and Agriculture Organization of the United Nations (FAO)—recently developed a Code of Practice (CoP) for Recreational Fisheries for global application (European Inland Fishery Advisory Commission [EIFAC] 2008; Arlinghaus et al. 2010). Although the EIFAC focuses on European countries, the CoP was developed in consultation with stakeholders and practitioners from across the world, and the wording and context are formulated to make it relevant across a range of jurisdictions that deal with recreational fisheries (Arlinghaus et al. 2010). As developed, the CoP can provide a coherent framework to address pertinent issues concerning recreational fisheries and may thus also be of interest to North American fisheries managers and researchers.

The objective of this article is to expose the North American fisheries profession to the background of the CoP and highlight the various areas where the CoP may provide a useful framework—or build upon existing approaches—to develop new policies for sustainable recreational fisheries. In addition to the benefits of the CoP, we address some risks associated with adopting the CoP. We finish by outlining a recent example where the code has been used in the policy arena at the international level.

OBJECTIVES OF THE CODE OF PRACTICE FOR RECREATIONAL FISHERIES

Similar to the popular and widely used FAO Code of Conduct for Responsible Fisheries (CCRF; FAO 1995) primarily direct at marine commercial fisheries, the EIFAC Code of Practice for Recreational Fisheries (Figure 1; EIFAC 2008) outlines the minimum standard for ethically permissible, socially acceptable, and biological sustainable recreational fisheries development and management. The CoP adopts and promotes a participatory consultation process and is built around the best available science. Though global in orientation, the CoP explicitly acknowledges regional and national specificities and leaves ample opportunity to accommodate national and regional differences. The goals of the CoP are to

1. establish best practice and management principles for responsible recreational fisheries among nations, regions, organizations, or individual recreational fishing communities;
2. serve as a guiding instrument to establish or improve institutional and policy frameworks required to exercise responsible management of recreational fisheries;
3. facilitate and promote cooperation among public bodies, nongovernmental organizations (NGOs), and individual stakeholders in the conservation, management, and development of recreational fisheries resources, including the aquatic ecosystems of which they are an intrinsic part;
4. promote recreational fisheries by outlining and facilitating best practices within the sector for long-term sustainability and for the responsible use of all ecological services generated by aquatic ecosystems and aquatic organisms;
5. serve as a model for development of sustainable recreational fisheries, especially for countries in which recreational fishing is a relatively new activity.

At a general policy level, the CoP thus seeks to promote understanding of the importance of recreational fishing as a provider of key socioeconomic services among public bodies, NGOs, and individual stakeholders involved in conservation, management, and development of aquatic ecosystems. The CoP adopts a science-based approach to sustainable recreational fisheries by outlining science-based best practices (e.g., in the context of catch and release), and it also emphasizes research and monitoring as an important component of sustainable fish-

eries. The CoP identifies adaptive comanagement of recreational fisheries through the integration of all stakeholder concerns into development of regulations and planning as an important component of effective management. Finally, the CoP promotes education, training, and appropriate angler conduct in areas where this is incomplete or even lacking as important to ensure that recreational fisheries remain viable.

STRUCTURE OF THE CODE OF PRACTICE FOR RECREATIONAL FISHERIES

The CoP has 13 articles, plus an annex, that provides definitions for key terms used in the document (Figure 2; EIFAC 2008). In addition, a brief introduction highlights the purpose of the CoP. Similar to the structure of the CCRF (FAO 1995), the first three articles of the CoP for recreational fisheries are introductory: (1) nature and scope; (2) objectives; and (3) implementation and updating. Some general principles are contained in Article 4, followed by Article 5 on environmental stewardship and ethics. These two articles prescribe a set of basic values that people involved with recreational fisheries may want to embrace when promoting sustainability (see Arlinghaus et al. [2009, 2010] for details). However, pro-environmental values (Article 5) are not sufficient to develop sustainable recreational fisheries, and need to be supported by a functioning policy and institutional framework (highlighted in Article 6), as well as by appropriate compliance and enforcement (Article 7). What follows these articles on basic policy and governance are four articles that deal with technical areas of importance for developing responsible and sustainable recreational fisheries, viz. recreational fishing practices (Article 8); fish welfare (Article 9); stakeholder interactions (Article 10); and management (Article 11). These technical articles specify basics and commonsense aspects, such as "avoid littering" and "do not take more fish than needed," but also elaborate on sophisticated management philosophies, such as adaptive management approaches. In terms of fish welfare, detailed guidelines—for example, the need to kill a fish immediately after dehooking if it is to be taken home for consumption—are included. Finally, a scientific basis for management of recreational fisheries is detailed in Article 12. Article 13 on awareness, education, and training closes the CoP by describing steps to educate and inform fisheries and other stakeholders who impact recreational fisheries resources.

The CoP for recreational fisheries is designed to be interpreted, applied, and used on a voluntary basis in conformity with the relevant rules of various international, national, regional, and local agreements and on legislation relating to the aquatic environment and fisheries. Further, the CoP can be viewed as a reference document, used to build upon existing approaches to recreational fisheries. The value of the CoP for recreational fisheries is its coherent direction toward sustainable and—depending on local conditions and norms—ethically appropriate recreational fishing, thereby avoiding lengthy jargon on sustainable fisheries that is only tangentially related to the recreational fishing sector. Importantly, the CoP nests recreational fisheries within the ecosystem, addressing non-fishery-related anthropogenic impacts (e.g., water management), which is a different perspective than raised in the CCRF by FAO (1995) and particularly important in freshwaters.

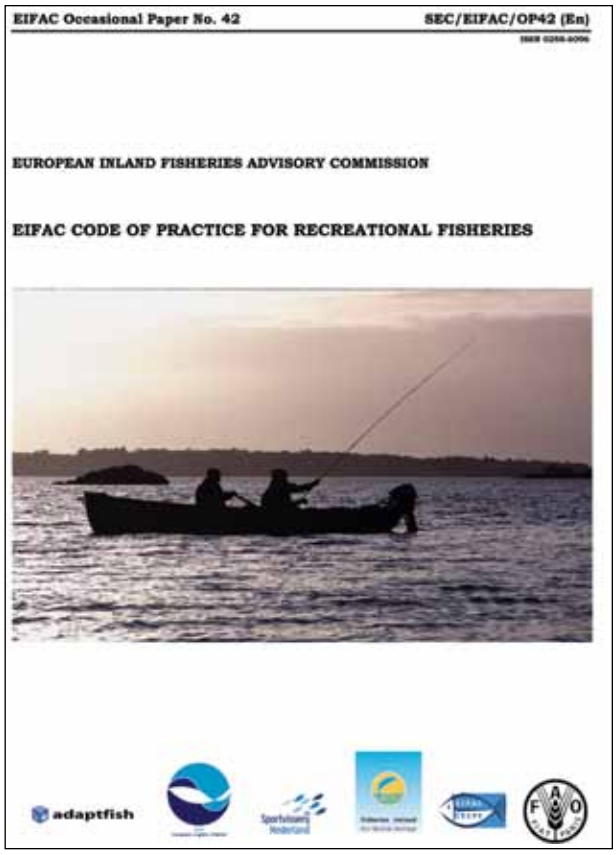

Figure 1. Front cover of the EIFAC code of practice for recreational fisheries as published by the Food and Agriculture Organization of the United Nations.

BENEFITS OF ADOPTING THE CODE OF PRACTICE TO RECREATIONAL FISHERIES

The CoP for recreational fisheries is mainly targeted at fisheries policy makers, representatives of recreational angler associations, unions and clubs, recreational fishers, the recreational fishing industry, local and regional fisheries managers, and fisheries scientists to serve as one of many possible approaches for outlining best practices for recreational fisheries management (Arlinghaus et al. 2010). Similar to the CCRF (FAO 1995), the most important impact may not be at the level of an individual angler but instead the raising of salient aspects of sustainable recreational fisheries among the recreational fishing community. Thus, the profile of recreational fisheries as providing critical ecosystem services could be raised by identifying the socioeconomic importance of recreational fishing among public bodies, NGOs, and individual stakeholders involved in conservation and management of aquatic ecosystems (Cowx and Arlinghaus 2008).

Integration of the CoP into public policy and management practices would probably result in a number of more tangible benefits to local and regional recreational fisheries management. Foremost, the CoP provides a logical framework to develop long-term sustainable management strategies. Further, benefits of the CoP through

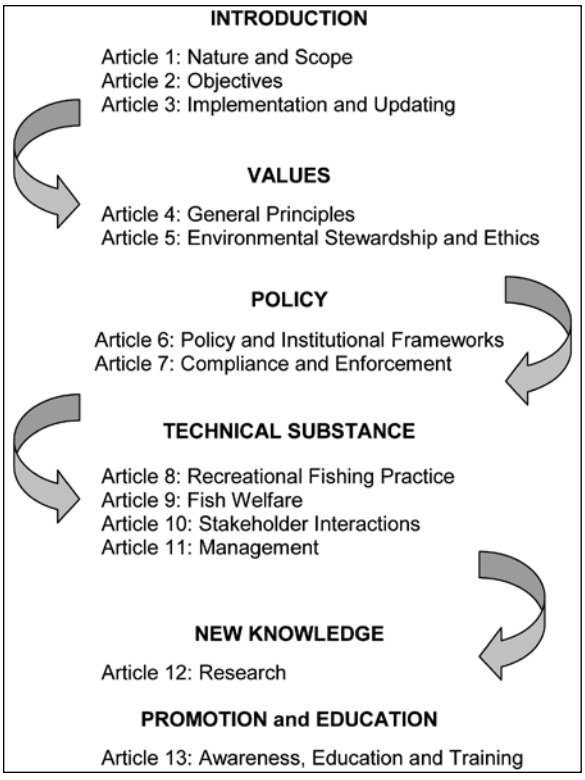

Figure 2. Content structure of the various articles of the code of practice for recreational fisheries. (Source: Arlinghaus et al. 2010.)

application of its provisions may include the following (Cowx and Arlinghaus 2008):

- increased awareness in the policy arena and an entry point for viable dialogue, at all levels of jurisdiction;
- improved understanding and management of impacts of recreational fisheries to move toward sustainability;
- better identification of issues of conservation concern;
- promotion of a platform for exchange of experiences and collaboration between organizations and jurisdictions;
- increased acceptance of the sector as a major player in the world's fisheries;
- improved assessment and potential resolution of conflicts between sectors and user groups;
- promotion of low-risk and sustainable enhancement measures;
- promotion of a positive image of recreational fisheries within society;
- promotion of integrated aquatic resource management and an ecosystem approach to recreational fisheries management;
- promotion of environmentally and socially responsible behavior of recreational fishers/anglers.

Other important benefits of the most salient articles of the CoP for individual stakeholders groups (managers, anglers/recreational fishing industry, and researchers) are summarized in Table 1. The benefits will vary in importance among countries and jurisdictions, but a number of general statements can be derived from adopting the principles inherent in the CoP. In terms of fisheries managers and management agencies, benefits include development of sustainable management practices, development of consistent approaches to recreational fisheries, and a scientific approach to recreational fisheries management. The CoP may also facilitate the development of common monitoring and research approaches to support recreational fisheries, an important issue given the limitations on financial and manpower resources for monitoring thousands of independent stocks (Fayram et al. 2009) and the increasingly recognized need for standardized sampling programs and the collation of data across jurisdictions (Bonar et al. 2009). Monitoring information that is coordinated across regions and states should in turn prove useful for identifying research priorities to support policy and management of recreational fisheries at a range of scales. Integration of the suggested CoP principles for management into agency policy may also help decrease the complexity in development of management policies for shared fisheries.

Anglers and the recreational fishing industry may benefit from the CoP because the CoP's provisions emphasize the "right" and opportunity to fish recreationally and demand the integration of anglers' interests in management decision making, including regulation planning (Table 1). Following the CoP would provide recreational angling stakeholders a seat at the table when discussions about management approaches are being developed. Further, anglers and the recreational fishing industry would be integrated into monitoring approaches necessary to understand the impacts of recreational fishing and the complexities of quantitative fisheries stock assessment. In a more abstract way, the principles of the CoP may result in enhancing the social priority and visibility of the entire sector if recreational fisheries are maintained sustainably and sustainable recreational fisheries are communicated and promoted in the public arena. Thereby, a more positive public image of recreational angling could be produced; for example, by using the guiding moral of the CoP, that of environmental stewardship (Chapin et al. 2010). In addition, with many anglers moving across territorial boundaries (Aas and Arlinghaus 2009), a common framework would mean that anglers would be cognizant of angling practices in new jurisdictions, which helps reduce conflicts and transaction costs.

The CoP also has the potential to provide a proactive framework for addressing the growing lobby against angling as a leisure and sporting pursuit. For example, inherent in the CoP is recognition that fish welfare is important and that all participants should be working toward incorporating strategies that maintain the welfare status of fish into their practices. By empowering anglers and other stakeholders with such knowledge about fish welfare through education and awareness, the CoP could help counter the growing lobby against angling on moral grounds through demonstration of responsible fishing practices that are scientifically supported to benefit both the individual fish and the individual angler.

Recreational fisheries researchers may benefit from an explicit statement in the CoP about the need for cutting-edge scientific infor-

TABLE 1. Summary of the potential benefits and risks of adopting the code of practice for recreational fisheries (CoP) globally. Issues are ranked according to selected articles of the CoP. "Industry" refers to the recreational fishing industry.

Article	Group	Benefit of Adoption	Risk of Adoption
Article 5—Environmental Stewardship and Ethics	Management agencies	Aligns management policies with dominant social goals of environmental sustainability and preservation of biodiversity	Loss of constituency support by anthropocentric stakeholders
	Industry/anglers	Reassures the lost position of being the most important stewards of aquatic systems within society	Could lead to a more formal education regime and greater expectation of environmentally appropriate products
	Researchers	Provides direction in terms of the knowledge needed to ensure environmentally responsible angling and management practices	Research studying traditional objectives (i.e., maximizing yield irrespective of the fate of nontarget species) may lose acceptance in the wider society
Article 6—Policy and Institutional Framework	Management agencies	Provides the legal and institutional means for sustainable management	Shortage of fisheries professionals to meet institutional demands, inappropriate funds
	Industry/anglers	Assures access to resources	Reduced potential for self-organization
	Researchers	Assures a role for science to comply with institutional demands	Increased burden for access to fisheries in terms of sampling if fishing rights get privatized
Article 7—Compliance and Enforcement	Management agencies	Fewer enforcement needs, more sustainable exploitation	Increased communication of regulation needs, diversion of resources to enforcement
	Industry/anglers	Socially agreed-upon commitment to rule compliance, reduced rule-breaking behavior	Reduced enforcement resulting in free riding
	Researchers	Research on rule compliance and how to encourage rule compliance encouraged	Underdeveloped research methodologies
Article 8—Recreational Fishing Practices	Management agencies	Ensure sustainable exploitation	Conflicts with angler constituency if popular practices are curtailed
	Industry/anglers	Ensure high-quality fishing experiences, positive public image	Altering common practices difficult
	Researchers	Provide evidence of impacts of angling practices	Reductionist view on current practices in terms of research
Article 9—Fish Welfare	Management agencies	Ensures that constituency recognizes the important role they play in determining the fate of the angling event for the individual fish, reduced fishing mortality, and improved public image	May have to change the way in which fisheries are operated to ensure that fish welfare issues are mitigated, resulting in conflict with constituency
	Industry/anglers	Provides anglers with the knowledge and guidelines to properly handle and kill or release captured fish, more sustainable exploitation, improved public image	May have to change popular fishing practices to ensure that fish welfare issues are mitigated, industry may need to develop modified gear to comply with welfare concerns
	Researchers	Clarified research questions that require scientific study (e.g., development of thresholds for different handling practices, evaluating gear innovations)	Research efforts could be misdirected and fail to address the key issues facing recreational fisheries, research may put sector under increasing pressure from anti-angling groups that misinterpret results
Article 10—Stakeholder Interactions	Management agencies	Potential to reduce conflict and increase buy-in of management actions	Institutionalizing stakeholder engagement can prolong management decisions
	Industry/anglers	Potential to contribute to management process and reduce conflict within and among sectors	Vocal groups might yield suboptimal management and management response that is not democratic
	Researchers	Guidance of appropriate research to support development	Research may be influenced by constituency, loss of freedom, and increased need for communication of results
Article 11—Management	Management agencies	Ensures that management is in line with modern approaches and philosophies such as the ecosystem approach, justifies long-term monitoring programs in a standardized way across regions to improve management	Budgetary and financial constraints resulting in allocation issues and suboptimal priority setting across fisheries
	Industry/anglers	Professional approach to management may be more sustainable	Unrealistic expectations about management successes, potential for reduced stocking efforts in the future affecting fish abundance negatively
	Researchers	Data available for dedicated long-term research	Budgetary constraints result in suboptimal data collection
Article 12—Research	Management agencies	Scientific results for decision making	Scientific uncertainty to inform fisheries management remains, conflicts with idealized expectations about the potential of science
	Industry/anglers	Assurance management agencies are using science as a basis for management policy, cooperative research, input in research questions, and scientifically defensible management	Curtailing of popular practices; for example, stocking, evidence for negative impacts of fishing that were overlooked before
	Researchers	More applicable research findings	Increased interaction among fisheries researchers within various regions and with stakeholders might prove a burden
Article 13—Awareness, Education, and Training	Management agencies	Educated recreational fishing sector	Budgetary constraints resulting in ineffective education and outreach programs
	Industry/anglers	Up-to-date information on latest knowledge about recreational fisheries	Burden on education needs
	Researchers	Opportunities for research on effective education and awareness raising	Might become engaged in education, reducing time for research

mation to inform recreational fisheries management. Scientific information can be shared with stakeholders through direct involvement in identifying the most relevant research questions. Finally, incorporation of research results into recreational fisheries management would help assure science-based approaches to management and policy, a necessary step for insuring sustainability.

RISKS AND UNCERTAINTY OF A CODE OF PRACTICE TO RECREATIONAL FISHERIES

Clearly, there are also risks and uncertainties associated with the CoP (Table 1). For fisheries managers these include increased demands for inclusive participation and conflict resolution that may outweigh the budgetary and financial possibilities of some fisheries bodies. Moreover, there is the risk that stakeholder integration into research and management will prolong decisions or that managers and researchers will be confronted with conflicting stakeholder demands and aspirations. As a consequence, many management bodies may lack the resources to fulfill other pertinent needs because limited resources are bound for participatory processes.

For anglers and the recreational fishing industry, adoption of the CoP (or the principles outlined in this document) may bring about changes to popular practices (e.g., how to kill or release a fish after capture) and gear used. Adoption of the CoP may also increase the expectations for pro-environmental behaviors and may result in greater educational needs. The issue of participation in fisheries management decisions may increase the potential for vocal minorities to increase their influence, and decisions may be prolonged due to participative procedures. Finally, the CoP takes a clear stance that management approaches should be science based, which may lead to changes in common practices (e.g., stocking), conflicting with the desires of some stakeholders.

For researchers, adopting the CoP may involve the need to expand into unfamiliar research disciplines (e.g., social science). Stakeholder involvement will also increase the need for communicating study findings in a language that is accessible to stakeholders.

Ultimately, however, despite obvious risks (Table 1), we believe that the benefits of the CoP outweigh their costs. We believe that as society continues to urbanize and become disconnected with nature, the threats to maintaining fishing as a recreational pursuit will increase. Mere self-interest of the recreational fishing sector will inevitably require implementation of frameworks and policies that have proven to provide a sustainable approach to protecting and sustaining fisheries. In the long run, the CoP can play a dual role, first, by influencing international fisheries management and policy through its incorporation into international agreements and conventions and, second, by providing national and local fisheries management agencies with a sustainable, agreed-upon approach to managing fisheries. A CoP that unifies the diversity of actors within the recreational fisheries sector in a region or state, such as the EIFAC CoP, might thus provide a vehicle to assure that recreational fisheries can be sustained in the face of a changing populace and changing social norms.

EXAMPLE OF USE OF THE CODE OF PRACTICE FOR RAISING THE PROFILE OF RECREATIONAL FISHERIES IN THE GLOBAL POLICY ARENA

The CoP has already strongly influenced the European Charter on Recreational Fishing and Biodiversity by the Council of Europe (2010). This charter was developed to comply with the Convention on the Conservation of European Wildlife and Natural Habitats, also known as the Bern Convention. The various principles in the European Charter on Recreational Fishing and Biodiversity constitute adaptations of principles of the CoP for recreational fisheries and thereby exemplify how the CoP may be shaped to suit particular conditions, in this case international policies. Overall, the charter is meant to "compliment [*sic*] and supplement those laid down in the EIFAC CoP with an emphasis on biodiversity conservation" (Council of Europe 2010). This is an outstanding example of how the CoP can be used as a guiding framework that is applied to development of more specific international policies. The same approach may hold true for regulations guiding certain angler organizations or for development of policies in a certain fisheries management region. In all of these cases, the CoP may provide the backbone around which specific policies tailored to specific conditions are developed.

RELEVANCE OF THE CODE OF PRACTICE FOR RECREATIONAL FISHERIES IN NORTH AMERICA

North American recreational fisheries are generally well developed and are fairly sustainable. However, after periods of stable participation in recreational fishing in the United States, rates have started to show signs of decline in participation (USFWS 2006), although not as precipitous as those experienced for hunting. This trend should be examined in light of the push in North America against fishing for ethical reasons (Arlinghaus et al. 2012). Irrespective, the trends suggest that it is naïve to pretend that increases in urbanization in North America will not eventually further impact the general public's acceptance of recreational fishing, and affirmative action is required. The CoP can provide one mechanism for creating sustainable approaches that may help provide "certification" of recreational fisheries that will be publically supported.

We recognize that many agencies or fisheries management bodies in both the United States and Canada have already developed and adopted various codes or policies for management of recreational fisheries, many of which are of the highest standards worldwide and already extend the principles of the CoP. For example, one successful program for promoting sustainable fishing practices in North America is the Ethical Angler program, which has been vetted through the U.S. federal registry process. The CoP is not meant to replace such existing

approaches; instead, it can complement or enhance existing programs and, most important, provide a unifying framework of reference for all. The CoP provides a potential platform and unified framework, in which already well-grounded approaches can be expanded or checked to assure that they are working through all aspects of creating sustainable recreational fisheries. Further, recreational fisheries should examine their own management plans, policies, and procedures to see whether the CoP can either help provide consistency in thinking, a common planning framework, or identification of other concerns or approaches that could be integrated into current approaches. In this context, the CoP for recreational fisheries can facilitate exchange of knowledge and experiences across state boundaries and between North America and the rest of the world. Ultimately, given the high standards on recreational fisheries management in the United States and Canada, the CoP may also assist in the transfer of knowledge and experiences from this region of the world to other, less developed areas (e.g., South America).

CONCLUSION

Twenty years ago, no one could have predicted the proliferation of sustainable approaches to dining on seafood, yet there is now a plethora of "sustainable seafood" documentation that many individuals use when purchasing seafood (Philipps et al. 2003; Jacquet and Pauly 2007). Similarly, 20 years ago in some European countries, no one could have predicted the advent of the animal welfare concerns and their impacts on traditional approaches to recreational fishing in selected countries (Arlinghaus, Cooke, Lymna, et al. 2007; Arlinghaus, Cooke, Schwab, et al. 2007; Arlinghaus et al. 2009). However, in Germany and Switzerland it is now illegal to catch and release harvestable fish out of moral concern that harvesting fish is the only reasonable justification for recreational fishing (Arlinghaus 2007). Though this is an extreme example that is unlikely to be on the agenda in North America within the next decade, we can envision a time when anglers (or perhaps the general public) will be seeking a set of sustainable standards for recreational fisheries. One benefit of the CoP to participants in recreational fisheries will be to show proactive approaches by integration of a standard CoP into policies, approaches, and procedures potentially providing a single frame for future certification standards of sustainable recreational fisheries. Given the importance of professional fisheries societies—such as the American Fisheries Society—in the provision of best science to ensure sustainable recreational fisheries, development of a policy statement supporting the CoP as a set of possible practices could be an important step forward. Development of an American Fisheries Society policy statement would provide a signal of professional acceptability and hopefully quality of the code to the entire sector and the public at large.

Figure 3. Participants of the Workshop on the EIFAC Code of Practice for Recreational Fisheries at the Dutch Angler Association in Bilthoven, The Netherlands, November 2007.

At the highest political level, the next step is to ensure representation of the CoP for recreational fisheries in the FAO (1995) CCRF and development of more elaborate technical guidelines for sustainable recreational fisheries. This process is ongoing. In the meantime, agencies and governmental and nongovernmental organizations, angling bodies, and basically any stakeholder responsible for governance or management of local, regional, or national recreational fishing, can consider voluntarily endorsing, considering, or adhering to the principles of CoP. This involves and invites modifying the CoP to suit local and regional needs and particular fisheries. To overcome language barriers, various translations of the CoP are now available online (FAO 2012), which should help this process.

ACKNOWLEDGMENTS

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Plan Ahead to Experience the Best of the Twin Cities and Beyond

The 2012 AFS Annual Meeting, Fisheries Networks: Building Ecological, Social, and Professional Relationships, will take place in beautiful St. Paul and Minneapolis, Minnesota on the Mississippi riverfront. The Twin Cities offer a plethora of recreational, cultural, and entertainment activities to explore. The AFS Technical Program will occur at the RiverCentre in St. Paul. You'll be able to explore neighboring Minneapolis on Wednesday evening for our social. Symposia, contributed papers, poster sessions, continuing education workshops, the trade show, and networking events will highlight the conference. The 2012 AFS 142nd annual meeting promises to be a conference unlike any other. We hope you can join us!

Welcome!

Minneapolis and St. Paul are charming, scenic cities that offer tourists an array of places to go and things to do. The weather in late August is pleasant, with warm summer sun during the day and comfortable temperatures at night. Minneapolis and Saint Paul are some of the nation's most sustainable cities, ranked 11th and 12th, respectively, on the list of America's greenest cities by *Popular Science*. If you're willing to travel outside of the Twin Cities, there are many memorable and historic destinations to visit in Minnesota. The opportunities are endless!

Getting around:
Metro Transit
metrotransit.org
Super Shuttle
shuttlefinder.net
Airport Taxi
airporttaximn.com
ITN Taxi Service
itntaxi.com
Green and White Taxi
suburbantaxi.com
Yellow Cab
saintpaulyellowtaxi.com
Bike and hike routes
bikewalktwincities.org

"Things to Do" link at
afs2012.org

Lodging

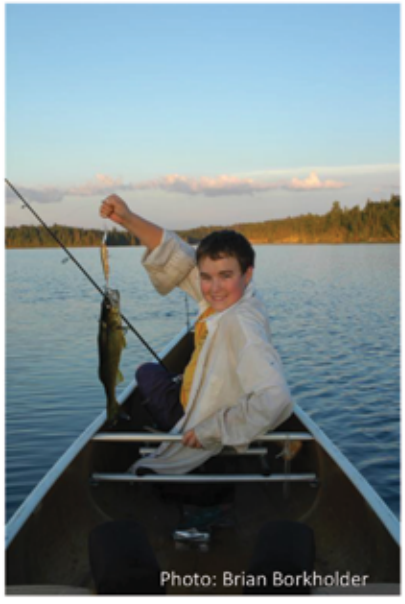
There are a number of hotels within walking distance of RiverCentre, offering easy access to the meeting and surrounding attractions. Whether you're looking for luxury or affordability, there's a place for you to stay. The Crowne Plaza Riverfront is the host hotel in downtown Saint Paul.

Shared student lodging for $25 per person per night will be offered at Concordia University from Sunday through Wednesday night.

Fishing Opportunities Galore!

Minnesota, Land of 10,000 Lakes, could also be called the Fishing Capital of the World. The state offers a tackle box of angling opportunities for novices and experts alike. The Twin Cities are surrounded by urban and suburban lakes offering exceptional fishing for bass, pike, and sunfish. The Minneapolis Chain of Lakes (Calhoun, Harriet, Isles, and Cedar) harbor walleye and tiger muskellunge. If you want to tangle with river monsters and experience the thrill of not knowing what species is on the end of your line, the Mississippi and St. Croix rivers hold catfish, sturgeon, and a variety of other fishes. Bring your own fishing gear, or rent it for free from the National Park Service's Mississippi River Visitor Center.

Outside the Twin Cities, even more fishing opportunities await you and guided launches are available. Within a few hours of the Cities is great walleye fishing on Lake Mille Lacs, Minnesota's famous inland sea. Duluth on Lake Superior is one of the most scenic cities in Minnesota and offers unmatched fishing opportunities for lake trout, salmon, steelhead, and walleye. If you're up for an even longer trip, plan to experience the diverse fishing opportunities of the beautiful Minnesota northwoods. Make a stop at Vermilion Lake, Rainy Lake, or Lake of the Woods. These lakes hold unparallelled populations of walleye, Minnesota's famously delicious state fish, in addition to northern pike, muskellunge, smallmouth bass, and other game species. Extend your trip to experience the wild. Book your entry passes in advance for the Boundary Waters Canoe Area Wilderness or contact a guide service that can outfit you with all you need.



If trout are your quarry, have no fear! The Driftless Region of southeast Minnesota is home to a number of famous groundwater-fed streams that hold brown trout, brook trout, and rainbow trout.

Fishing Planning

MN Department of Natural Resources: mndnr.gov
Use the "Destination" link for
Lakefinder (fish surveys)
Water Access (look for Twin Cities)
Fishing Piers
Lakes & Rivers
Fishing (trout stream maps)

Lake Mille Lacs
millelacs.com
Lake Superior
fishduluth.com
Vermilion Lake
lakevermilioncommerce.com
Rainy Lake
rainylake.org
Lake of the Woods
lakeofthewoodsmn.com

Urban Adventures: Exciting Attractions
The Twin Cities are bursting with exciting opportunities to learn and explore science and appreciate culture and the arts. As you plan your trip, pencil in some time to explore some of these attractions.

Discover and Learn: Museums, Zoos, and More
The Twin Cities offer diverse opportunities to explore and experience aspects of the natural and social sciences.


Como Park Conservatory
Photo: Dan Anderson

The Science Museum of Minnesota and Imax Omnitheater
Mississippi River Visitors Center
Como Park Zoo and Conservatory
Minnesota Zoo
Sea Life Aquarium at the Mall of America
The Bell Museum of Natural History
The Minnesota Landscape Arboretum
The Minnesota History Center

Explore the Arts Scene: Paintings, Performances, and more
The Twin Cities are well known for their rich arts scene. During your visit, take advantage of the premiere venues to experience local and world-class exhibits in both the visual and performing arts.

The Walker Arts Center and Minnesota Sculpture Garden
Minneapolis Institute for the Arts
The Weisman Art Museum
The Guthrie Theater
The Ordway Center for the Performing Arts


Minnesota Sculpture Garden
Photo: Meet Minneapolis

Squeeze In Some Family Fun
In addition to the Minnesota Children's Museum and Como Park, the Twin Cities are home to several attractions that offer fun for the entire family.

The Minnesota Children's Museum
Nickelodeon Universe at the Mall of America
Water Park of America


Photo: Meet Minneapolis
Hennepin Avenue Theater District

Enjoy Exciting Sporting Events
If you're interested in summertime sporting events, you'll find a number of opportunities in the Twin Cities metropolitan area. The Minnesota Twins will be on the road during this year's meeting, but the St. Paul Saints are a popular minor league baseball team with games at beautiful Midway Stadium. Offering premier horseracing and a topnotch casino, Canterbury Park would make for a memorable day trip or overnight stay. It is located about 30 minutes south of downtown Minneapolis in Shakopee, MN.

And More....

Numerous golf courses, hiking and biking trials, outdoor basketball courts, baseball diamonds, and football and soccer fields are located within driving distance of the RiverCentre. Whatever your sporting passion, the Twin Cities has something to match your desire!

Take a Tour of Local Waterfalls

Minnesota boasts a collection of breathtaking waterfalls. To experience these scenic spots, you don't even have to leave the Twin Cities. Here are seven waterfalls to map out and visit:

1. St. Anthony Falls
2. Bridal Veil Falls
3. Shadow Falls
4. Minnehaha Falls
5. Hidden Falls
6. Ivy Falls
7. Lilydale Ice Falls

And don't forget, the **Minnesota State Fair** starts on August 23 and goes to September 3!

More trip planning resources:

Meet Minneapolis	minneapolis.org
Visit Saint Paul	visitsaintpaul.com
Twin Cities Tours	twincitiestours.com
City of Minneapolis	ci.minneapolis.mn.us
City of St. Paul	ci.stpaul.mn.us
Explore Minnesota	exploreminnesota.com

U.S. Fish and Wildlife Service is Expecting Multiples

Daniel McGarvey

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The Endangered Species Program at the U.S. Fish and Wildlife Service (USFWS) recently received some big news. The list of threatened and endangered species is poised to grow. On September 9, 2011, a joint settlement between the USFWS, Wild Earth Guardians, and the Center for Biological Diversity was approved in the District of Columbia U.S. District Court. Under this settlement, the USFWS agreed to process a backlog of more than 700 listing petitions by 2018 (USFWS 2012). Sixty-six of these are for fishes.

Conservationists are celebrating, and a part of me is inclined to join them. However, as a fisheries scientist, I'm troubled by a nagging question. How will the USFWS manage this additional responsibility? The historical average rate of new listings is 41 species per year (Greenwald et al. 2005). For argument's sake, let's assume that the settlement will double this rate. (The express purpose of the settlement is, after all, to accelerate the pace of listing decisions.) This equates to 492 newly listed species by the end of 2018, or approximately one third of all currently listed species (1,381 as of January 27, 2012; USFWS 2012). We can entertain more or less conservative projections, but the take-home message is clear. The workload for the USFWS is going to become a lot heavier.

We can certainly hope that funding levels at the USFWS will rise to the challenge. And a proposed increase of $2.9 million for listing activities in the fiscal year 2012 budget request is grounds for cautious optimism. But I am skeptical that the USFWS budget will keep pace with rising expenses, given the current and foreseeable politico-economic climate. And so I propose that we, as a community of fisheries professionals, should do for the USFWS what one does for any friend or colleague expecting multiples. Be prepared to step up and offer as much assistance as possible.

We can start by helping to build the empirical database. Relatively little is known about most of the fishes in the settlement. For instance, the median number of primary references in Web of Science (on January 27, 2012) is two per fish. Additional information on the biology and distributions of some species does exist in the gray literature. And online resources like the "Imperiled Freshwater Organisms of North America" web portal (U.S. Geological Survey/American Fisheries Society 2012) are excellent tools for mapping and cataloging existing data. But it is obvious that the USFWS will need more data to reach informed listing decisions, specify critical habitat, and create and manage recovery plans.

We must also remember that endangered species science is fundamentally different than conventional science. Conventional science aims to minimize type I errors or false-positive results. However, the USFWS is tasked with ensuring that human activities do not jeopardize the continued existence of listed species. Its mission is therefore to prevent type II errors or false-negative results (i.e., failing to provide protecting measures when they are truly necessary). This mission, and the authority to enforce it, stems from a normative belief that the U.S. Congress codified nearly 40 years ago: when uncertainty is high and extinction is on the line, it is better to take a precautionary stance and risk unnecessary regulation. On this note, I will emphatically suggest (as many others have) that it is time to abandon the use of null hypothesis testing in endangered species science. Analytical tools that do not place the burden of proof on listed species, such as model fitting (Burnham and Anderson 1998) and equivalence testing (Brosi and Biber 2009), are available. If they are not familiar to you, invest some time in learning about them.

We, as a community of fisheries professionals, should do for the USFWS what one does for any friend or colleague expecting multiples. Be prepared to step up and offer as much assistance as possible.

It is hoped that we will all find creative ways to assist the USFWS. The listing settlement may ultimately prove to be a good thing for biodiversity. But there is much work to be done in preparation for the arrival of new threatened and endangered species.

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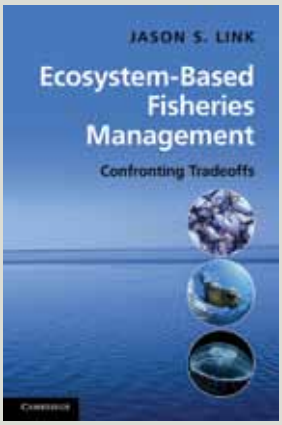

Ecosystem-Based Fisheries Management: Confronting Tradeoffs

Jason S. Link. Cambridge University Press. Cambridge, UK. 2010. 207 pages. US$72.00

Jason Link's easily read book focuses on conventional thinking and current forms of fisheries management (Belgrano and Fowler 2011). It represents a valuable step toward greater holism in fisheries management—especially marine fisheries. The book develops an argument for improving the management of our (human) influence on not only ecosystems but also individual resource species. Part of the argument involves the recognition that we face problems that cannot be denied (Chapter 1). Many fisheries worldwide are overfished, even as measured by conventional standards. Often, overfished, depleted, or collapsed fisheries have failed to recover. Changes in the size composition both within and among fish species are noteworthy and abnormal. As Link puts it, "… there is a major, pandemic problem...". The set of serious problems that Link identifies underlines the need for doing things differently. The context of history, including a laundry list of worldwide legislative mandates, provides motivation for working toward a more holistic approach (Chapter 2). More holism, at a minimum, involves accounting for the complexity of the systems with which we humans interact. This complexity is something that Link emphasizes with his "horrendograms" (messy pictures) and by referencing a quote from Jack Ward Thomas stating that ecosystems are "… more complicated than you can think." Link goes on to conclude that management is confined to regulating human activities, including our interactions with other species and ecosystems (a conclusion emphasized on page 20).

The summary points of Chapter 6 suggest that "Having ecosystem indicators does not necessarily mean the same thing as having reference points or control rules. … As a matter of principle, measures of one thing do not lead directly to management advice regarding another." Much of the remainder of the book is a very effective presentation of conventional thinking wherein the formulation of such basic principles is a foundational contribution.

Among the basic principles revealed by conventional thinking, one is given primary emphasis in Link's book: complex systems involve tradeoffs among the various forms of dynamics involved. The subtitle of this book points to that principle: "Confronting tradeoffs." This theme is uppermost in Link's mind; he mentions it repeatedly throughout the text, focusing on one specific form of tradeoff as a core element of what he considers ecosystem-based management to be: the tradeoff(s) involved in harvesting one or more species insofar as these and other species are impacted ecologically. He draws on the principles of predator/prey interactions to make his point. The allocation of harvests among multiple species is one of his primary concerns.

The reader is reminded of the role of evolution, coevolution, and extinction with their concomitant tradeoffs—tradeoffs that, in principle, are as important and as numerous as all of the tradeoffs involved in the ecological complexity of ecosystems. Link mentions genetic effects and extinction on several occasions throughout the book so that the principles involved are acknowledged. That, however, is where Link stops in regard to his consideration of related issues. Dobzhansky (1973) then provides advice yet to be fully incorporated in the practical matter of management: "Nothing in biology makes sense except in the light of evolution."

In summary, we see this book as a valuable conceptual framework among a growing volume of work that contributes to meaningful understanding in the form of basic principles as they relate to the management of human impacts on ecosystems. Conventional thinking in regards to our understanding of ecosystems and management has taught us a lot but, as Gregory Bateson (1972) said: "The systemic view is something else again." It inherently and holistically accounts for all tradeoffs, principles, and complexity.

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The 2010–2011 Fenske Fellowship: New Perspectives in Fisheries Management

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The Great Lakes have been subject to increasing scrutiny in recent years as the world's largest supply of freshwater. Climate change, overexploitation, habitat degradation, and invasive species are just a few of the threats facing the region, with aquatic resources particularly in peril. In addition to supporting a multi-billion-dollar commercial and sport fishing industry, the Great Lakes sustain traditional subsistence activities that represent a way of life for many of the region's native people. Finding a balance between social, economic, and cultural values in a complex political arena is often a difficult but necessary task for natural resource managers. For natural resources in the Great Lakes where social, political, and economic boundaries frequently differ, a system of shared, cooperative management becomes absolutely essential. Such a system exists and has proven successful in northern Michigan where fishery resources are comanaged by five sovereign tribal governments and the state of Michigan.

FENSKE EXCELLENCE IN FISHERIES MANAGEMENT FELLOWSHIP

The Janice Lee Fenske Excellence in Fisheries Management Fellowship was established to honor the first female fisheries biologist in the history of the Michigan Department of Natural Resources (MDNR) and provides unique instructive opportunities that enhance personal and professional development in the field of fisheries science and management. Fellowship recipients work with mentors from a management agency and Michigan State University in a year-long project to address a specific need as identified by the management agency.

As a 2010–2011 recipient, my fellowship experience has taken me on a journey that began in 1836 when the U.S. government acquired a large tract of land in a treaty with the Ottawa and Chippewa tribes of the northern lower and eastern upper peninsulas of Michigan. Article 13 of the 1836 Treaty of Washington stipulates that the Tribes reserve hunting, fishing, and gathering rights on ceded lands "until the land is required for settlement." The scope of those treaty rights has been the subject of much debate over the last several decades, resulting in the negotiation of the 2007 Inland Consent Decree between the state of Michigan, United States, and five tribes involved in the 1836 Treaty. The agreement defines the extent of the tribes' Article 13 hunting and fishing rights on lands and inland waters within the ceded territory and seeks to provide long-term protection and stability of inland fishery resources under the separate jurisdictions of several sovereign governments.

The decree establishes protocols to coordinate and collaborate on the management of the 1836 treaty area, including annual reporting and communication requirements. In the years following the implementation of the decree, there has been a demonstrated need for a comprehensive report to evaluate how well those provisions have been met in an annual cycle. A primary objective of this fellowship is to develop an annual review template to summarize the implementation of the 2007 Inland Consent Decree, under the guidance of fellowship mentors MDNR Fisheries Division Tribal Unit Coordinator Nick Popoff and my Michigan State University graduate advisor, Dr. Daniel Hayes.

CONFLICT TO COOPERATION

Subsistence fishing has represented a way of life for Native Americans in the Great Lakes region for centuries. When the 1836 treaty was signed, the tribes retained hunting and fishing rights within the ceded territory; however, the Michigan Supreme Court declared in 1930 that Native Americans had no special hunting or fishing rights in the Great Lakes. It wasn't until 4 decades later that Bay Mills tribal member Albert "Big Abe" LeBlanc challenged the order by setting up gill nets in Lake Superior. The actions of LeBlanc eventually caused the Michigan Supreme Court to reverse its ruling and honor the 1836 treaty, a decision upheld by the federal government. Regardless, conflicts among state and tribal fishers continued, and in 1985 the U.S. District Court ordered the first of three consent decrees used to allocate fishery resources among the state and tribes in order to provide long-term stability and predictability of Michigan's valuable fishery resources.

Tribal fishing

First Nation fishing boat with fishermen

A long history of conflict and mistrust between Native Americans and the state and federal governments has created tense undercurrents that continue to challenge resource managers. Considered an outsider because I am not a representative of an agency signatory to the decrees, I was excluded from several meetings with state and tribal biologists. I've learned not to take this personally, because decades of tension are not easily forgotten, and strong professional relationships take time to develop and mature on a foundation of mutual respect. My work with Nick Popoff has taught me that these tensions can be overcome, and a healthy partnership between state and tribal governments is possible through effective collaboration, transparency, and a shared responsibility for—and authority in—decision making.

NEW PERSPECTIVES

Through this fellowship, I have learned that regardless of the governmental agency, the focus of fisheries management is more than just managing fish; it is heavily vested in managing people (i.e., the resource users themselves). My work with the MDNR has taught me how important perceptions and expectations of management are to stakeholders and that effective communication is absolutely essential for successful management. Policies must not only address and integrate stakeholder concerns; they must also be comprehensible and carefully explained to avoid misinterpretation. Strong communication strategies are especially important in comanaged systems. In northern Michigan, the tribes and the state work together to coordinate research, restoration, and enhancement activities, as well as share harvest and effort data, saving time and money in a weakened economy by eliminating administrative redundancies. Multiple stakeholder resource management can be complicated because policies may vary among state, provincial, tribal, and federal fisheries management agencies. As such, the process can benefit from the experiential learning of other systems and a shared knowledge base.

Dr. Hayes's scientific background and expertise added a decisive element to this project by provoking new ideas and inciting a truly interdisciplinary perspective. Partnerships in academia are becoming increasingly important in the management realm, because both sides have much to gain from cooperation, and in a rapidly changing environment, these types of networks are even more valuable. Beyond simply informing policy makers of the facts, scientists are increasingly engaging management by identifying policy alternatives or providing an outside perspective on an issue.

As an aspiring scientist, I have always appreciated the role of science in effective policy making; both science and management are important components in long-term sustainability of fisheries resources. Too frequently, however, the science is moderated by existing political values when, instead, scientific research should be the lens through which those values are shaped. In comanaged systems, cooperation in scientific research, independent of policy, can be an easy and effective tool to develop a larger, more efficient database for the mutual benefit of all parties involved. Problems seem to arise, however, when collaboration in research and management are intertwined, and the science can become the more tangible scapegoat for a deeper conflict arising from inherently different values. For example, in northern Michigan, tribal and state fisheries biologists coordinate and share data on walleye population dynamics in order to develop harvest limits and to continuously update Michigan walleye population estimates in lakes not surveyed. However, sometimes the parties won't agree to use the population estimates to set harvest limits or toward the development of population models, fearing what their possible effects may be to future walleye harvest limits.

Sound management cannot occur in the absence of sound science; however, the importance of stakeholder opinion cannot be undervalued either. Through this fellowship experience I have learned how imperative it is to acknowledge and appreciate the value that collaboration brings to the table. Jan Fenske understood the significance of this broader human dimension and always ensured that honesty and integrity formed the foundation for management in her trailblazing work for the MDNR Fisheries Division. Her legacy and commitment to aquatic resource management set an important example that influenced a generation and continues to inspire future fisheries professionals.

The Liturgy and Sacraments of Science for Naturalists, Poets, and Artists in Our Ranks

Donald C. Jackson

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We use the term "professional" a lot in the American Fisheries Society. It isn't a term to be used lightly because frankly, in my opinion, it denotes (or should) the deepest level of being: what we "profess" to be—our core identity.

Professionally, *I am not a scientist* (There—I've said it! I've come out of the closet!). I do science. I'm trained in science. I'm disciplined in science. I promote science. But, professionally I'm a naturalist who loves to paint pictures with words—to watch sunsets, feel the wind, paddle a canoe on a foggy morning, listen to the whisper of wings as waterfowl passes overhead, cast a fly to rising fish, and marvel at the fluid motion of a fine bird dog coursing the landscape. These are things that don't engage the quantitative assessments so important to science. They engage a very different realm of being—a different realm of relationships.

Many of us working in natural resources arenas didn't count and measure things as children. Rather, we collected things and put them in boxes. We wandered around in the woods and waded in creeks. We caught baby birds and rabbits and little fish and tried to keep them alive. We spent a lot of time looking at the tops of trees, at clouds, and at surf. It may never have entered our minds as children that counting and measuring things would some day become important to us. We were engaged in listening to the songs of the Earth. We were energized by those songs.

In my case, it wasn't that I had a math phobia. In fact, I was and still am pretty good at math. I didn't particularly like math, but then I didn't particularly dislike math. Math just was what it was. I was in graduate school before I realized that there was a lot of math (and statistics) in the natural sciences and that biologists used these tools extensively. Our science textbooks back then hardly even mentioned the scientific method. It was all about the names of things and theories. So, I tucked that math stuff, the counting, the measuring, the equations and processes, up into a corner of my brain, pulled the curtain, and moved on with life. Suffering in my own quiet bubble as a graduate student, I counted plankton and developed tables and figures for my thesis—but I was still more focused on the sirens that called to me from the mountains and rivers that surrounded our university than on scientific process. It was then, as a graduate student, that I realized that I could *do* science without *being* a scientist.

Soon after completing my M.S. degree, I joined the Peace Corps. I taught invertebrate zoology and limnology at the National University of Malaysia. A fellow Peace Corps Volunteer (PCV) taught mathematics. One day we were sitting on his front porch after climbing a mountain in Borneo and he showed me an equation he was developing.

"What does it do?" I asked. "What is it for?"

"It doesn't do anything," he replied. "It is just something beautiful and I'm trying to make it even more beautiful."

I was stunned. This guy was talking like an artist, composer, or poet. Something didn't fit. I couldn't get his words out of my mind—beauty in math? Somehow, in my way of thinking, there was a disconnect.

My roommate during my volunteer years was a PCV who taught statistics at the same university. He tried to talk to me about beauty extant in variance but that to see it, to truly understand it, it was necessary to clean the trash (i.e., experimental error) from around it. To him statistics was like a symphony. You set up the framework (the orchestra) and then address magnitude (F and p—interesting that statistics and music use the same letters), variance (ranges of instruments), and trend (movements). I was astounded by the common denominators. As my roommate talked, all I could think of was the glass bead game in Hermann Hesse's (1943) book *Das Glasperlenspiel* (*Magister Ludi*).

Then, following the Peace Corps, while in graduate school working on my Ph.D., my major professor stopped me in the hallway as I was about to walk out of our building. I was struggling through some pretty stiff challenges in a statistics course at that time and had final exams on the near horizon. I could do the math but it was all just numbers and formulae. I had no feeling at all about the material. I was just grinding my way through the course. My major professor sensed this.

"Don," he said, "one of these days variance is going to reach out to you. It will become personified. It will seek to be your friend, a friend opening a new dimension of life and meaning and understanding for you. If this doesn't happen you won't ever be much of a fisheries biologist." I had no response. He shrugged his shoulders and walked away.

Soon thereafter I read a passage by Daniel Simberloff (1980): "What the physicist views as noise is music to the ecologist." (Now, physicists are also listening to the music!)

When I read this passage by Simberloff, I experienced an epiphany. I understood for the first time the possibility of beauty in my Peace Corps friend's equation and my Peace Corps roommate's statistical "orchestra." The beauty of creation, the rhythms of the Earth that I'd celebrated through poetry and prose and music suddenly took on incredibly powerful new realms of being as my new friend, "variance," rushed out of the shadows and began to sing its song. It is a song that has endured throughout my career as a university professor.

Fast forward 30 years, to the beginning of this year's spring

semester. My department head came by my office for a visit. Our conversation evolved to the topic of professional training and career development in the natural resources fields. At one point in the conversation I told him exactly what I stated at the beginning of this essay: that professionally I wasn't a scientist, and that in spite of the inherent beauty that can be part of the scientific process, I cared about as much for engaging science as I do for engaging religion, which isn't much at all. He stood in my office door with a shocked look on his face. I rather enjoyed the precious moments of speechlessness as he sought to digest what he'd just heard from one of the department's senior professors.

"Yep," I said, "I don't care very much for engaging science and religion but I have great respect for what they can do and I like where they can take us."

It is only fair that I clarify my perspective on this. In fact, I was invited to write this essay in *Fisheries* for this very reason: that it might give other naturalists, poets, and artists (and perhaps even theologians) in our ranks some sense of peace, and still the trembling hearts of colleagues that are the result of deep questioning, questioning that even though they do science, perhaps they have been "fakes" because they are in love with something other than science. And you know something? For about half of my career I actually wondered if indeed I was a fake.

For the record, as a "fake," I'm officially a "distinguished professor" in my college with a shelf full of M.S. theses and Ph.D. dissertations behind my desk. They are testimony to lots of science and the fledging of many fine young professionals in fisheries. I am proud of the work my students and I have done. Together we've published a lot of stuff and most if it qualifies as scientific writing. I've taught lots of college courses in the sciences during my career. I've served on scientific review panels and on editorial boards for scientific journals. I'm also a past president of the American Fisheries Society. And with regard to religion, I have attended seminary, have served as the pastor of a church, and am an ordained elder in the Presbyterian Church.

So, here goes: Science, like religion, is an ordering process founded on trust. Within the process are sacraments (e.g., technology, experimental design, statistics, modeling) used for the discernment of truth that can (hopefully) lead to understanding and perhaps ultimately even take us into realms of meaning. From time to time there may be revelation. As in religion, there's a lot of blur around the edges of science, but generally there's enough light on the path for us to move ahead in the fog. As we work in the "church of reason" (sensu Persig 1974) we should be well versed in our sacraments and treat them with discipline and respect. Likewise, we should be well versed regarding our operational framework, our liturgy (i.e., the scientific method) within which the sacraments are typically expressed.

However, some words of caution are in order here. For some they may be words of assurance. When carefully addressed, liturgy within our church of reason can be very beautiful, and especially so for the scientists among us. But if the naturalists, poets, and artists among us focus too intently, or too long, on our liturgy, we risk getting hung up, short-stopped in the shadows of the temple's curtains, and our spirits fade. We can handle the liturgy just fine, but our approach is pretty straightforward. Tinkering with it isn't how we make our greatest contributions in science. We'll leave that to the scientists and love them for doing it! Likewise, spending a lot of time thinking about sacraments is, for me, akin to focusing on the head and handle of a hammer. There is certainly elegance in the tool but, as a naturalist who does science, I'd rather focus on the nail I'm trying to hit and think about what might result if I hit true and continue to pound nails—hopefully engaged in creative processes—and perhaps even advancing good relationships between humanity and the Earth.

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Please visit our website here to access the survey: http://www.surveymonkey.com/s/DK7HR5H

Thanks for your consideration. If you have any questions about this survey, email managing editor: sgilbertfox@fisheries.org

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Black Bass Diversity: Multidisciplinary Science for Conservation

A special symposium is being organized to be held in conjunction with the Southern Division American Fisheries Society (SDAFS) Annual Meeting in Nashville, TN in February 2013. This symposium will emphasize the conservation need and diversity of black basses (genus *Micropterus*) in their native habitats. Of the nine described species or subspecies of black bass in North America, three were described in the past 12 years and more possibly exist as undescribed species (e.g., Bartram's bass and Cuatro Ciénegas bass). Many black bass populations have conservation issues related to genetic integrity and habitat degradation. Building on previous work, this symposium will highlight the conservation of native black basses in an AFS publication that contains accounts related to:

- Biology/ecology/life history requirements
- Habitat management and restoration
- Conservation genetics
- Fish populations, fisheries, and human dimensions

The symposium organizers will target scientists for invited submissions to the symposium, but contributed abstracts that fit the theme of the symposium are encouraged and will also be considered for the symposium and book. If you are conducting research on a black bass species or unique population that can contribute to the understanding or conservation of black basses, feel free to contact the steering committee at BlackBassSymposium@myFWC.com for possible inclusion in the symposium. Authors of papers who want to be included in the publication must have their manuscript submitted by the date of the meeting.

Abstracts (in plain text or MS-Word) are to be submitted to BlackBassSymposium@myFWC.com by 10/31/2012 and must include:

1. Type of presentation preferred (oral or poster)
2. To be considered for publication? (yes or no)
3. Presentation topic (select from below)
   - Biology/ecology/life history requirements
   - Habitat management and restoration
   - Conservation genetics
   - Fish populations, fisheries, and human dimensions
4. Title, in upper/lower case format
5. Author(s) name(s) and affiliation(s) as they should appear
6. Name of presenter, mailing address, phone, and email
7. Text of abstract in 300 words or less.

JOURNAL HIGHLIGHTS
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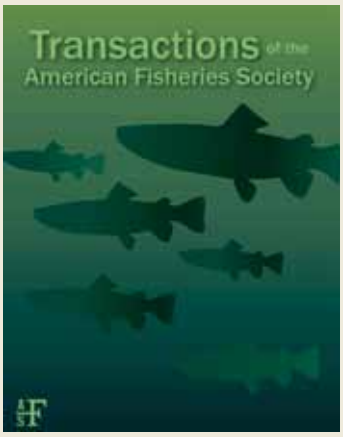


Optimal Suturing Technique and Number of Sutures for Surgical Implantation of Acoustic Transmitters in Juvenile Salmonids. *Katherine A. Deters, Richard S. Brown, James W. Boyd, M. Brad Eppard, and Adam G. Seaburg. 141: 1–10.*

Accounting for Tag Loss and Its Uncertainty in a Mark–Recapture Study with a Mixture of Single and Double Tags. *Saang-Yoon Hyun, Joel H. Reynolds, and Peter F. Galbreath. 141: 11–25.*

Do Behavioral Syndromes Affect Foraging Strategy and Risk-Taking in a Juvenile Fish Predator? *Michael A. Nannini, Joseph Parkos III, and David H. Wahl. 141: 26–33.*

Occupancy Modeling and Estimation of the Holiday Darter Species Complex within the Etowah River System. *Gregory B. Anderson, Mary C. Freeman, Megan M. Hagler, and Byron J. Freeman. 141: 34–45.*

Population Structure and Evolutionary History of Southern Flounder in the Gulf of Mexico and Western Atlantic Ocean. *Joel D. Anderson, William J. Karel, and Allison C. S. Mione. 141: 46–55.*

Past and Present Processes Influencing Genetic Diversity and Effective Population Size in a Natural Population of Atlantic Sturgeon. *G. R. Moyer, J. A. Sweka, and D. L. Peterson. 141: 56–67.*

Smoltification in an Impounded, Adfluvial Redband Trout Population Upstream from an Impassable Dam: Does It Persist? *Dean E. Holecek, Dennis L. Scarnecchia, and Shannon E. Miller. 141: 68–75.*

[Note] Low Juvenile Pinto Abalone Haliotis kamtschatkana kamtschatkana Abundance in the San Juan Archipelago, Washington State. *Joshua V. Bouma, Don P. Rothaus, Kristina M. Straus, Brent Vadopalas, and Carolyn S. Friedman. 141: 76–83.*

Assessing Effects of the Nonindigenous Pike Killifish on Indigenous Fishes in Tampa Bay, Florida, Using a Weighted-Evidence Approach. *Marin F. D. Greenwood. 141: 84–99.*

Effects of Suture Material and Ultrasonic Transmitter Size on Survival, Growth, Wound Healing, and Tag Expulsion in Rainbow Trout. *Tomas J. Ivasauskas, Phillip W. Bettoli, and Thomas Holt. 141: 100–106.*

[Note] Influence of Turbidity on the Foraging of Largemouth Bass. *Thad W. Huenemann, Eric D. Dibble, and Jonathan P. Fleming. 141: 107–111.*

Habitat Selection and Movement of Naturally Occurring Pallid Sturgeon in the Mississippi River. *Brian Koch, Ronald C. Brooks, Amanda Oliver, David Herzog, James E. Garvey, Robert Hrabik, Robert Colombo, Quinton Phelps, and Timothy Spier. 141: 112–120.*

Assessing Freshwater and Marine Environmental Influences on Life-Stage-Specific Survival Rates of Snake River Spring–Summer Chinook Salmon and Steelhead. *Steven L. Haeseker, Jerry A. McCann, Jack Tuomikoski, and Brandon Chockley. 141: 121–138.*

Effect of Experience with Predators on the Behavior and Survival of Muskellunge and Tiger Muskellunge. *David H. Wahl, Lisa M. Einfalt, and Douglas B. Wojcieszak. 141: 139–146.*

Quantifying Mortal Injury of Juvenile Chinook Salmon Exposed to Simulated Hydro-Turbine Passage. *Richard S. Brown, Thomas J. Carlson, Andrew J. Gingerich, John R. Stephenson, Brett D. Pflugrath, Abigail E.Welch,Mike J. Langeslay, Martin L. Ahmann, Robert L. Johnson, John R. Skalski, Adam G. Seaburg, and Richard L. Townsend. 141: 147–157.*

Bioenergetics and Population Dynamics of Flannelmouth Sucker and Bluehead Sucker in Grand Canyon as Evidenced by Tag Recapture Observations. *Carl J. Walters, Brett T. van Poorten, and Lewis G. Coggins. 141: 158–173.*

Effects of Smallmouth Bass on Atlantic Salmon Habitat Use and Diel Movements in an Artificial Stream. *Gus Wathen, Joseph Zydlewski, Stephen M. Coghlan Jr., and Joan G. Trial. 141: 174–184.*

A Method for an Image-Analysis-Based Two-Dimensional Computational Fluid Dynamics Simulation of Moving Fish. *Justin W. Garvin, Ozge Kureksiz, Philip J. Breczinski, and Mona K. Garvin. 141: 185–198.*

[Note] Does Anaerobic Activity Differ Seasonally or between Sexes in Yellow Perch Populations? *Casey W. Schoenebeck and Michael L. Brown. 141: 199–203.*

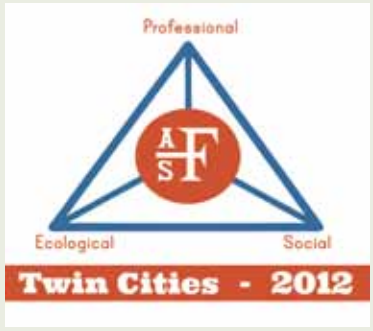
Exploring Mechanisms Underlying Sex-Specific Differences in Mortality of Lake Michigan Bloaters. *David B. Bunnell, Charles P. Madenjian, Mark W. Rogers, Jeffrey D. Holuszko, and Linda J. Begnoche. 141: 204–214.*

Modeling Habitat Selection of a Top Predator: Considering Growth and Physical Environments in a Spatial Context. *Cassandra J. May, D. Derek Aday, R. Scott Hale, Jonathan C. S. Denlinger, and Elizabeth A. Marschall. 141: 215–223.*

Effects of Stocking Catchable-Sized Hatchery Rainbow Trout on Wild Rainbow Trout Abundance, Survival, Growth, and Recruitment. *Kevin A. Meyer, Brett High, and F. Steven Elle. 141: 224–237.*

Modeling the Effect of Environmental Parameters on Feeding Ecology of the Shortnose Sturgeon in the Saint John River, New Brunswick. *Sima Usvyatsov, James Watmough, and Matthew K. Litvak. 141: 238–256.*

AFS 2012 Annual Meeting
Minneapolis–St. Paul, August 19–23, 2012
Scheduled Symposia



1. Biology and Control of Invasive Fishes: Lessons Across Species and Regions
2. Teaming up Atlantic and Pacific Salmonid Biologists to Enhance Recovery of Endangered Salmon in North America
3. Understanding the Ecological and Social Constraints to Achieving Sustainable Fisheries Resource Policy and Management
4. The Role of Molecular Genetics in Fisheries Management in the Great Lakes Region
5. Valuing Alternative Views in Fisheries Management
6. Effects of Anthropogenic Chemicals on Chemosensation and Behavior in Fish: Organismal, Ecological, and Regulatory Implications
7. Advances in Telemetry in the Great Lakes and Beyond
8. Development of Sustainable Fisheries Resources Internationally: Useful Tools in Simulations, Modeling, and Planning.
9. Innovations in Thermal Research and Ecological Effects of Thermal Discharges
10. Existing and Evolving Relationships in Fisheries: Influence on Gulf of Mexico Research, Restoration and Conservation Following the Deepwater Horizon Oil Spill
11. Fisheries Data Dissemination – Building Better Networks
12. Diel Vertical Migration: Scaling Down From Populations to Individuals
13. Comparing and Contrasting Fisheries Research and Management Paradigms Across Marine and Freshwater Ecosystems
14. Science Communication: Information Delivery and the New Face of 21st Century
15. Calibration, Validation and Other Recent Progress on the AFS Standard Methods for Sampling Freshwater Fish.
16. The Interdependence of Fish Populations and Their Food Webs in Temporally Varying Environments.
17. Free Data: Opportunities in Open-Access Network Databases to Advance Spatiotemporal Scales of Inquiry in Fisheries Science
18. Making Native Fish and Their Habitat Relevant: Contemporary Challenges and Creative Solutions to Generate Broad Public Interest
19. Stakeholder Involvement in Fisheries Science: New Approaches and New Partnerships
20. Wildlife and Sport Fish Restoration 75th Anniversary
21. Fishery Information Networks As Agents of Change
22. Effects of Climate and Land Use Changes on Fish and Fish Habitat in Streams and Lakes: Special Emphasis on Strategies for Fisheries Management and Conservation
23. Connectivity in Coastal and Estuarine Ecosystems: Patterns, Processes and Consequences
24. Fish Habitat Condition Assessment in the Midwest and Great Plains
25. Standardization in Hydroacoustic Assessments: Fundament or Folly?
26. Understanding Complex Linkages Between Fish and Fisheries in a Changing Ocean
27. Upper Mississippi River Restoration: Combining Habitat Rehabilitation, Monitoring, and Research to Enhance Fish Communities.
28. Moving Beyond Distribution and Abundance in Quantifying Fish Habitat Selection
29. Lake Trout East and West: What Can We Learn by Comparing Lake Trout Restoration in the Eastern USA to Lake Trout Suppression in the Western USA?
30. Role of Forage Species in Ecosystem Approaches to Management
31. New Perspectives in Fish Habitat: Remote Sensing, Modeling, and Scaling
32. Great Lakes Fish Communities: Tales, Lessons, and Futures
33. Fish Habitat and the American Reinvestment and Recovery Act of 2009
34. Double-Crested Cormorants and Fisheries Management: Policy, Perceptions, and Research
35. The National Fish Habitat Partnership – Building Relationships to Enhance Conservation of Aquatic Ecosystems
36. Achieving Sustainability – Connecting the Environment with the Economy At a Bioregional Scale
37. The Future of Fishing: Leisure, Sport and Conservation
38. Science and Management Community Aquatic Habitat Connectivity Discussion
39. Collaboration Through Fisheries Networks: Restoration of Sturgeon and Paddlefish Populations
40. Missouri and Mississippi River Flooding 2011: Impacts of Historic Flows on Big River Systems
41. The NOAA Habitat Blueprint: Improving Fisheries, Marine Life, and Coastal Communities Through Habitat Conservation
42. The New Food Web: Emerging Methods for Bringing Together Social and Ecological Networks
43. Science That Informs Policy – An Evolving Opportunity for Scientists and Decision Makers
44. Linking Land Use and Water Quality: Fisheries Management Beyong the Aquatic Zone
45. Making the Connection: Land, Water, and Sustainable Fisheries"
46. Climate and Fisheries: Responses of a Socio-Ecological System to Global Change
47. Geomorphic-Based Design Responses to Natural Disasters
48. Constructing Fish Passage Projects

(List current as of 2/19/2012)

53rd American Fisheries Society (AFS) | Fish Health Section Meeting

New This Year - Attend Several Aquatic Animal Health Events
& Reduce Your Carbon Footprint - All Held in La Crosse, Wis.!

Great Lakes Fish Health Committee Meeting
Radisson Hotel, La Crosse, Wis.
July 30-31, 2012
&
Veterinary Workshop on Fish Regulatory Medicine
Radisson Hotel, La Crosse, Wis.
July 31, 2012
&
18th Annual USFWS Aquaculture Drug Approval Coordination Workshop
Radisson Hotel, La Crosse, Wis.
July 31, 2012
&
53rd American Fisheries Society (AFS) | Fish Health Section Meeting
Radisson Hotel, La Crosse, Wis.
July 31-August 3, 2012

Tentative AFS Fish Health Section Meeting Agenda

Tuesday, July 31, 2012
5-7 p.m. Registration
6-9 p.m. Social/Reception/Poster Set-up

Wednesday, August 1, 2012
8-9 a.m. Registration
8 a.m. – 5 p.m. Sessions:
- Aquaculture Drug Research & Development
- Emerging Fish & Aquatic Animal Pathogens
- Amazing and Challenging Diagnostic Cases

6-7 p.m. Poster Session
7-9 p.m. Banquet

Thursday, August 2, 2012
8-9 a.m. Registration
8 a.m. – 5 p.m. Sessions:
- Bacteriology
- Virology
- Parasitology
- Introduced Pathogens and their Ecological Consequences

5 p.m. Poster take down
6-7:30 p.m. Mississippi River Backwater Cruise

Friday, August 3, 2012
8-9 a.m. Registration
8 a.m. – 5 p.m. Continuing Education Course:
Molecular Diagnostic Tests for Aquatic Animal Pathogens:
Regulatory Perspectives, Current Methods and Emerging Technologies

Radisson Hotel with spectacular views of the Mississippi River (Photo courtesy of the Radisson).

For more information about La Crosse, WI, the meeting venues, registration, accommodations and travel arrangements, please visit the website: http://www.uwlax.edu/conted/fish/index.htm

To submit upcoming events for inclusion on the AFS web site calendar, send event name, dates, city, state/province, web address, and contact information to sgilbertfox@fisheries.org.

(If space is available, events will also be printed in Fisheries magazine.)

More events listed at www.fisheries.org

CALENDAR
Fisheries Events

DATE	EVENT	LOCATION	WEBSITE
May 7–11, 2012	6th World Fisheries Congress	Edinburgh, Scotland	www.6thwfc2012.com
May 14-17, 2012	Washington-British Columbia Chapter Annual General Meeting	Victoria, BC, Canada	agm2012.wabc-afs.org
May 15–May 18, 2012	Beyond Borders 2012	Victoria, BC, Canada	www.ser.org/sernw/Conference_2012.asp
May 21–25, 2012	Planning and Executing Successful Rotenone and Antimycin Projects	Utah State University, Logan, UT	http://www.fisheriessociety.org/rotenone
May 27–May 31, 2012	Canada's First National Fish and Wildlife Conservation Congress	Ottawa, ON, Canada	www.afs-oc.org/events.htm
June 5–7, 2012	National Conference on Engineering and Ecohydrology for Fish Passage	Amherst, Massachusetts	http://www.umass.edu/tei/conferences/FishPassage
July 2-6, 2012	36th Annual Larval Fish Conference	Osøyro, Norway	www.larvalfishcon.org
July 15–July 19, 2012	10th International Congress on the Biology of Fish	Madison, WI	conferencing.uwex.edu/conferences/icbf2012/index.cfm
August 19–23, 2012	142nd Annual Meeting of the American Fisheries Society	Minneapolis-St. Paul, MN	www.afs2012.org
September 17-21, 2012	ICES Annual Science Conference 2012	Bergen, Norway	www.ices.dk

Professional

Ecological Social

Twin Cities - 2012

The American Fisheries Society Annual Meeting in the Twin Cities in 2012 provides a great opportunity for groups to host workshops, alumni gatherings, technical work groups and other meetings in conjunction with the main conference.

To host an event or gathering at Twin Cities 2012 between August 18 to 23, you need to register with conference planners no later than July 6th. Events will be scheduled on a first come, first served basis.

To register and request information contact: Henry Van Offelen, **henry.vanoffelen@gmail.com**

Or visit the AFS2012 website at **www.afs2012.org** and click "Associated Meetings" for a registration form.

Employers: to list a job opening on the AFS online job center submit a position description, job title, agency/company, city, state, responsibilities, qualifications, salary, closing date, and contact information (maximum 150 words) to jobs@fisheries.org. Online job announcements will be billed at $350 for 150 word increments. Please send billing information. Listings are free (150 words or less) for organizations with associate, official, and sustaining memberships, and for individual members, who are faculty members, hiring graduate assistants. if space is available, jobs may also be printed in *Fisheries* magazine, free of additional charge.

Assistant/Associate Professor in Aquatic Sciences
Texas Tech University
Permanent

Salary: Salary will be competitive and commensurate with qualifications and experience. Eligible for generous benefit package available to faculty members at Texas Tech University.

Closing: 5/1

Responsibilities: Teaching may include undergraduate course in Freshwater Bioassessment and graduate class in area of expertise and interest. Incumbent will develop and maintain research program. Service activities for the department, college, and university are expected.

Qualifications: Strong commitment to research and teaching Ph.D. degree in fisheries, aquatic sciences or closely related field. Preference given to field-oriented scientists with expertise in fish population/conservation genetics native species limnology environmental flows impacts of climate variability or human dimensions.

Contact: Reynaldo Patino, Search Committee Chair, Department of Natural Resources Management, Texas Tech University, Box 42125, Lubbock, Texas 79409, Ph: 806-742-2851.

Link: http://jobs.texastech.edu; When accessing website, please consult requisition number 85072.

Email: reynaldo.patino@ttu.edu

MS Graduate Research Assistant
Pennsylvania State University, State College, PA
Student

Salary: $20,000/year, plus tuition coverage and benefits

Closing: Until filled

Responsibilities: A MS research assistantship is available at the Pennsylvania Cooperative Fish Wildlife Research Unit. The successful applicant will work on a collaborative project with the National Park Service to characterize resident fish communities in headwater streams located in the Eastern Rivers and Mountains Network. The successful applicant will develop a quantitative framework for assessing the ecological condition of headwater stream fish communities.

Qualifications: BS degree in Fisheries, Biology, Ecology, or a related field, a GPA of 3.0 or greater and competitive GRE scores. Additional information can be found at http://www.sfr.cas.psu.edu/Students/Admissions.html. Applicants must be highly motivated and capable of working independently. The most qualified applicants will have a strong quantitative background and experience with wadeable stream fish sampling and fish identification. To apply, email a cover letter describing research experience and interests, CV, transcripts, GRE scores, and contact information of three references to Dr. Tyler Wagner to below email.

Contact: Tyler Wagner, PhD, at txw19@psu.edu

Link: http://www.coopunits.org/Pennsylvania/People/Tyler_Wagner/index.html

Fish Culturist
Macaulay Salmon Hatchery, Juneau, AK
Permanent

Salary: DOE. Benefits include medical, dental and life insurance, 403b retirement plan, paid annual, sick and holiday leave.

Closing: Until filled

Responsibilities: Macaulay Salmon Hatchery, Juneau, Alaska. Operated by Douglas Island Pink Chum, Inc. Full-time permanent position involved in all aspects of chum, Chinook coho salmon culture.

Qualifications: Minimum of one year of hatchery experience as a fish culturist. Graduation from an accredited college with an Associates or Bachelors degree in aquaculture or fisheries technology may be considered as additional experience. Must be in good physical health and be able to work in inclement weather. Supervisory and computer experience desirable.

Contact: Submit resume along with verbal or written notification to: Andrew Ollenburg, Hatchery Manager, at below email or Douglas Island Pink and Chum, 2697 Channel Dr., Juneau, Alaska 99801, or phone 907 463-1634.

Link: www.dipac.net

Email: andrew_ollenburg@dipac.net

Post-Doctorate Research Associate
Fisheries Biologist Pacific Northwest National Laboratory, Richland, Washington
Temporary

Salary: TBD

Closing: Until filled

Responsibilities: Lead and assist on a variety of field and laboratory fisheries research topics including acoustic and radio telemetry of salmonids and effects of barotrauma and shear forces on fish physiology and ecology. Require handling fish, conducting in-depth necropsies, field deployment of telemetry gear and assisting or supervising surgical implantation of transmitters in fish, data processing and analysis, reporting and writing journal articles.

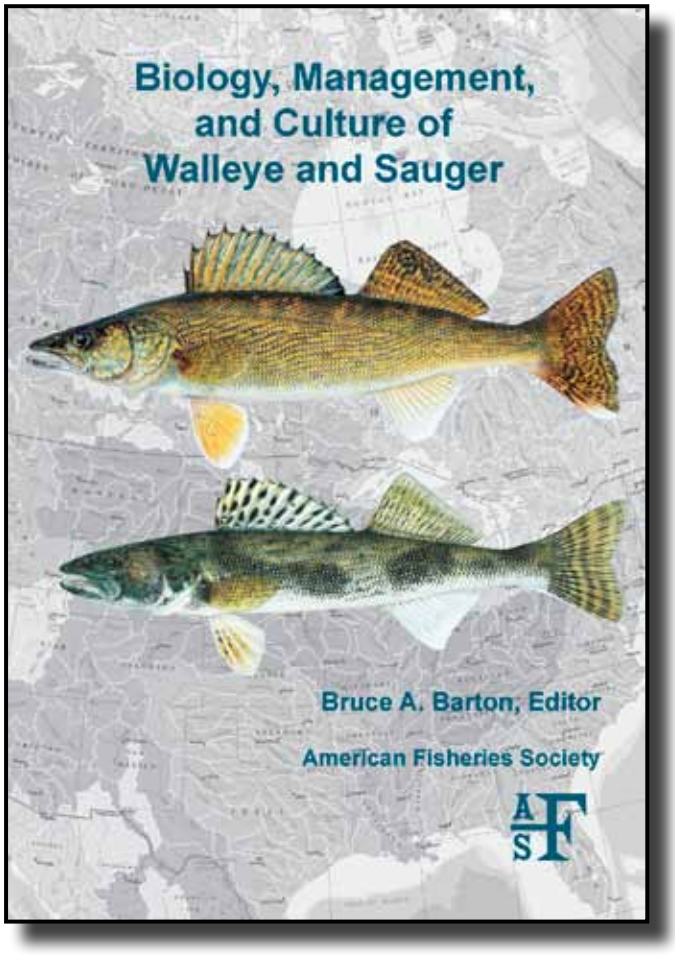
Qualifications: The candidate will have a PhD in biology or a fisheries-related field. Knowledge of fish physiology, anatomy, and telemetry techniques, surgical implantation of transmitters, data management, and statistical analysis is necessary. Experience with preparing written technical reports and peer-reviewed journal articles are desirable. The ability to work well in a team setting is necessary.

Contact: Dr. David Geist at david.geist@pnnl.gov

Link: www.jobs.pnnl.gov, Reference job posting #301480

Biology, Management, and Culture of Walleye and Sauger

Edited by Bruce A. Barton



570 pages, index
List price: $79.00
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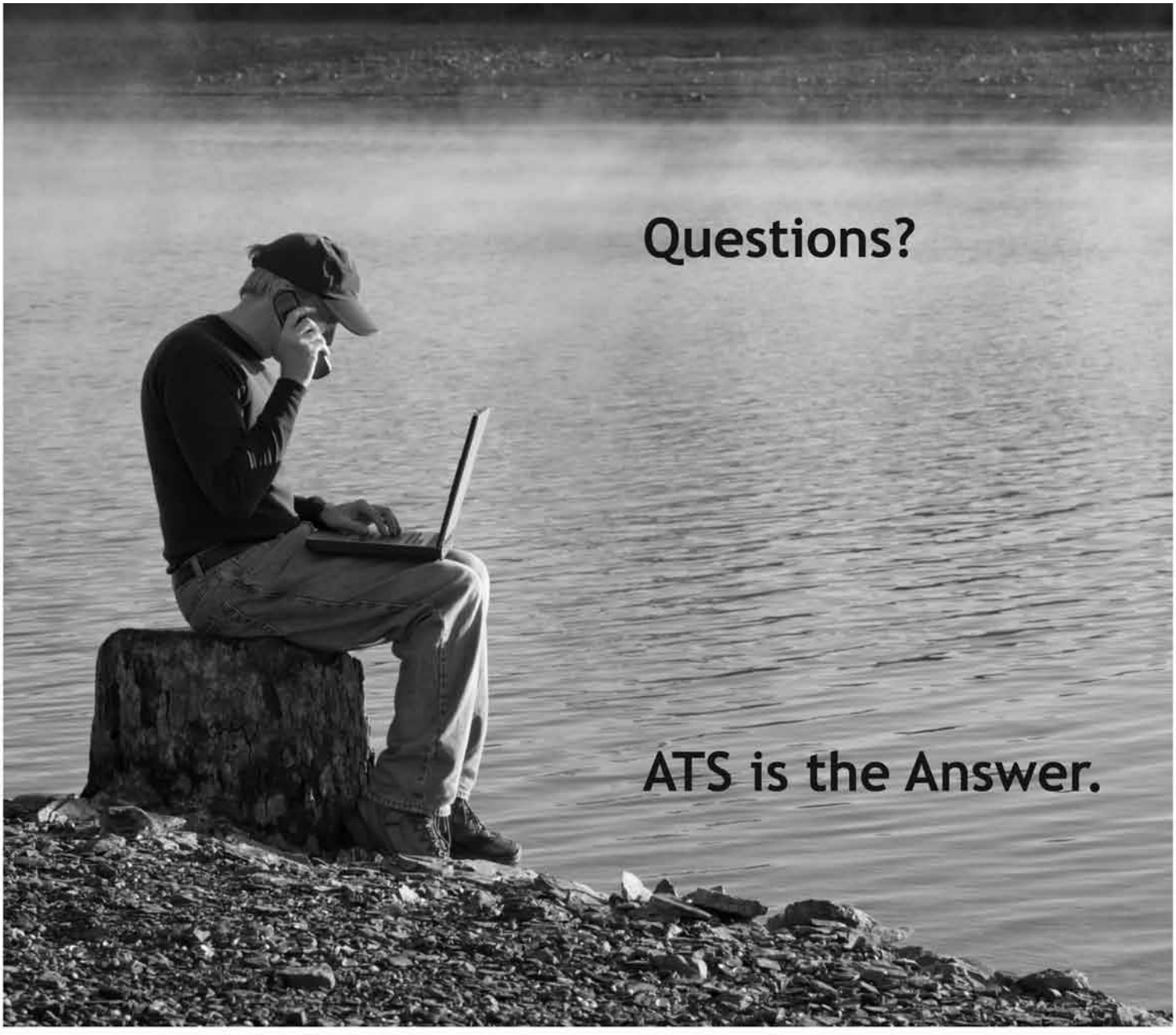
This new compendium serves as a single comprehensive source of information on the biology, ecology, management, and culture of walleye and sauger in North America.

Early chapters cover *Sander* systematics, including osteological evidence and molecular and population genetics and recent advancements in stock identification. Extensive information is documented on habitat requirements for various life history stages and how these stages can be influenced by environmental perturbations. Other chapters describe environmental biology and feeding energetics, and provide details on walleye and sauger life histories, walleye population and community dynamics in lakes that reflect the influence of lake size, fishing methods, and various management techniques using case histories, and exploitation from recreational, commercial, aboriginal, and mixed fisheries. Harvest regulations, sampling procedures, and their effectiveness are also reviewed and evaluated. Final chapters review and analyze stocking procedures, marking techniques, ecological effects of stocking, and the state of the art of walleye and hybrid walleye culture.



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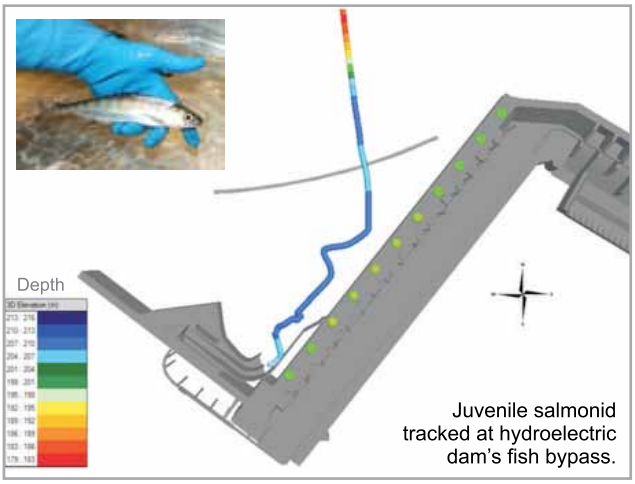
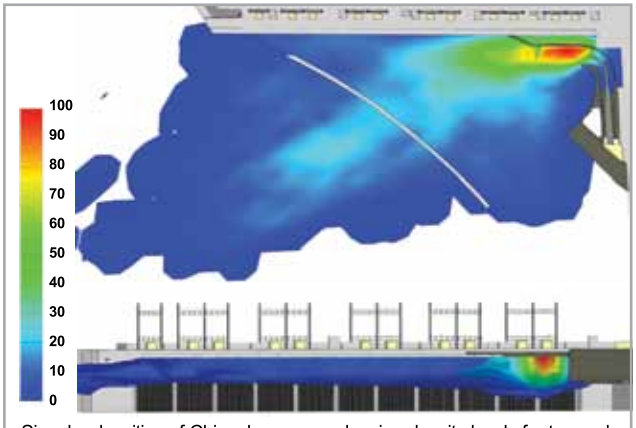
Helping Chelan County Public Utility District Reach Their Fisheries Survival Goals

Courtesy: Chelan Co. PUD No.1



Juvenile salmonid tracked at hydroelectric dam's fish bypass.



Singular densities of Chinook passage showing density levels for top and side view during both day/nighttime hours combined at Rocky Reach Dam, spring 2011.

Rocky Reach and Rock Island dams are located on the Columbia River, near Wenatchee, WA. Both hydroelectric facilities are owned and operated by Chelan County Public Utility District No. 1 (CPUD). Since the early 1980's CPUD has been exploring ways to enhance juvenile salmon and steelhead downstream migration at their facilities. A long-term habitat conservation plan for protection of salmon and steelhead, including species not currently listed as endangered species, was developed through partnerships with federal, state, and tribal entities responsible for salmon resource management and protection.

In order to evaluate the success of measures taken to increase survival of juvenile salmonids, CPUD required empirical evidence on route specific passage for both Rocky Reach and Rock Island dams. This included measurement of fish bypass efficiency, behavior, and survival. Acoustic tag studies conducted between 2003-2011 provided results related to the development of these protocols, including the three-dimensional swimming paths for each tagged fish approaching the dam.

To reach their objectives, HTI's *Model 290 Acoustic Tag Tracking System* was used. Acoustic tag systems determined the presence/absence of tagged fish and also remotely monitored their 3D behavior in high-resolution. The acoustic tags which operated at 307 kHz have been found to be an optimum frequency with respect to detection ranges and resolution at hydropower dams. All hydrophones operated 24 h/d, 7 d/wk for nearly 3 months each spring. Without tag collisions or false-positives, the resulting acoustic tag data provided salmon and steelhead migration paths for the studies.

Data from the 2003-2011 seasons provided the scientific information for CPUD to assess whether they had effectively met the survival standards set by the utility's federal Habitat Conservation Plan. In 2010 it was determined that Rock Island dam had met the survival requirement for spring salmon and steelhead migrations. The requirements were met in 2011 at Rocky Reach dam. All of these studies were conducted using HTI's *Model 795 Acoustic Tags*.

CPUD is nationally recognized for their dedication to the environment and HTI is honored to support their research efforts. For more details about the tools and techniques used, contact HTI at (206) 633-3383 or support@HTIsonar.com.

Know where fish go.
See fish tracks in motion at
YouTube.com/HTIsonar1

Track Fish Survival, Passage & Behavior with High-Resolution 3D Acoustic Telemetry

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