Factors Influencing Membership of USFWS and USGS Biologists in AFS

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Breaksea cod (Epinephelides armatus) showing signs of barotrauma.
Credit: Recfishwest, Australia
In this article, I review an important issue about the adoption of policy positions by a professional scientific society such as AFS: the fine line between scientific objectivity and advocacy. Conveniently for me, there is an ongoing debate about this very issue in the journals of the Society for Conservation Biology and some of the protagonists are well-known AFS members. One focus of this debate is the conflict between economic growth and conservation (Czech 2007) and the degree to which professional scientific societies may be involved in advocacy and still maintain scientific credibility with policy and decision makers (Scott et al. 2008). This seems on the surface a simple dichotomy, as it is the difference between using science to actively support a particular cause with respect to a resource issue (clearly advocacy) and providing objective scientific information on an issue and encouraging the decision makers to find a solution that yields the best outcome for the natural resource (in my mind, the role of a professional society like AFS). A professional society has to be very careful not to engage in the former position because (a) you marginalize your science and professionalism, and (b) you could lose your status as a professional society with regulators and affect your non-profit status.

Interestingly, the same conundrum plagues an individual scientist as well; how far can you go in supporting your personal resource agenda before your “objective science” is brought into question by your peers and the public? The problem runs deeper than that. Non-objective science has crept into the scientific literature in the form of value-laden words that are subtle forms of policy preference (Lackey 2007). Scott et al. (2007) reviewed 45 research papers published in 6 major natural resource journals between 2000 and 2004, including our own North American Journal of Fisheries Management, to look for evidence of policy advocacy. Our journal contained some evidence of both “normative science” and “stipulated policy preference.” Of course NAJFM is a management journal that engages in scientific research on policy alternatives, frequently by fisheries biologists employed by agencies with particular policies to test or defend. However, according to Lackey (2007), in presenting our science we should try to avoid “normative science” which is “an assumed, usually unstated, preference for a particular policy or class of policy choices.” It is easy for a biologist to fall into the use of such language. For example, you exhibit what Lackey calls “stealth policy advocacy” if in a scientific paper on the wilds of North America you say that a particular environment ought to be maintained in the “pristine” state that existed before European settlement. That would qualify as an unstated policy preference on your part. So, what is an appropriate role for a scientist or a professional society at the science-policy interface?

Should we stay out of the policy arena altogether and just put our science out there and let it be used, or not, in the development of important resource policy decisions, or should we actively engage in advocating particular resource policy positions? Scott et al. (2008) provide advice in their article on the roles and responsibilities of scientists and professional scientific societies at the science-policy interface. In their view, scientists and professional societies should engage in policy development but they must be careful how they do it. They point out that science is just one of the factors that decision makers must take into account in the development of policies and management strategies. The role of science is to inform policy development at every step where it can have an impact on the outcome. Here, inform means to provide the science analysis of all sides of the issue to all stakeholders in the discussion—objective scientific analyses of various policy outcomes. Scott et al. (2008) recognize my simplistic view stated above as just the two endpoints of a continuum for how scientists and professional societies might interact with policy makers. In their analysis they call for the presentation of science in easy-to-understand language that is unbiased, clearly objective, and available to all stakeholders with the policy implications clearly stated. Further they suggest that a professional society should use every mechanism such as synthesis white papers, newspaper

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The spectacular modern waterfront of Yokohama, Japan, bustled with more than 1,600 scientists from 56 countries who gathered for the Fifth World Fisheries Congress from 20–23 October 2008. More than 500 of the attendees were students. The theme of the meeting was “Fisheries for Global Welfare and Conservation.” Each day opened with plenary lectures by world-renowned scientists, followed by 11 concurrent oral sessions, a large poster session, and a teeming trade show. The oral and poster presentations were organized into themes such as fisheries and fish biology; aquaculture; biotechnology; post-harvest science and technology; material cycling in aquatic ecosystems; linking climate change and fisheries; freshwater, coastal and marine environment; biodiversity and management; fisheries economics and social science education; and international cooperation. Continuing education workshops were also held, including a GIS workshop organized by members of the AFS Fisheries Information and Technology Section.

One highlight of the meeting was the attendance of the Emperor and Empress of Japan. AFS Past President and World Council of Fisheries Societies Vice President Barb Knuth gave formal remarks before the Emperor, who then in turn addressed the Congress on the importance of fisheries sustainability, including habitat protection. Emperor Akihito is an ichthyologist with expertise on gobies.

The Congress banquet included the presentation of the first International Fisheries Science Prize to Kurt Fausch of Colorado State University for his outstanding contribution to global fisheries and conservation. In 2007, the AFS International Fisheries Section approved the prestigious International Fisheries Science Prize to be supported from the Carl R. Sullivan International Endowment Fund, to honor an organization or individual for contributions to fisheries sciences or conservation at the global level. This prize is to be presented once every four years at the meetings of the World Fisheries Congress. Six impressive nominations from five countries (Australia, India, Japan, Russia, and United States) were received for the first prize. The International Fisheries Science Prize Committee was composed of individuals from the AFS International Fisheries Section and an additional reviewer representing the World Council of Fisheries Societies. This year’s prize included a commemorative engraved bronze medal and an honorarium for $3,000 USD.

Fausch’s research has had international significance since the publication of his doctoral work on salmonid habitat use and competition in 1981, which informed and inspired work on similar problems in North America, Europe, Japan, Australia, New Zealand, and elsewhere that continues today. Since that time his influential efforts have

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European Union reaches agreement on 2009 fish quotas

EU fisheries ministers reached an agreement in late December 2008 on the 2009 fish quotas. According to the 2009 quotas, North Sea cod quotas will be raised by 30% from 2008 levels, while other Atlantic fishing zones will see quotas cut an average of 25%, with the exception of the Celtic Sea south of Ireland. Herring quotas for the zone west of Scotland were cut by 20% from 2008 levels.

Fishers are obligated to use nets and gear that allow more targeted catches so that they can avoid wasteful discarding. This will help to reduce discarding, which can make up half the fish caught on average.

United States to pay British Columbia fishing industry

The U.S. government will give $30 million to compensate the British Columbia fishing industry for dramatic cuts in salmon fisheries. This financial transfer is one of several changes that took effect in the Pacific Salmon Treaty at the beginning of this year.

The most notable other change is the significant reduction to the Chinook harvest in southeast Alaska and off the west coast of Vancouver Island. As much as 75% of the Chinooks caught off Vancouver Island are bound for U.S. waters with some of those salmon being listed under the U.S. Endangered Species Act. However, the Canadian government has not listed the salmon as endangered. The renewed treaty will mean a 30% reduction this year off Vancouver Island and a 15% cut for Alaskan fishermen. Most of the U.S. funding will go toward the loss in the Chinook salmon catch off the west coast of Vancouver Island, with the funds supporting a transition in British Columbia fisheries hurt by the conservation measures.

The changes to five chapters of the treaty took effect 1 January 2008 and include new sockeye harvest agreements on the rivers shared by Yukon and Alaska, and an agreement on a catch ceiling for U.S. fishermen for Fraser River chum. The Canadian and U.S. governments will also each contribute $7.5 million for other programs aimed at helping the recovery of salmon stocks along the Pacific coast.

The Pacific Salmon Treaty was first signed in 1985 to provide the framework allowing Canada and the U.S. to jointly conserve and sustainably manage migratory Pacific salmon.

Pakistani government plans to ban use of small fishing nets in sea

A committee of officials from Sindh and Balochistan, formed by the Pakistani government, met in early January to discuss proposals for legislation that would ban the use of small fishing nets in the sea. The use of small nets has caused a considerable decline in the number of small fish and resulted in depletion of stocks in these provinces of Pakistan.

The meeting resulted in a revision of the current catch rates and allowed deep sea fishing beyond an area 20 nautical miles from the coastline. According to the Food and Agriculture Organization, in the early parts of this decade, Pakistan recorded a marine catch of 420,000 metric tons per year, with about 20% being exported. About 60% of non-exported marine fishery catch is used to produce 37,000 tons of fishmeal, most of which is used as poultry feed at home. Only 160,000 tons of marine fishery production is consumed domestically every year.

GAO finds administration failed to protect marine mammals from commercial fishing

The Government Accountability Office (GAO) recently made public a report that concludes that the National Marine Fisheries Service (NMFS) has been inadequate in meeting its obligations to protect marine mammals from incidental injury or death resulting from commercial fishing activities.

Marine mammals that inhabit waters near commercial fishing can become entangled in fishing gear, often referred to as "incidental take." The Marine Mammal Protection Act (MMPA) requires NMFS to establish teams of experts from the scientific community and the fishing industry to devise methods to reduce incidental deaths of these species.

The GAO report found that NMFS has failed to establish such teams for nearly half of the marine mammal stocks afforded protection under the MMPA, leaving these species jeopardized by commercial fishing activities.

Maine considers steps to protect lobsters

Concern over an increased fishing effort has prompted the National Marine Fisheries Service (NMFS) to seek public comment on a proposal to restrict future access to the American lobster trap fishery in the inshore Gulf of Maine.

It is estimated that each American lobster trap remains in the water about 30% longer than in 1970 before being hauled. Current fishing effort removes a large proportion of lobsters before they have had a chance to spawn even once, and the average size of lobsters landed continues to drop.

NMFS aims to discourage American lobster non-trap vessels from entering the lobster trap fishery, and discourage American lobster trap vessels fishing in other lobster management areas from entering the area.

Over three-quarters of all American lobsters are landed in Maine, with most of the other landings occurring in or from Massachusetts, Rhode Island, Long Island Sound, and Georges Bank. The American lobster fishery is a year-round fishery in the United States, including the summer and fall months when the lobsters are molting. Approximately 96% of lobsters are taken in lobster traps. The rest are taken in trawls, gillnets, dredges, and by divers.
Salmonid Spawning Habitat in Rivers: Physical Controls, Biological Responses, and Approaches to Remediation

Edited by David Sear and Paul DeVries

This timely volume presents recent research on the interactions between physical habitat and the ecology of salmon. Salmon habitats have been under increasing pressure from catchment management and river management activity, resulting in a decline in available habitat.

North American and European scientists review the processes that control habitat availability, explore the issues impacting the quality of this habitat, and assess the biological factors affecting habitat use and the interaction between habitat quality and salmon reproductive success.

376 pages
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ABSTRACT: Membership in scientific societies is an avenue biologists may use to enhance their professional capabilities. We studied factors influencing federal biologists’ membership in scientific societies, including the American Fisheries Society. We conducted an Internet survey of 3,755 U.S. Fish and Wildlife Service and 932 U.S. Geological Survey professionals. A greater proportion of U.S. Geological Survey biologists (90.2%) than U.S. Fish and Wildlife Service biologists (51.8%) were members of scientific societies. The factors most consistently correlated with membership in the American Fisheries Society included minimal external constraints, supervisor support, and membership of friends, peers, and supervisors in scientific societies. These results suggest that membership in scientific societies is influenced by the organizational culture of agencies. Agencies seeking to increase their employees’ membership in scientific societies will be most successful if they create a culture in which involvement in scientific societies is expected and in which supervisors also participate.

T. Bruce Lauber, Eric J. Taylor, and Barbara A. Knuth

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INTRODUCTION

In June 2004, The Wildlife Society (TWS), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Geological Survey (USGS) developed a partnership to exchange scientific information, advance professionalism in the agencies, and elevate continuing education of wildlife biologists and managers. In part, the organizations believed greater involvement of agency biologists in scientific societies helps to achieve these ends by providing a forum for interaction between biologists from different agencies and organizations and an opportunity to become informed about the latest research and management developments.

Promoting involvement in scientific societies requires a thorough understanding of those factors influencing involvement, and this understanding should be rooted in relevant social science theory. The objective of our study was to identify variables that influenced
becoming a member of AFS). Research has explored how professional and organizational commitment generally appear to be independent, although they may be incompatible in particular employing organizations (Tuma and Grimes 1981; Lee et al. 2000; Bamber and Iyer 2002). In these cases, organizational values are not compatible with professional values. In other cases, however, organizational and professional commitment are positively correlated because organizational standards are similar to professional standards (Lachman and Aranya 1986). We hypothesized that USFWS and USGS biologists' professional commitment and organizational commitment and the characteristics of their employing agencies would influence whether they became members of AFS. In particular:

- For biologists with a high organizational commitment, organizational culture (or the behaviors and expectations of other agency employees) will have a strong influence on whether they join AFS. In the language of the Theory of Planned Behavior, biologists with a strong organizational commitment will feel a strong "motivation to comply" with their coworkers' and supervisors' expectations regarding involvement in AFS.
- For biologists with a high professional commitment, their particular professional interests

THE THEORY OF PLANNED BEHAVIOR

The Theory of Planned Behavior (Ajzen 1989) identifies three interrelated factors that could influence whether biologists join AFS:

1. "Perceived behavioral control" (How easy or difficult do biologists think it is to become a member?);
2. "Attitude toward becoming a member" (Do biologists think becoming a member is good or bad?); and
3. "Subjective norm" (What social pressures exist for biologists to become or not become members?).

Each of these factors is affected by others:

- "Perceived behavioral control" is determined by "control beliefs" and "perceived facilitation." For our context, "control beliefs" are biologists' beliefs about the presence of factors that could make becoming a member easier or more difficult (e.g., how much money it would cost to become a member). "Perceived facilitation" refers to perceptions as to whether these factors will make the behavior easier or more difficult.
- "Attitude toward becoming a member" is determined by "behavioral beliefs" and "outcome evaluation." "Behavioral beliefs" are the outcomes biologists expect if they become a member (e.g., they will acquire more knowledge about current research). "Outcome evaluations" are the biologists' judgments about whether those outcomes are good or bad.
- "Subjective norms" are determined by "normative beliefs" and "motivation to comply." "Normative beliefs" are biologists' beliefs about whether people they know would approve of them becoming a member (e.g., coworkers might also be interested in becoming members). "Motivation to comply" refers to how important the biologists think it is to comply with these people.

The Theory of Planned Behavior applies to behavior in general and not to involvement in AFS in particular. A separate body of theory based on research on the commitment of employees to their employing organizations and to their professions allows us to fine tune our expectations about factors influencing involvement in scientific societies.

ORGANIZATIONAL AND PROFESSIONAL COMMITMENT

Baugh and Roberts (1994:108) argued that professions have the following characteristics:

1. A common body of knowledge,
2. Autonomy in the application of that knowledge,
3. Commitment to a specialized line of work,
4. Identification with the profession or line of work,
5. Responsibility to society for the ethical use of specialized knowledge, and

Given this definition, fisheries biology has many of the characteristics of professions. A considerable body of research has explored how professionals' identification with their employing organizations (organizational commitment) and their professions (professional commitment) influences the way they balance their responsibilities to their employers and their professions.

Early work on professional and organizational commitment concluded that professional and organizational roles tended to conflict (Gouldner 1957, 1958; Sorensen and Sorensen 1974). Employing organizations were viewed as emphasizing bureaucratic values such as hierarchical control, authority, and organizational loyalty (Lachman and Aranya 1986). These values conflicted with professional values, which emphasized at least some autonomy in how professional knowledge was applied and being accountable to professional standards rather than being accountable solely to the employing organization. Consequently, commitment to an employing organization meant lower professional commitment and vice versa.

More recent work on the relationship between organizational and professional commitment, however, has not found an inverse correlation between the two (Jausch et al. 1978; Tuma and Grimes 1981; Wallace 1993; Baugh and Roberts 1994; Bamber and Iyer 2002). Rather, organizational and professional commitment generally appear to be independent, although they may be incompatible in particular employing organizations (Tuma and Grimes 1981; Lee et al. 2000; Bamber and Iyer 2002). In these cases, organizational values are not compatible with professional values. In other cases, however, organizational and professional commitment are positively correlated because organizational standards are similar to professional standards (Lachman and Aranya 1986).
will have a strong influence on whether they participate in AFS. Many biologists with high professional commitment will belong to some type of scientific society, likely selecting a society with priorities that align with their professional interests. If their interests are not closely aligned with those of AFS, they may be more likely to join a different scientific society. In the language of the Theory of Planned Behavior, their “behavioral beliefs” may be that they would gain knowledge or networking possibilities through their involvement in AFS. However, the value they place on those outcomes would be low because they view their priorities as different from those of AFS.

The hypothesized relationships between the variables we studied are depicted in Figure 1. The first set of variables focuses on employees’ “beliefs about scientific society involvement” and “professional values.” Beliefs about scientific society involvement which may influence biologists’ behavior include considerations such as whether being involved in a scientific society will keep them informed about scientific developments, allow them to network with other professionals, support resource advocacy efforts, or result in other professional benefits. Professional values are expressions of the importance of these outcomes to biologists. Those biologists who become involved in scientific societies are those who think these outcomes are important and who believe that being involved in a particular scientific society will contribute to those outcomes.

The figure also points out that biologists may think that “other professional activities” besides scientific society involvement (e.g., accessing journals in libraries, participating in listservs, etc.) may also help them achieve these professional outcomes they value. Therefore, they may choose to forego scientific society involvement because they have other ways of achieving the outcomes they seek as professionals.

The influence of professional values and beliefs about scientific society involvement on society membership may be influenced by biologists’ “professional commitment.” Biologists with a strong professional commitment will be more heavily influenced by their professional values and beliefs about scientific society involvement. A strong professional commitment may also promote greater involvement in other professional activities (as alternatives or in addition to scientific society involvement).

The second set of factors that can influence scientific society involvement focuses on employees’ “organizational

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**Figure 1.** Hypothesized relationships between variables studied.
culture" and "organizational commitment." Organizational culture reflects the degree to which coworkers value being involved in a scientific society. Organizational commitment is the dedication of professionals to their employing organization—either USFWS or USGS—in this study. If employees have a strong organizational commitment and the organizational culture emphasizes involvement in scientific societies, employees will be more likely to be involved in scientific societies.

The third set of factors that can influence scientific society involvement is "constraints" i.e., factors that may limit employees' ability to become involved in scientific societies—cost, other time commitments, etc.

METHODS

We conducted an internet census survey of 3,755 USFWS and 932 USGS Biological Resources Discipline biologists and other scientists working throughout the United States. The USFWS population consisted of professionals in the endangered species, fisheries and habitat conservation, refuges, migratory birds, Federal Aid, international affairs, and law enforcement programs. The USGS population consisted of professionals in all 17 science centers and 40 cooperative research units. Positions represented in our populations included fish and wildlife biologists, ecologists, botanists, geneticists, foresters, directors, fisheries biologists, refuge managers, wildlife biologists, hydrologists, and wildlife inspectors.

To help in the development of the survey instrument and in the interpretation of results, we conducted semi-structured, open-ended interviews of 42 USFWS and USGS professionals between March and June 2006 in Washington, DC; Arlington, Virginia; Shepherdstown, West Virginia; Albuquerque, New Mexico (and vicinity); and Anchorage, Alaska. We used the results of the interviews and the social science literature to design a World Wide Web survey instrument for exploring reasons for professionals' decisions about membership in AFS. Standardized questions in the survey gathered data on eight theoretical constructs (Figure 1):

AFS Membership. Membership in AFS (and other scientific societies) was measured using a checklist on which respondents could check off societies in which they were a member.

Other Professional Activities. We included a list of 12 activities other than scientific society membership that respondents might engage in to maintain their scientific capacity (e.g., "accessing journals over the Internet"). Respondents rated the importance of each of these activities to them for "maintaining [their] scientific knowledge" on a 4-point scale.

Professional Values. We asked the respondents to rate how important it was to them to fill each of the 12 professional needs (e.g., "strengthen my scientific knowledge in my field"). Importance was rated on a 4-point scale.

Beliefs about Scientific Society Involvement. We asked AFS members in the respondent population to rank the importance of 12 possible reasons for being a member of AFS. These reasons paralleled the list of 12 professional values described above (e.g., "I am a member of AFS because it helps me strengthen my scientific knowledge in my field."). As a more general measure of fisheries biologists' interests in the benefits of AFS, we asked them to rate their level of agreement with the statement: "My own lack of motivation limits my participation" [in AFS] on a 5-point scale (from strongly disagree to strongly agree). To assess whether fisheries biologists thought the focus of AFS matched their interests, we asked them (both AFS members and nonmembers) how much attention they thought AFS should place on each of 16 key areas (e.g., "influencing natural resource policy"). Respondents answered these questions on a 5-point scale (from much less to much more). As another way to assess whether the focus of AFS matched that of respondents, respondents indicated their "primary professional field" from a list of 12 possible fields, including "fisheries."

Professional Commitment. We used a scale (a series of closely related questions to which the mean response is calculated) to measure professional commitment. Professional commitment has often been measured with scales analogous to those used to measure organizational commitment (Jausch et al. 1978; Aranya and Ferris 1984; Reichers 1985; Parasuraman and Nachman 1987; Wallace 1995; Bamber and Iyer 2002). We selected six items from these scales that were most relevant to the fisheries profession, and respondents indicated their level of agreement with these statements:

1. I definitely want to continue my career in this profession;
2. If I could do it all over again, I would not choose to work in this profession;
3. If I had all the money I needed without working, I would probably still continue to work in this profession;
4. I like this profession too well to give it up;
5. This is the ideal profession for my life's work; and
6. I am disappointed that I ever entered this profession.

Constraints. Fisheries biologists indicated how much each of eight possible constraints limited their participation in AFS (e.g., "My current work load limits my participation."). Respondents rated their agreement with each of these statements on a 5-point scale (from strongly disagree to strongly agree).

Organizational Culture. We assessed the organizational support for scientific society involvement by asking two questions about how much USFWS and USGS, in general, and immediate supervisors, in particular, encouraged or discouraged "membership in scientific societies." Respondents answered these questions using a 5-point scale (from strongly discourage to strongly encourage). Fisheries biologists also answered six questions assessing whether their coworkers, friends in the profession, and immediate supervisors were members of scientific societies, in general, and AFS, in particular.

Organizational Commitment. We selected 6 items for this scale from the 15-item scale developed by Porter (Porter et al. 1974), which has been used in numerous past studies of organizational commitment (Jausch et al. 1978; Aranya and Ferris 1984; Reichers 1985; Parasuraman and Nachman 1987; Wallace 1995; Bamber and Iyer 2002). We selected the 6 items that we believed were most relevant to the USFWS and USGS, and respondents indicated their level of agreement with these statements:
1. I would be very happy to spend the rest of my career with the USFWS/USGS;
2. I enjoy discussing the USFWS/USGS with people outside it;
3. I really feel as if the USGS/USFS problems are my own;
4. I think that I could easily become as attached to another organization as I am to the USFWS/USGS;
5. The USFWS/USGS has a great deal of personal meaning for me; and
6. I do not feel a strong sense of belonging to the USFWS/USGS.

The Survey Research Institute (SRI) at Cornell University was contracted to conduct the World Wide Web survey. Participants were contacted via e-mail and directed to the SRI website for the survey. The initial invitations went out on 2 May 2006 to 3,755 USFWS employees and 932 USGS employees. This was followed by four reminder e-mails to nonrespondents that were sent on 5 May, 12 May, 19 May, and 26 May. Data collection ended on 1 June 2006.

Certain survey questions were asked of all respondents. Other questions (those focused specifically on AFS) were intended only for fisheries biologists. We defined “fisheries biologist” loosely because we wanted to:
1. Include all individuals to whom AFS might be potentially relevant and
2. Use our analyses to distinguish the types of individuals who actually joined AFS.

We conducted a telephone survey of nonrespondents to the USFWS and USGS web surveys to determine whether and how nonrespondents differed from respondents. We asked a subset of key questions from the web surveys modified for the telephone survey format. We completed 100 interviews with USFWS nonrespondents and 50 interviews with USGS nonrespondents. All interviews were completed 1–7 June 2006.

ANALYSIS

All statistical analyses were conducted using SPSS 15.0 for Windows. For questions asked of both respondents and nonrespondents, we compared their responses to determine whether and how they differed. Depending on the question types, we compared either respondents’ mean responses or the percentages of respondents choosing particular response categories with estimates of the same parameters for nonrespondents (95% confidence intervals). These analyses were conducted to determine whether the Internet survey data likely reflected the populations from which they were collected, or whether they were biased in some way. The nonrespondent data were not used in the primary analyses.

In our primary analyses, several of the question categories we used (other professional activities, professional values, reasons for belonging to AFS, and constraints) consisted of multiple items. For each of these categories, we conducted factor analyses and calculated inter-item correlations to determine if responses to subsets of individual questions within that category were highly correlated. If they were, we calculated the mean response to all items in that subset and developed a single scale for use in our subsequent analyses.

The analyses that we conducted to identify factors influencing membership in AFS consisted of several steps:
1. Two forward stepwise logistic regressions were conducted in which the dependent variables were whether biologists belonged to AFS. We calculated one regression equation modeling USFWS fisheries biologists’ membership in AFS and a parallel regression equation for USGS fisheries biologists. The explanatory variables we considered in each regression equation were most of those for which we had data from both members and nonmembers of AFS. These included:
   • The importance of satisfying each of 12 possible professional needs;
   • Whether or not fisheries was the primary field;
   • Professional commitment;
   • The importance of each of 8 possible constraints on society membership;
   • The support of agencies and supervisors for society membership;
   • Whether or not coworkers, friends in the profession, and supervisors were known to belong to societies, in general, and AFS, in particular;
   • Organizational commitment; and
   • Age, education, and gender.

Other variables, which included job classification for all regressions and geographic region for the USFWS regressions, were included as controls.

We allowed for interaction terms between professional commitment and professional needs and between organizational commitment and organizational culture. We had intended to include the questions about the perceived appropriateness of the focus of AFS, but biologists who were not members of these societies were much more likely than members to answer “Don’t Know” to these questions, obviating their use in our regressions.

2. Because we hypothesized that some biologists might not belong to scientific societies as a consequence of their use of other methods to meet their professional needs, we compared the percentage of members and nonmembers who relied on each of 12 possible “other activities” to meet these needs. If nonmembers were relying on activities other than society membership to meet their professional needs, their level of engagement in these other activities would expectedly be higher compared to members of scientific societies.

3. For some questions for which we had data for AFS members but not nonmembers (e.g., reasons for being members of AFS), we calculated means or frequencies to support or clarify our regression analyses.

RESULTS

We obtained a response rate of 74% among USFWS biologists and 68% among USGS biologists. Respondents did not differ (P < 0.05) from nonrespondents relative to professional field, years in profession, years in current agency, membership in various scientific
societies (including AFS), gender, and education.

Membership in Scientific Societies

Some 51.8% (SE = 0.5 of USFWS biologists and 90.2% (SE = 0.7) of USGS biologists belonged to at least one scientific society. USFWS biologists belonged to a mean of 0.80 (SE = 0.01) societies, and USGS biologists belonged to a mean of 2.26 (SE = 0.04) societies. Table 1 lists the percentage of biologists belonging to the scientific societies of which most biologists were members. Among fisheries biologists, 51.2% (SE = 1.0) of USFWS biologists and 73.1% (SE = 1.7) of USGS biologists belonged to AFS.

Other Professional Activities to Maintain Scientific Capabilities

Members of scientific societies in USFWS were more likely to engage in 12 out of 12 professional activities (in addition to membership in scientific societies) to “keep their scientific knowledge current” (Table 2). In USGS, results were more variable. Scientific society members in USGS were more likely than nonmembers to keep their knowledge current by attending meetings with other professionals, using electronic literature searchable databases, reading books, and attending conferences and symposia. Members were less likely than nonmembers, however, to take continuing education courses.

Beliefs about Scientific Society Involvement

Based on a factor analysis and inter-item correlations, 8 of the 12 questions about respondents’ “professional values” were grouped into 2 scales, which (when combined with the remaining 4 individual questions) resulted in data on 6 professional values. Because the 12 items assessing AFS members’ beliefs about the benefits of scientific society involvement paralleled the professional value items, these items were grouped in the same way to provide data on the importance of 6 different reasons for being involved in AFS (Table 3).

On average, networking with other professionals and maintaining research capacity were the most important overall reasons for USFWS and USGS fisheries biologists to belong to AFS. Keeping informed of natural resource policy was nearly as important in USFWS, but not in USGS. Solidifying opinion through discussion, maintaining professional status, and influencing natural resource policy were of greater importance in USFWS than in USGS (Table 3).

USFWS and USGS fisheries biologists, both AFS members and nonmembers, believed on average that AFS should increase emphasis on ecosystem management, conservation biology, influencing natural resource policy, and applied research (Table 4). The only topic that USFWS and USGS fisheries biologists, including both AFS members and nonmembers, thought should receive less attention was game species management.

Predicting Membership in AFS

Tables 5–6 summarize the logistic regression analyses predicting membership of:

1. USFWS fisheries biologists in AFS and
2. USGS fisheries biologists in AFS.

Rather than reporting the logistic regression coefficients, which are often difficult to interpret, for each significant independent variable, we report the percentage of biologists predicted to be AFS members for each level of the independent variables.

Two caveats exist regarding interpretation of these percentages:

1. The predicted level of membership for a given level of a given variable (e.g., whether one's friends in the profession are members of AFS) is not equivalent to the actual level of society membership at that level of the variable (i.e., the actual percentage of society members for those biologists whose friends are members of AFS).

The logistic regression equation is multivariate; the predicted influence of any one variable depends on the levels of the other independent variables. Therefore, when assessing the effect of any one independent variable, we fixed the levels of the other independent variables at either their median (for interval or ordinal variables) or their mode (for categorical variables) values.

2. For some interval independent variables, answers at one extreme of a possible range of responses were very unlikely. For example, for some variables we asked respondents to rate their level of agreement with certain statements, but 95% or more of the responses were limited to one end of this range. Rather than reporting the influence of a variable at a level at which it was unlikely to occur, we predicted levels of society membership only for the range of responses that included at least 95% of the actual responses.
Table 2. Percentage of scientific society members and nonmembers stating activities were “very important” to maintain their scientific knowledge in their field.

<table>
<thead>
<tr>
<th>Activity</th>
<th>USFWS</th>
<th>USGS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Members %</td>
<td>Members %</td>
</tr>
<tr>
<td>Accessing journals over the Internet</td>
<td>55.2\textsuperscript{1}</td>
<td>0.7</td>
</tr>
<tr>
<td>Accessing journals through libraries</td>
<td>18.6\textsuperscript{1}</td>
<td>0.5</td>
</tr>
<tr>
<td>Accessing the Internet</td>
<td>72.4\textsuperscript{1}</td>
<td>0.6</td>
</tr>
<tr>
<td>Attending meetings with other professionals</td>
<td>51.1\textsuperscript{1}</td>
<td>0.7</td>
</tr>
<tr>
<td>Using the National Conservation Training Center Literature Search Service</td>
<td>34.2\textsuperscript{1}</td>
<td>0.6</td>
</tr>
<tr>
<td>Using (other) electronic literature searchable databases</td>
<td>35.7\textsuperscript{1}</td>
<td>0.6</td>
</tr>
<tr>
<td>Interacting with colleagues individually</td>
<td>59.9\textsuperscript{1}</td>
<td>0.7</td>
</tr>
<tr>
<td>Participating in listserv</td>
<td>11.9\textsuperscript{1}</td>
<td>0.4</td>
</tr>
<tr>
<td>Reading books</td>
<td>26.8\textsuperscript{1}</td>
<td>0.6</td>
</tr>
<tr>
<td>Reading government documents and other gray literature</td>
<td>27.9\textsuperscript{1}</td>
<td>0.6</td>
</tr>
<tr>
<td>Taking continuing education courses</td>
<td>29.4\textsuperscript{1}</td>
<td>0.6</td>
</tr>
<tr>
<td>Attending conferences and symposia</td>
<td>49.5\textsuperscript{1}</td>
<td>0.7</td>
</tr>
</tbody>
</table>

\textsuperscript{1}Scientific society members significantly more likely to engage in activity than nonmembers (P < 0.05).

\textsuperscript{2}Scientific society members significantly less likely to engage in activity than nonmembers (P < 0.05).

Table 3. Mean importance\textsuperscript{1} of reasons for belonging to AFS.

<table>
<thead>
<tr>
<th>I am a member of AFS because it helps me:</th>
<th>USFWS Mean</th>
<th>USFWS SE</th>
<th>USGS Mean</th>
<th>USGS SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network with other professionals</td>
<td>3.33</td>
<td>0.02</td>
<td>3.36</td>
<td>0.04</td>
</tr>
<tr>
<td>Maintain my “research capacity”\textsuperscript{2}</td>
<td>3.23</td>
<td>0.02</td>
<td>3.30</td>
<td>0.03</td>
</tr>
<tr>
<td>Keep informed of natural resource policy</td>
<td>3.03</td>
<td>0.02</td>
<td>2.85</td>
<td>0.04</td>
</tr>
<tr>
<td>Solidify my opinion through discussion</td>
<td>2.84</td>
<td>0.03</td>
<td>2.54</td>
<td>0.04</td>
</tr>
<tr>
<td>Maintain my “professional status”\textsuperscript{2}</td>
<td>2.74</td>
<td>0.02</td>
<td>2.63</td>
<td>0.03</td>
</tr>
<tr>
<td>Influence natural resource policy</td>
<td>2.62</td>
<td>0.03</td>
<td>2.21</td>
<td>0.04</td>
</tr>
</tbody>
</table>

\textsuperscript{1}1 = “not at all important,” 2 = “slightly important,” 3 = “moderately important,” and 4 = “very important.”

\textsuperscript{2}Factor is mean of the following correlated variables: strengthen scientific knowledge in field, share research results and their management implications, and keep informed about new research methods, results, and their management implications.

Table 4. Perceived importance\textsuperscript{1} of 16 focal areas for AFS among USFWS and USGS fisheries biologists.

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>USFWS AFS Members Mean</th>
<th>USFWS AFS Nonmembers Mean</th>
<th>USGS AFS Members Mean</th>
<th>USGS AFS Nonmembers Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystem management</td>
<td>3.87\textsuperscript{1}</td>
<td>0.02</td>
<td>4.2</td>
<td>0.04</td>
</tr>
<tr>
<td>Conservation biology</td>
<td>3.79</td>
<td>0.02</td>
<td>5.1</td>
<td>0.04</td>
</tr>
<tr>
<td>Influence natural resource policy</td>
<td>3.92</td>
<td>0.03</td>
<td>4.2</td>
<td>0.04</td>
</tr>
<tr>
<td>Applied research</td>
<td>3.72</td>
<td>0.02</td>
<td>4.0</td>
<td>0.04</td>
</tr>
<tr>
<td>Nongame species management</td>
<td>3.58</td>
<td>0.02</td>
<td>4.8</td>
<td>0.04</td>
</tr>
<tr>
<td>Practical management issues</td>
<td>3.79\textsuperscript{1}</td>
<td>0.02</td>
<td>7.4</td>
<td>0.04</td>
</tr>
<tr>
<td>Education and outreach</td>
<td>3.62\textsuperscript{1}</td>
<td>0.02</td>
<td>4.0</td>
<td>0.04</td>
</tr>
<tr>
<td>Marine fisheries</td>
<td>3.26</td>
<td>0.02</td>
<td>7.1</td>
<td>0.04</td>
</tr>
<tr>
<td>Human dimensions and socioeconomics</td>
<td>3.46</td>
<td>0.03</td>
<td>7.7</td>
<td>0.05</td>
</tr>
<tr>
<td>Freshwater fisheries</td>
<td>3.21\textsuperscript{1}</td>
<td>0.02</td>
<td>4.8</td>
<td>0.04</td>
</tr>
<tr>
<td>Academic research</td>
<td>3.07</td>
<td>0.02</td>
<td>4.5</td>
<td>0.04</td>
</tr>
<tr>
<td>Commercial fisheries</td>
<td>3.13</td>
<td>0.02</td>
<td>6.0</td>
<td>0.05</td>
</tr>
<tr>
<td>Individual species management</td>
<td>3.06</td>
<td>0.02</td>
<td>6.0</td>
<td>0.08</td>
</tr>
<tr>
<td>Recreational fisheries</td>
<td>3.02\textsuperscript{1}</td>
<td>0.02</td>
<td>5.1</td>
<td>0.05</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>3.09</td>
<td>0.03</td>
<td>6.3</td>
<td>0.05</td>
</tr>
<tr>
<td>Game species management</td>
<td>2.85</td>
<td>0.02</td>
<td>6.2</td>
<td>0.04</td>
</tr>
</tbody>
</table>

\textsuperscript{1}1 = “AFS should pay “much less” attention to topic; 2 = “less;” 3 = “about the same;” 4 = “more;” and 5 = “much more.”

\textsuperscript{2}Percentage of respondents who did not answer the question.

\textsuperscript{3}AFS members and nonmembers within agency (who answered the question) differed significantly (P < 0.05).
Table 5. Logistic regression results predicting AFS membership among USFWS fisheries biologists.

<table>
<thead>
<tr>
<th>Variable</th>
<th>P</th>
<th>Predicted Membership in AFS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BELIEFS ABOUT SCIENTIFIC SOCIETY INVOLVEMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of motivation a barrier?</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td>64.6</td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
<td>54.9</td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td>44.7</td>
</tr>
<tr>
<td>Agree</td>
<td></td>
<td>35.0</td>
</tr>
<tr>
<td>Primary Field</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Fisheries</td>
<td></td>
<td>74.3</td>
</tr>
<tr>
<td>Another field</td>
<td></td>
<td>54.9</td>
</tr>
<tr>
<td><strong>CONSTRAINTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of journals a barrier?</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
<td>63.0</td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td>54.9</td>
</tr>
<tr>
<td>Agree</td>
<td></td>
<td>46.4</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td></td>
<td>38.2</td>
</tr>
<tr>
<td>Family responsibilities a barrier?</td>
<td>0.019</td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td>64.5</td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
<td>59.8</td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td>54.9</td>
</tr>
<tr>
<td>Agree</td>
<td></td>
<td>49.9</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td></td>
<td>44.8</td>
</tr>
<tr>
<td><strong>ORGANIZATIONAL CULTURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisor encourages or discourages membership?</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td></td>
<td>54.9</td>
</tr>
<tr>
<td>Encourage</td>
<td></td>
<td>66.9</td>
</tr>
<tr>
<td>Strongly Encourage</td>
<td></td>
<td>77.1</td>
</tr>
<tr>
<td>Friends members of AFS?</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>25.0</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>54.9</td>
</tr>
<tr>
<td>Office coworkers members of scientific societies?</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>54.9</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>67.4</td>
</tr>
</tbody>
</table>

Table 6. Logistic regression results predicting AFS membership among USGS fisheries biologists.

<table>
<thead>
<tr>
<th>Variable</th>
<th>P</th>
<th>Predicted Membership in AFS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BELIEFS ABOUT SCIENTIFIC SOCIETY INVOLVEMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Field</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Fisheries</td>
<td></td>
<td>99.0</td>
</tr>
<tr>
<td>Other Field</td>
<td></td>
<td>88.0</td>
</tr>
<tr>
<td><strong>ORGANIZATIONAL CULTURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office coworkers members of scientific societies?</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>49.6</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>88.0</td>
</tr>
<tr>
<td>Friends in profession members of AFS?</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>43.1</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>88.0</td>
</tr>
<tr>
<td>Supervisor member of scientific society?</td>
<td>0.011</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>71.7</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>88.0</td>
</tr>
</tbody>
</table>
USFWS Fisheries Biologists and AFS. The logistic regression equation correctly predicted whether 73.4% of USFWS fisheries biologists were or were not members of AFS (Table 5, $P < 0.001$, Nagelkerke $R^2 = 0.330$). Lack of motivation to participate in AFS was associated with significantly lower membership, and identification of fisheries as one's primary field was associated with significantly higher membership. Two constraints, costs of journals and family responsibilities, limited AFS membership among USFWS fisheries biologists. Three organizational culture variables increased the likelihood of membership in AFS.

USGS Fisheries Biologists and AFS. The logistic regression equation correctly predicted whether 81.8% of USGS fisheries biologists were or were not members of AFS (Table 6, $P < 0.001$, Nagelkerke $R^2 = 0.462$). Membership in AFS was significantly higher among those who considered fisheries their primary field. The other three variables correlated with membership were all reflections of the organizational culture—whether one's office coworkers and one's supervisor were members of scientific societies and whether one's friends in the profession were members of AFS.

DISCUSSION

Our study sought to identify the factors influencing involvement in scientific societies (particularly AFS) among USFWS and USGS biologists. Membership in scientific societies was markedly higher among USGS biologists than among USFWS biologists according to the variables we considered. USGS biologists were more likely to belong to at least one scientific society and they belonged to a greater number of societies on average. USGS fisheries biologists were more likely than USFWS fisheries biologists to belong to AFS.

These differences in scientific society involvement between the two agencies may reflect differences in the organizations’ missions and their expectations of their employees. USGS is a research agency, while USFWS is a management and regulatory agency. In the early 1990s, the Department of Interior reorganized to consolidate nearly all of its biological research positions (including those in USFWS) in the National Biological Survey and later the USGS (Pulliam 1998). Because of this differentiation in the types of work that the two agencies carry out, the professional needs of USGS and USFWS employees undoubtedly will differ. In particular, the needs for which professionals turn to scientific societies will differ.

USFWS officially encourages involvement in scientific societies. In a policy memorandum issued in 1999, Acting Director Rogers stated that “membership, involvement, and participation in professional societies are more important now than ever, for the purposes of maintaining and enhancing our capabilities in professional resource management” (USFWS 1999). USGS not only encourages involvement, however, but expects it; involvement in scientific societies is part of employees’ performance review for research grade-evaluated positions. This contrast between the agencies underscores the influence of organizational culture and processes on the professional behavior.
of employees, which also has been noted in past work (Tuma and Grimes 1981; Karahanna et al. 2005).

Given that we believed that maintaining scientific knowledge was one of the reasons biologists joined scientific societies, we considered whether biologists who did not belong to scientific societies relied on other professional activities to maintain their scientific knowledge. However, we determined that biologists who were members of scientific societies were more likely than nonmembers to use other professional activities, in addition to being members of scientific societies, to maintain their scientific knowledge. The correlation between these activities and membership in scientific societies suggests that:

1. Engagement in these professional activities is influenced by the same factors that drive society membership, or
2. One professional activity (such as participating in scientific societies) is contributing to the others.

The logistic regressions provided the best insight into the factors most closely correlated with society membership. The importance placed on satisfying particular professional values did not show a significant relationship to membership in AFS for either agency. This finding may indicate that, despite the fact that biologists state that they join AFS to meet particular needs, trying to meet particular professional needs does not influence the decision to join scientific societies. On the other hand, these needs may indeed have a strong influence on society membership, but that influence did not appear in our regressions because we examined membership only in AFS. Those biologists who did not join AFS might have met their needs by joining other societies.

A generalized measure of biologists’ motivation to participate in AFS was a significant predictor of involvement in the USFWS regression. We viewed this variable as an indicator of the strength of interest biologists had in the benefits of membership in AFS. However, this correlation is difficult to interpret because it could reflect a general lack of interest in the benefits of belonging to AFS in particular, or it could reflect a lack of interest in scientific societies in general.

For fisheries biologists in both agencies, identification of fisheries as one’s “primary field” was strongly correlated with membership in AFS. This finding suggests that most professionals who consider themselves fisheries biologists find AFS to be a good fit to their interests.

The constraints we examined were an important limitation on society membership in USFWS, but not USGS. Both costs of journals and family responsibilities were negatively correlated with USFWS membership in AFS. We believe this difference may reflect dissimilarity between USFWS and USGS expectations of their employees. Because the expectation for involvement in scientific societies is higher in USGS, the same constraints are less likely to encourage employees from joining scientific societies. In addition, USGS biologists reported higher rates of accessing journals over the Internet and through libraries than did those in USFWS (Table 2). This finding suggests that USGS biologists may either have or make better use of access to journals through other means than subscriptions, making the costs of journals less relevant to them.

The organizational culture variables were the most consistent predictors of membership in all the regressions. In USFWS, supervisor encouragement to belong to scientific societies had a strong influence on membership. Although very few respondents said that their supervisors discouraged membership, whether supervisors were neutral or actively discouraged membership was correlated with different membership levels. The same variable did not enter into the USGS regressions, likely because the expectations of involvement in scientific societies are clearer in USGS compared to USFWS. In both agencies, however, awareness of scientific society membership among one’s office coworkers, professional friends, and supervisors was strongly correlated with membership in AFS.

Contrary to our hypotheses, we found no indication that membership in AFS was influenced by professional or organizational commitment (either as primary influences or as moderators of the influence of other variables). These findings may indicate that these variables do not influence scientific society membership, in general, or only membership in AFS. Even if the commitment variables had a strong influence on scientific society membership, they might not enter into our regressions because biologists who were not members of AFS often were members of other scientific societies.

Of greatest importance is that both the policies and the cultures of USFWS and USGS (both overall and within specific units) shaped membership in scientific societies. This conclusion is consistent with past findings that have shown how organizational culture and characteristics shape professional orientation and behaviors (Tuma and Grimes 1981; Karahanna et al. 2005).

MANAGEMENT IMPLICATIONS

USFWS policy states that involvement of its professional employees in scientific societies is important, but agency behavior has to be consistent with a policy in order for it to be successful. Our results suggest that the most successful route to encouraging membership is through the cultivation of a culture of participation in scientific societies within agencies. Employees participate in scientific societies when their agency expects participation and when their peers and supervisors participate. Our recommendation follows the suggestion by Schmutz (2002) who believed higher involvement of USFWS employees in societies was important. The removal of constraints to participation (particularly in terms of work load) could increase involvement in USFWS, but not USGS. Higher agency expectations of involvement might also minimize the importance of these constraints.

ACKNOWLEDGMENTS

This study was funded by The Wildlife Society via funding provided by the USGS Biological Resources Discipline and the USFWS Office of the Science Advisor. Dan Ashe, William Knapp, Jim Fleming, and Tom Franklin offered timely advice and feedback throughout the course of this study.
REFERENCES


Does Venting Promote Survival of Released Fish?

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ABSTRACT: Fishes captured and brought to the surface by commercial and recreational fishers may suffer a variety of injuries that collectively are referred to as barotrauma. To relieve barotrauma symptoms, particularly those associated with an expanded swim bladder, some anglers deflate, or vent, the swim bladder (or body cavity when the swim bladder has ruptured) of fishes before releasing them. I compiled 17 studies that assessed the potential benefits of venting in 21 fish species and 1 composite group. These studies provided 39 sample estimates that compare survival (N = 18) and recapture rates (N = 21) of vented and unvented fish. I used relative risk to summarize results of individual studies, which allowed me to combine results from experimental and capture-recapture studies. Overall, there was little evidence that venting benefited fish survival. Venting was equally ineffective for freshwater and marine fishes and its efficacy was unaffected based on whether venting was performed by fishery biologists or anglers. The effects of venting did vary with capture depth: venting was slightly beneficial to fish captured from shallow waters, but appeared to be increasingly harmful for fish captured from progressively deeper waters. The available evidence suggests that venting fish should not only be discouraged by fishery management agencies, but given the possibility that venting may adversely affect survival of fish captured from deep water, this practice should be prohibited, rather than required by regulation.

La maniobra de descarga en peces liberados promueve su supervivencia?

RESUMEN: Los peces que son capturados y llevados a la superficie por parte de los pescadores recreativos y comerciales pueden sufrir una variedad de lesiones que genéricamente se conocen como barotraumas. Para aliviar los síntomas del barotrauma en peces, particularmente aquellos asociados a la expansión de la vejiga natatoria, algunos pescadores la desinflan o descargan (o la propia cavidad corporal cuando la vejiga está rasgada) antes de regresarlas al agua. Se copilaron 17 estudios que evaluaban los beneficios potenciales de la maniobra de descarga en 21 especies de peces y un grupo compuesto. En estos estudios se presentan 39 estimaciones muestrales que comparan la supervivencia (N = 18) y tasas de recaptura (N = 21) de peces a los que se les practicó y no se les practicó la maniobra de descarga. Se utilizó el riesgo relativo para resumir los hallazgos de cada trabajo, lo que permitió combinar los resultados tanto de los estudios experimentales como de los de captura-recaptura. En general hubo poca evidencia de que la maniobra de descarga beneficiara la supervivencia de los peces. La maniobra fue igualmente inefectiva en peces marinos y de agua dulce y su eficacia no dependió de si era realizada por un biólogo pesquero o un pescador. Los efectos de la maniobra de descarga sí variaron con la profundidad de captura: la maniobra fue ligeramente más benéfica para los peces de aguas someras pero más perjudicial a medida que aumentaba la profundidad de captura. La evidencia disponible sugiere que la maniobra de descarga es una práctica que no solo debe desalentarse en las agencias de manejo de pesquerías sino que dado que puede afectar de manera adversa la supervivencia de los peces que se capturan en aguas profundas, esta práctica más que requerir una regulación, debe prohibirse.
INTRODUCTION

Fishes captured and brought to the surface by commercial and recreational fishers may suffer a variety of injuries that collectively are referred to as barotrauma. Although typically thought of as an affliction of physoclistous fishes, those having swim bladders lacking a direct connection to the digestive tract, barotrauma can affect any fish that experiences rapid depressurization. As a captured fish is brought to surface, it experiences a progressive decrease in ambient pressure, which in turn results in an increase in the partial pressure of dissolved gases within the blood and tissues as described by Boyle’s Law. As the blood and tissues become supersaturated, gases may leave solution and form bubbles (emboli) in the blood, and various tissues and organs, including the eyes, brain, heart, arteries, gills, spleen, fins, musculature, and the dermis beneath the scales (Feathers and Knable 1983; Parrish and Moffitt 1993; Brown et al. 2007). These emboli may occlude the heart and arteries, affecting circulation to the heart and gills (Beyer et al. 1976). Fish with physoclistous swim bladders may suffer additional injuries as the swim bladder expands, causing compaction and displacement injuries to, as well as hemorrhage and hematoma of, the eyes, heart, liver, kidneys, and other internal organs (Gotshall 1964; Rummer and Bennett 2005; Phelan 2008). These injuries are so widespread among fishes afflicted with barotrauma that Rummer and Bennett (2005) suggested they could be aptly described as a syndrome. Physiological effects of barotrauma include changes in plasma concentrations of proteins that affect coagulation (Casillas et al. 1975), and lysis of red blood cells and an increase in concentration of enzymes indicative of tissue damage (Morrisey et al. 2005). The prevalence and severity of physical (Rogers et al. 1986; St. John and Syers 2005; Hannah et al. 2008) and physiological (Casillas et al. 1975) affects of barotrauma progressively increase with increased capture depth.

To relieve barotrauma symptoms, particularly those associated with an expanded swim bladder, some anglers deflate, or vent or “fizz,” the swim bladder of fish showing obvious signs of barotrauma. Fish are vented in a variety of ways, but this is most commonly accomplished by inserting a wide-bore hypodermic needle into the swim bladder (or body cavity if the swim bladder has ruptured), thereby allowing it to deflate. Venting is considered to be “controversial” (Rummer and Bennett 2005; Jarvis and Lowe 2008) because the apparent benefits of venting vary widely among studies, with some suggesting this practice is beneficial (W. Fable, National Marine Fisheries Service, Panama City, Florida, unpublished data; Collins et al. 1999; Sumpton et al. 2008) or without adverse effect (Lee 1992), whereas others suggest that venting is ineffective as a means of increasing survival of released fish (Render and Wilson 1996). Bartholomew and Bohnsack (2005) conducted a simple “vote counting” meta-analysis (see Gurevitch and Hedges 1999 for limitations of this method) of four experimental studies that assessed the efficacy of venting. They found no significant excess in the proportion of positive versus negative results, but concluded that the available evidence suggested venting, if performed properly, was an effective means of increasing survival of released fish.

At present, most Canadian provincial and many U.S. state fishery management agencies discourage anglers from venting released fish because improper venting may result in additional, occasionally fatal, injuries (Kerr 2001). Nevertheless, despite the conflicting evidence in support of venting, various individual investigators, some U.S. fishery management agencies (see Kerr 2001), and numerous marine fishery extension services and angler groups advocate this practice in pamphlets (e.g., FSG 1999) and on their website. The Australian National Strategy for the Survival of Released Line Caught Fish recently endorsed venting as, in fact, the U.S. National Marine Fisheries Service, which now requires offshore anglers in U.S. territorial waters in the Gulf of Mexico to have venting devices in their possession (NMFS 2008).

Studies that have assessed the potential benefits of venting fish released by anglers have been of two basic designs, survival experiments and capture-recapture studies. In survival experiments, fish are captured by angling or exposed to rapid depressurization in the lab, held in cages, aquaria, etc., and the survival of vented and unvented fish then is compared. In capture-recapture studies, vented and unvented fish are captured, tagged, and released. Subsequent recaptures then are used to assess the recapture rates of vented and unvented fish, based on the assumption that recapture rates are surrogate measures of survival (see Sumpton et al. 2008). Herein, I conduct a meta-analysis of published and unpublished studies that assess the potential survival benefits of venting fish to relieve the symptoms of barotrauma. I use relative risk (Sutton et al. 2000), which is widely used in the medical and epidemiological literature in the analysis of binary data, to summarize results of individual studies that assess the efficacy of venting fish. This approach allows me to combined survival estimates from experimental and capture-recapture studies. I specifically sought to determine whether:

1. There is any difference in survival rate between fish that have their swim bladders vented and those that do not,
2. There is any difference in the survival benefits of venting between freshwater and marine fishes,
3. There is any difference in survival benefits between fish vented by anglers versus those vented by fishery biologists, and
4. There is a relationship between capture depth and the survival benefits of venting.

METHODS

I compiled studies that compared survival or recapture rates of vented and unvented fish. I obtained comparative results from tables, figures, or text of the cited sources. Burns et al. (2002) presented tagging results compiled during two overlapping periods, October 1998 to December 2001 and 1990 through February 2002; I used results from the latter, more inclusive, period. I made no distinction among studies based on the type of device used to vent fish (e.g., hypodermic syringe, ice pick, knife, etc.). Most survival and recapture studies conducted by fishery biologists explicitly comment on the venting device; however, studies that used angler-supplied capture-recapture data include fish vented with a variety of devices for which no quantification was provided. I included only studies that allow direct comparisons of vented and unvented fish. For example, Brueseewitz et al. (1993) assessed survival of vented burbot (Lota lota), but they did not assess survival of unvented fish. Although survival of vented burbot was high, there is no way to determine whether this was attributable to venting. Similarly, Lee (1992) compared recapture rates of three groups of tournament-caught largemouth bass (Micropterus salmoides): those that showed no sign of barotrauma, an indicator of which some were released unvented and others vented, and those that possessed distended abdomens, an indicator of barotrauma, and were vented prior to release. Lee (1992) did not include fish that showed distended abdomens but which were not vented prior to release; therefore, no proper control group is available with which to assess the potential effects of venting on survival.

Among studies that compared different venting devices (e.g., Fable unpublished data; Collins et al. 1999), I combined data for all vented fish and made no distinction on this basis. Similarly, Keniry et al. (1996) assessed survival of three groups of fish: unvented and untagged, unvented and tagged, and vented and tagged. I used the combined results of the first two groups as control (unvented) fish. Some studies presented results for more than one trial, conducted in different seasons (Gitschlag and Renaud 1994) or years (Fable unpublished data); I combined data across seasons or years into a single sample for each study. In studies that examined multiple species, I treated each species as a separate sample. Similarly, among studies that examined one or more species using different protocols (experimental and tag-recapture), I treated data collected using each protocol as a separate observation.

Several studies presented experimental or capture-recapture results for vented and unvented fish captured from discrete depths or various depth ranges. To assess the relationship between potential survival benefits of venting and depth, I tabulated results separately for each depth or depth range reported. If samples were collected from a range in depth, e.g., 10 to 20 m, I used the midpoint of that range. When results for fish collected from an indefinite depth range were presented, such as 100+ m, I used the shallower depth of that range (i.e., 100 m) as the nominal capture depth.

If venting has no effect on survival or recapture, then vented and unvented fish should survive or be recaptured at equal rates. Therefore, I used relative risk to assess the efficacy of venting fish. Relative risk is the probability of an event (survival or recapture) in a treatment group (vented fish) divided by the probability of that event in a control group (unvented fish). I added 0.5 to all cells to accommodate those with zero values, as recommended by Sutton et al. (2000), and calculated relative risk as:

\[
\text{relative risk} = \frac{S_v}{(S_v + NS_v)} / \frac{S_{nv}}{(S_{nv} + NS_{nv})}
\]

where \(S_v\) is the number of vented fish that survived in experimental studies or that were recaptured, \(NS_v\) is the number of vented fish that did not survive or that were not recaptured, \(S_{nv}\) is the number of unvented fish that survived experimental studies or that were recaptured, and \(NS_{nv}\) is the number of unvented fish that did not survive or that were not recaptured. A value of 1.0 for the risk ratio implies no effect of venting; values greater than 1.0 imply that venting increases survival and recapture rates. The natural log of relative risk, \(\ln(\text{RR})\), has a sampling distribution that is approximately normal, with variance:

\[
\text{Var}(\ln(\text{RR})) = 1 / S_v - 1 / (S_v + NS_v) + 1 / S_{nv} - 1 / (S_{nv} + NS_{nv})
\]

I used variances calculated according to equation (2) to estimate 95% confidence intervals about \(\ln(\text{RR})\) using the equation:

\[
\ln(\text{RR}) \pm 1.96 \times \sqrt{\text{Var}(\ln(\text{RR}))}
\]

Herein, I report values of relative risk and its confidence interval that have been back-transformed to the linear scale; consequently, the confidence intervals reported herein are asymmetrical about the mean.

I used MetaWin 2.0 (Rosenberg et al. 2000) to calculate relative risk and its variance for each sample. I used Cochran’s Q (Rosenberg et al. 2000), which is distributed as a \(X^2\) statistic with \(n-1\) df, where \(n\) is the number of groups being compared, to assess whether there was significant heterogeneity in relative risk among samples. In all cases, there was significant (\(P < 0.05\)) heterogeneity among samples, so I performed random effects meta-analyses of relative risk among species grouped across all species combined, by habitat type (freshwater versus marine), and by study type (experimental versus tagging).

To assess the relationship between relative risk and capture depth, I performed a random effects meta-analysis with depth as a continuous covariate (Lipsey and Wilson 2001). This is, essentially, a weighted regression of \(\ln(\text{RR})\) on depth, in which each sample is weighted by the inverse of its variance. All analyses presented herein were performed with MetaWin 2.0 (Rosenberg et al. 2000).

RESULTS

I located 17 studies (Table 1), which provided a total of 39 samples, that compared survival \((N = 18)\) or recapture rates \((N = 21)\) of vented and unvented fish in 21 species and 1
Table 1. A summary of experimental (exp) and capture-recapture (cap-recap) studies that assessed the survival benefits of venting fishes showing external signs of barotrauma. Relative risk, and 95% confidence intervals (CI), is the ratio of survival (or recapture) in vented fish divided by survival of unvented fish; values greater than 1.0 indicate that venting has a positive survival affect. Angler participation in capture-recapture studies is indicated by Y—yes or N—no.

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat type</th>
<th>Study type</th>
<th>Anglers in study</th>
<th>Relative risk</th>
<th>Lower 95% CI</th>
<th>Upper 95% CI</th>
<th>Source</th>
</tr>
</thead>
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<tr>
<td>Black crappie Pomoxis nigromaculatus</td>
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<td>exp</td>
<td>N</td>
<td>1.03</td>
<td>0.44</td>
<td>2.41</td>
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<td>exp</td>
<td>N</td>
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<td>1.08</td>
<td>1.31</td>
<td>Collins et al. (1999)</td>
</tr>
<tr>
<td>Blue rockfish Sebastes mystinus</td>
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<td>cap-recap</td>
<td>N</td>
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<td>0.55</td>
<td>1.23</td>
<td>Gotshall (1964)</td>
</tr>
<tr>
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<td>exp</td>
<td>N</td>
<td>1.03</td>
<td>0.87</td>
<td>1.22</td>
<td>Brown et al. (2008)</td>
</tr>
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<td>4.18</td>
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<td>1.02</td>
<td>1.76</td>
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<td>8.45</td>
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<td>Willis and Babcock (1998)</td>
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</tbody>
</table>
composite group (coral trout Plectrodus spp.). My analyses include results for 4 freshwater and 17 marine species or groups. Relative risk ranged from 0.23 (95% confidence interval = 0.17 to 0.31) in red snapper (Lutjanus campechanus) to 85.00 (95% confidence interval = 5.31 to 1360.58) in walleye (Sander vitreus) that were captured in a fishing tournament and held in live wells before being vented and released.

Venting had no effect on fish survival in 32 of 39 individual samples (Table 1). In 2 samples, red grouper (Ephinephelus morio) and red snapper, upper 95% confidence intervals for relative risk were less than 1.00, which suggests that venting significantly (P < 0.05) reduced survival of these species. In 5 samples, black sea bass (Centropristis striata), crimson snapper (L. crytropterus), gag (Mycteroperca microlepis), walleye, and yellow perch (Perca flavescens), the lower 95% confidence intervals for relative risk exceeded 1.00, which suggests that venting significantly (P < 0.05) increased survival of these species. Among the 7 species that showed a significant response to venting, multiple samples were available for 3 (red snapper, crimson snapper, and walleye), none of which showed more than 1 significant (P < 0.05) response to venting. Similarly, none of the 10 species for which multiple estimates of survival were available showed a significant (P < 0.05) overall response to venting (Table 2).

Pooling relative risk estimates across all species and studies showed there was no evidence that venting affected fish survival (relative risk = 1.01, 95% confidence interval = 0.92 to 1.11). There was no evidence (X^2 = 0.2821, df = 1, P = 0.595) that venting affected fish survival differentially in freshwater (relative risk = 1.07, 95% confidence interval = 0.75 to 1.54) versus marine fishes (relative risk = 1.00, 95% confidence interval = 0.90 to 1.11). Relative risk did not differ (X^2 = 0.758, df = 1, P = 0.384) among studies based on design (experimental studies relative risk = 1.04, 95% confidence interval = 0.92 to 1.18; capture-recapture studies relative risk = 0.96, 95% confidence interval = 0.82 to 1.12). Finally, among tagging studies, there was no evidence (X^2 = 0.476, df = 1, P = 0.490) that survival differed based on whether fish were tagged and vented by fishery biologists (relative risk = 0.86, 95% confidence interval = 0.18 to 4.05) or anglers (relative risk = 1.13, 95% confidence interval = 0.78 to 1.65). The wider confidence interval observed in studies conducted by fishery biologists is, presumably, due to the smaller number of such studies (N = 3) compared with those in which anglers participated (N = 18).

The effects of venting varied with capture depth particularly in capture-recapture studies Figure 1), which are most sensitive to delayed effects of capture and release. Relative risk decreased significantly with capture depth (P = 0.044), indicating that venting was slightly beneficial for fish captured from shallow waters, but was potentially harmful to fish captured from progressively deeper depths. The relationship between relative risk and capture depth was more pronounced in capture-recapture studies (P = 0.001) than in experimental studies (P = 0.781). There are two possible explanations for this. Capture-recapture studies assess the long-term consequences of capture, venting, and release, and fishes captured in these studies were frequently captured at greater depth than those used in experimental studies.

**DISCUSSION**

The available information provides virtually no support for the practice of venting as a means of increasing survival of captured and released fish. This result is consistent across a variety of experimental and field study protocols, within and among various species of fish, including species captured in freshwater and in saltwater, and from various depths. Nevertheless, this result is counterintuitive because fish that are unable to submerge after release have poor survival prospects. Fish that cannot submerge are subject to predation (Collins 1996; Keniry et al. 1996; Overton et al. 2008), stress from high surface water temperatures (Shasteen and Sneath 1997; Bettoli and Osborne 1998), and injury due to sun exposure (Keniry et al. 1996) and being struck by boats (Gravel and Cooke 2008). Although fish that can swim away or submerge commonly are considered to have survived catch and release (e.g., Gitschlag and Renaud 1994), this assumption is largely untested and there is some evidence that the ability to swim away is unrelated to survival (Bettoli and Osborne 1998; St. John and Syers 2005). Additionally, fish suffering barotrauma often exhibit atypical behavior (Gotshall 1964; Hannah and Matteson 2007; Gravel and Cooke 2008), which can adversely affect survival. It is, perhaps, the counterintuitive nature of this result, along with some wishful thinking, that has perpetuated the practice of venting.

Both experimental studies, which assess short-term affects of venting, and capture-recapture studies, which assess long-term effects, failed to provide support for venting. Failure to

---

**Table 2.** Composite estimates of relative risk, and 95% confidence intervals (CI), in species for which there were multiple assessments of the survival benefits of venting.

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of estimates</th>
<th>Relative Risk</th>
<th>Lower 95% CI</th>
<th>Upper 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coral trout</td>
<td>3</td>
<td>0.93</td>
<td>0.24</td>
<td>3.56</td>
</tr>
<tr>
<td>Crimson snapper</td>
<td>3</td>
<td>1.27</td>
<td>0.35</td>
<td>4.59</td>
</tr>
<tr>
<td>Grass emperor</td>
<td>2</td>
<td>1.97</td>
<td>0.00</td>
<td>2431.05</td>
</tr>
<tr>
<td>Red emperor</td>
<td>3</td>
<td>1.07</td>
<td>0.31</td>
<td>3.73</td>
</tr>
<tr>
<td>Red snapper</td>
<td>4</td>
<td>0.71</td>
<td>0.33</td>
<td>1.55</td>
</tr>
<tr>
<td>Redthroat emperor</td>
<td>2</td>
<td>1.14</td>
<td>0.01</td>
<td>151.34</td>
</tr>
<tr>
<td>Saddletail snapper</td>
<td>3</td>
<td>1.27</td>
<td>0.35</td>
<td>4.62</td>
</tr>
<tr>
<td>Spangled snapper</td>
<td>2</td>
<td>0.95</td>
<td>0.00</td>
<td>525.66</td>
</tr>
<tr>
<td>Vermilion snapper</td>
<td>3</td>
<td>0.96</td>
<td>0.25</td>
<td>3.72</td>
</tr>
<tr>
<td>Walleye</td>
<td>2</td>
<td>1.25</td>
<td>0.01</td>
<td>307.55</td>
</tr>
</tbody>
</table>
properly deflate swim bladders by anglers participating in capture-recapture studies could contribute to the observed inefficacy of venting. Indeed, many fishery management agencies (see Kerr 2001), extension services (e.g., Theberge and Parker 2005), and researchers (Keniry et al. 1996; Render and Wilson 1996) discourage anglers from venting fish because poor technique can result in injuries to internal organs, causing potentially fatal wounds. However, there has been no demonstration that fishery biologists are more knowledgeable concerning barotrauma or more skilled at venting than are anglers. For example, Gitschlag and Renaud (1994) repeatedly state that they vented the everted “gas bladders” (i.e., everted stomachs) of red snapper. The available information shows that, on average, fish captured, vented, and released by anglers fare no worse than those that are vented by fishery biologists. Thus, the observed inefficacy of venting in capture-recapture studies cannot be attributed to angler technique.

As an alternative to venting, several devices have been developed, recommended by fishery biologists, and used by anglers to return fish to the depth from which they were captured. These devices include baskets or cages in which fish are placed and lowered to some depth, usually the bottom, and shot weights (e.g., Theberge and Parker 2005). Brown et al. (2008) provide the only available assessment of the survival benefits of shot weights compared with venting. Among six species of Australian reef fish showing signs of barotrauma, Brown et al. (2008) found that survival was similar among control (unvented) fish, vented fish, and fish that were returned to depth using shot weights. Thus, there was no evidence that shot weights increased survival of released fish. There has been no assessment of the efficacy of baskets or cages in promoting survival of released fish.

The inefficacy of venting, and apparently drop weights, in promoting survival of released fish may be due to the severity of the injuries sustained as a result of barotrauma. Virtually every organ in the body of a fish is affected by barotrauma (e.g., Feathers and Knable 1983; Rummer and Bennett 2005; Phelan 2008), regardless of the presence of a swim bladder (e.g., Brown et al. 2007). Notably, Rummer and Bennett (2005) identified over 70 different injuries that resulted from overexpansion of the swim bladder alone. Venting fish, or returning them to their capture depth by any other means, has the potential benefit of relieving some symptoms of barotrauma (St. John and Syers 2005; Parker et al. 2006; Jarvis and Lowe 2008). However, the physiological effects of barotrauma are not remediated simply by returning the fish to its capture depth (Morrissey et al. 2005) and many barotrauma injuries are unaffected by recompression. Eversion and prolapse of the stomach and intestine are irreversible in some species and ultimately can result in death (Rogers et al. 1986; Phelan 2008). Similarly, torsion and volvulus of the stomach and intestines, which commonly are observed in fishes suffering barotrauma (Render and Wilson 1996; Rummer and Bennett 2005; Jarvis and Lowe 2008), are potentially fatal and are unlikely to resolve following recompression (Rummer and Bennett 2005; Phelan 2008). Hemorrhaging of the liver, heart, and other organs (e.g., Rummer and Bennett 2005; Parker et al. 2006; Phelan 2008) does not necessarily cease, nor do hematomas caused by this bleeding spontaneously resolve, upon recompression. Severe exophthalmia, such as occurs following rupture of the swim bladder and the consequent accumulation of gases in orbital cavities, can result in extreme stretching of the optic nerve, causing permanent impairment or loss of vision (Fable unpublished data; Rogers et al. 2008). Gravel and Cooke (2008) suggested there was a need to find alternatives to venting as a means for recompression of fishes suffering barotrauma. Any such alternative would have to provide relief from a number of serious injuries to be effective.

Several studies have shown that survival of released fish is inversely related to capture depth (Rogers et al. 1986; Gitschlag and Renaud 1994; St. John and Syers 2005). In particular, Render and Wilson (1994) hypothesized that survival decreased exponentially with capture depth and, consequently, that the potential benefits of venting would increase with capture depth. My summaries and analyses do not address variation in the magnitude of survival, or its relationship

**Figure 1.** The natural log of relative risk (lnRR) was negatively related to capture depth, which indicates that venting may be beneficial for fishes captured from shallow waters, but becomes less beneficial, possibly harmful, for fish captured at greater capture depths. The upper line and regression statistics are for combined samples from experimental (solid circles) and capture-recapture studies (open circles). The lower line and regression statistics are for capture-recapture studies (open circles) only.

![Graph](image-url)
with depth; however, they are inconsistent with Render and Wilson’s (1994) hypothesis and, instead, show that the survival of vented fish, compared with those that are not vented, actually decreases with depth of capture.

The observed negative relationship between relative risk for venting and capture depth can arise in either of two slightly different ways. First, venting might be beneficial to fish captured from shallow waters, but becomes progressively less beneficial as capture depth increases. Hannah et al. (2008) concluded that venting had no effect on the survival of released fish that were unable to submerge on their own. They suggested that such fish failed to submerge not because of their expanded swim bladders, but because they already were fatally stressed or injured and, thus, were incapable of submerging. Because the prevalence and severity of barotrauma injuries increase with depth of capture (Rummer and Bennett 2005; St. John and Syers 2005; Hannah et al. 2008), one would expect greater survival among vented (as well as unvented) fish captured from shallow waters compared with those captured from deeper waters. This could result in the observed relationship. Alternatively, venting may be of no benefit to fish captured from shallow waters, but it then becomes increasingly harmful as capture depth increases. This could result if venting was without effect, except as one additional stressor to which captured fish are subjected, and survival of fish captured from progressively deeper waters, which arguably are more stressed than those captured from shallower waters, is reduced because of the stress of venting and associated handling. The available data do not allow one to distinguish between these two alternatives; however, both have important fishery management implications.

High release mortality and the potential for permanent injuries in fishes suffering barotrauma led Rummer and Bennett (2005) and St. John and Syers (2005) to question the effectiveness of minimum length limits in the management of fisheries for red snapper and West Australian dhufish (Glaoosoma hebraicum), respectively. These authors proposed eliminating minimum length limits and requiring that all captured fish, up to the bag limit, be kept (Rummer and Bennett 2005), or enacting seasonal or spatial restrictions on demersal fishing when and where undersized fish were concentrated (St. John and Syers 2005). As an alternative to minimum length limits, Wilde et al. (2003) suggested that restrictions on the size of lures and baits used by anglers could be used to reduce catches of undersized fish in fisheries with high release mortality. Any alternative to the use of minimum length limits will affect some portion of the angling community, but the inefficacy of venting provides a compelling need to consider and enact these alternatives. Capture depth was recognized by Muoneke and Childress (1994) as an important determinant of survival of released fish and, hence, fishery quality. Fifteen years later, barotrauma and the means for mitigating it remain among the most important unresolved issues in fishery management (Arlinghaus et al. 2007).

There is an additional reason to pursue alternatives to the management status quo in fisheries affected by a high incidence of barotrauma. Fishes suffering barotrauma experience a wide range of serious, permanent, and potentially debilitating injuries. Although there is ongoing debate as to whether, and to what extent, fish feel pain (e.g., Rose 2002; Sneddon 2006), there is growing concern within the fishery management community for the welfare of fishes captured and released by anglers (Davie and Kopf 2006; Huntingford et al. 2006; Cooke and Sneddon 2007). Indeed, Arlinghaus et al. (2007) argue convincingly that this concern cannot be ignored and, in the future, will directly impact fishery management. Responsible fishery management requires such actions as are necessary to reduce mortality attributable to barotrauma. Ethical fisheries management similarly requires such actions as are necessary to minimize catches of undersize and nontarget fishes and minimize injuries resulting from barotrauma.

CONCLUSION AND RECOMMENDATION

The available evidence fails to demonstrate that venting fishes exhibiting symptoms of barotrauma promotes post-release survival. In fact, it is possible that this practice decreases survival of fish captured from deeper waters, presumably because of the greater severity of their barotrauma symptoms. Vventing fish should not only be discouraged by fishery management agencies (e.g., Kerr 2001), but given the possibility that venting adversely affects survival of released fish, this practice should be prohibited, rather than mandated (i.e., NMFS 2008).

ACKNOWLEDGMENTS

I thank Ian Brown, Steve Kerr, Brian Lucko, and Dave Walty for providing copies of unpublished reports, and Ian Brown, Dave Insley, and Wayne Sumpton for allowing me access to their original data. This manuscript has benefited from discussions with Phil Bettoli and Robin Riechers, and from comments by Phil Bettoli, John Carmichael, Matt Campbell, and Kevin Pope. I acknowledge the efforts of the authors of the original studies cited in Table 1, on which this manuscript is based. I thank Frank Prokop and Recfishwest Australia, and Bill Sawynok and SunFish Australia for use of their photographs.

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Gravel, M., and S. J. Cooke. 2008. Severity of barotrauma influences the physiological status, postrelease behavior, and

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There are two bills in U.S. Congress that you should be familiar with. One is the “Pacific Salmon Stronghold Partnership Act of 2008” (S. 3608) and the other is the “National Fish Habitat Conservation Act” (H.R. 7150, S. 3552). The fish habitat bill was introduced by Rep. Ron Kind of Wisconsin, and is currently in the natural resources committee awaiting action. The Pacific salmon bill was introduced by Sen. Maria Cantwell of Washington. It has been read twice in committee and referred to the Committee on Commerce, Science, and Transportation. Copies of the bill and their progress can be seen at www.thomas.gov.

**NATIONAL FISH HABITAT CONSERVATION ACT**

H.R. 7150 is fish-friendly bill aimed at protecting healthy habitat and improving poor habitat for fisheries, in both freshwater and marine environments. It creates a board that will decide which projects to fund. The board would have 19 members representing the National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), Environmental Protection Agency (EPA), state agencies, Indian tribes, regional fishery management councils, marine fisheries commissions, Sportfishing and Boating Partnership Council, sportfishing industry, commercial sportfishing industry, subsistence fishermen, marine and freshwater recreational anglers, conservation organizations, livestock and poultry industry, housing development industry, row crop industry, natural resources commodity interests, and the American Fisheries Society. I think the inclusion of AFS in the council is noteworthy. Twelve members would initially serve either 1 \( (n = 4) \), 2 \( (n = 4) \), or 3 \( (n = 3) \) year terms, then 3-year terms after that, providing continuity to the board. The board chair is elected by the board. Votes require 2/3 majority to pass. A quorum is a majority of the members.

Projects to be funded by the bill must be partnerships—multi-agency, multi-interest group efforts—that protect and improve aquatic habitat. Half of the funding must come from non-federal sources, except for projects “located on federal land or waters, including the acquisition of inholdings within such lands and waters.” In-kind contributions are acceptable as a match, as well as cash. Exception is also made for funds available to Indian tribes, which can be used as a match. The funding requested is $75 million per year from 2009 to 2013, 5% of which is dedicated to projects carried out by Indian tribes. The Partnership Office (see below) would get $3 million or 25% of appropriations. In addition, $300,000 would be given to the Secretary of the Interior for planning, reporting, and administrative expenses. Funds for the partnership program would remain available until expended.
The board would submit a prioritized list of project recommendations to the Secretary of the Interior each year. Project selection criteria include the extent to which the project:

1. Addresses priorities established by the board,
2. Fulfills act goals,
3. Includes non-federal funds,
4. Includes multiple-entity involvement,
5. Increases public access and fishing opportunities, and
6. Protects threatened and endangered species.

Projects must also include a monitoring plan to make sure the desired results were achieved.

The legislation provides requirements for any land purchases. It also creates a National Fish Habitat Conservation Partnership Office within the U.S. Fish and Wildlife Service. The office would administer the program (distribute funds for the projects, facilitate cooperative development and approval of projects, and develop an interagency operational plan). Additionally, a report to Congress is required every two years regarding the implementation of the act. The board would also be required to submit to Congress a separate “Status and Trends Report” on the status of aquatic habitats in the United States to Congress every 5 years.

**PACIFIC SALMON STRONGHOLD PARTNERSHIP ACT OF 2008**

This bill creates a 17-member board charged with establishing a “Salmon Stronghold Partnership program to protect wild Pacific salmon.” The purpose of the act is to protect and restore the “healthiest remaining salmon strongholds in North America to sustain core centers of salmon abundance, productivity, and diversity in order to prevent decline of salmon populations.” Additional goals are recovery of threatened or endangered salmon populations within the salmon strongholds, as well as promotion of economic co-benefits such as flood protection, recreation, water quality, and climate benefits.

Like the fish habitat bill, S.3608 emphasizes partnerships among entities that represent fish interests. The board includes one representative each from NOAA, USFWS, USFS, EPA, Bonneville Power Administration (BPA), Bureau of Land Management, and the Northwest Power and Conservation Council. In addition, five states (Oregon, Washington, California, Idaho, and Alaska) each have one representative, West Coast Indian tribes get three representatives, and lastly, three representatives from non-governmental agencies are selected by the board.

The board is charged with:

1. Developing a charter describing members;
2. Defining salmon strongholds and the process for identifying strongholds;
3. Developing demonstration projects designed for specific salmon strongholds;
4. Developing the process for reviewing and selecting watershed grants;
5. Maintaining a forum to share best practices and consistent methodology;
6. Monitoring, evaluating, and reporting regional status and trends of salmon ecosystems;
7. Making information available to the public; and
8. Conducting education outreach to encourage stronghold stewardship.

The board would meet at least three times/year. The Salmon Partnership program would be administered by the National Marine Fisheries Service (NMFS). NMFS would have the responsibility to provide a triennial assessment of status and trends in strongholds, provide GIS and mapping support to facilitate conservation planning, develop and apply models and other tools to identify highest value conservation actions within strongholds, and develop measures of effectiveness of the partnership activities. NMFS, in coordination with the director of the USFWS, would be required to submit a report at least every three years to Congress describing activities carried out under the act.

A total of $15 million annually would be budgeted for 2009 to 2015. Funding would be appropriated via the National Fish and Wildlife Foundation. An additional $300,000 would be given to NMFS for administrative expenses. Both funds would be available until expended. For projects on non-federal land, the program would only cover 50% of the project costs. On federal land, up to 100% of the costs would be paid by the program. For the non-federal match, in-kind contributions and cash are acceptable. Exception is also made for BPA, whose funding would be credited as non-federal.
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contrast, a size of at least 4 x 6
inches, at least 300 dots per inch
(dpi) resolution, and be saved in EPS,
TIF, or JPG formats. For black-and-
white figures and graphs, please use
a minimum resolution of 300 dpi.
We cannot accept PowerPoint files.
Hardcopy also must be submitted for
production purposes after acceptance.

Page Proofs and Reprints
The corresponding author will receive
page proofs of the laid-out article (usually
sent as a PDF file via e-mail) approximately
four to six weeks prior to publication.
Check carefully for typographical errors.
and possible problems with the placement or captions of illustrations. Extensive revision is not allowed at this stage.

Indicate any changes and return page proofs within 48 hours to Production Editor, AFS; 5410 Grosvenor Lane, Suite 110; Bethesda, MD 20814-2199; 301/897-8616; fax 301/897-8097; cworth@fisheries.org. Reprint order forms will be provided to the corresponding author with page proofs. Orders should be placed with Allen Press, Inc. (fax 785/843-7251, phone 785/843-6343, reprints@allenpress.com) no later than two weeks prior to publication.

Charges are US$85 per published page and are billed to the author within two months of publication. AFS members may request full or partial subsidy of their papers if they lack institutional or grant funds to cover page charges. Technical reviews and acceptability of manuscripts are independent of the need for subsidy. All manuscripts will be reviewed by two or more outside experts in the subject of the manuscript and evaluated for publication by the science editors and editor. Authors may request anonymity during the review process and should structure their manuscripts accordingly. Papers are accepted for publication on the condition that they are submitted solely to Fisheries and that they will not be reprinted or translated without the publisher’s permission. See “Dual Publication of Scientific Information,” Trans. AFS 110:573-574 (1981). AFS requires an assignment of copyright from all authors, except for articles written on government time or for the government that cannot be copyrighted. Authors must obtain written permission to reprint any copyrighted material that has been published elsewhere, including tables and figures. Copies of the permission letter must be enclosed with the manuscript and credit given to the source.

ESSAYS

Essays are thought-provoking or opinion articles based upon sound science. Essays may cover a wide range of topics, including professional, conservation, research, AFS, political, management, and other issues. Essays may be submitted in conjunction with a full feature article on the same topic.

Essays range from 1,200–1,400 words, may include photographs or illustrations, and should not cite more than eight references. However, essays should provide scientific documentation, unlike unreviewed editorials (below). Essays are peer-reviewed based on the following criteria: contribution to the ongoing debate, logical opinion based on good science, persuasiveness, and clarity of writing. Reviewer agreement with the opinion of the views expressed is not a criterion. Essays do not have page charges or abstracts. Essays should be formatted and submitted online as above.

UNREVIEWED ARTICLES

Unit News and Other Departments

AFS members are encouraged to submit items for the Unit News, Member Happenings, Obituaries, Letters to the Editor, and Calendar departments. Dated material (calls for papers, meeting announcements, nominations for awards) should be submitted as early as possible, but at least eight weeks before the requested month of publication. AFS Unit News and Letters should be kept under 400 words and may be edited for length or content. Obituaries for former or current AFS members may be up 600 words long. Do NOT use the online manuscript tracking system to submit these items—the text and 300 dpi electronic photos for all departments except the Calendar should be e-mailed to the managing editor at bbeard@fisheries.org or mailed to the address below. Calendar items should include the date, event title, location, and contact information, and should be sent to the production editor at cworth@fisheries.org.

For information about submitting a Students’ Angle column, please contact Student Subsection President Kristal Schneider at ewell002@umn.edu.

Fisheries News

Brief items for the Fisheries News section are encouraged. Typical items include conservation news, science news, new programs of significance, major policy or regulatory initiatives, and other items that would be of interest to Fisheries readers. News items for the section should be no more than a few paragraphs; please consult the managing editor about submitting longer news articles.

Fisheries Forum (formerly Guest Editorials)

Authors are encouraged to submit most opinion pieces about fisheries science or management as essays for peer review. Occasionally, editorials about professional or policy issues may be inherently unsuitable for a scientific review. Sometimes these pieces are submitted by a committee, agency, or organization. Editorials should be 750–1,500 words, may be edited for length or content, and referred for outside review or rebuttal if necessary. A disclaimer will accompany all Fisheries Forum editorials.

Book Reviews

Please contact Book Review Editor Francis Juanes at 413/545-2758, juanes@forwild.umass.edu, if you want to be added to the list of potential book reviewers. New books (preferably two copies) submitted for review should be sent to Francis Juanes, Department of Natural Resources Conservation, University of Massachusetts, Amherst, MA 01003-4210.

QUESTIONS?

Contact Managing Editor Beth Beard; AFS; 5410 Grosvenor Lane, Suite 110; Bethesda, MD 20814-2199; 301/897-8616, ext.220; bbeard@fisheries.org. Detailed instructions for using the online manuscript tracking system are available at http://fisheries.allentrack.net.

Also see the Fisheries Guidelines for Reviewers and the Guidelines for Case Studies at www.fisheries.org.
CALL FOR AWARD NOMINATIONS:
2009 AMERICAN FISHERIES SOCIETY AWARDS

The American Fisheries Society is seeking nominations and applications for several 2009 awards. Award recipients will be honored at the Annual Meeting in Nashville, Tennessee, August 2009. Nominations typically require a candidate’s name, full contact information, biographical information, and/or history of service to the Society. Some awards require additional nomination materials. For more information on how to nominate an individual, or organization, see descriptions below or contact the award chair. You may also contact Gail Goldberg, AFS awards coordinator, at ggoldberg@fisheries.org or 301/897-8616 x201 for more information.

Award of Excellence
Presented to an AFS member for original and outstanding contributions to fisheries and aquatic biology.
Nomination deadline: 17 April 2009
Contact: Margaret H Murphy
Quantitative Environmental Analysis, LLC
290 Elwood Davis Rd
Liverpool, NY 13088
Phone: 315/453-9009
Fax: 315/453-9010
E-mail: mmurphy@qeallc.co

Carl R. Sullivan Fishery Conservation Award
Presented to an individual or organization for outstanding contributions to the conservation of fishery resources. Eligibility is not restricted to AFS members, and accomplishments can include political, legal, educational, scientific, and managerial successes. Nominations should include a synopsis of fishery conservation contributions; a description of the influence of those contributions on improved understanding, management, or use of fishery resources; and at least one additional supporting letter.
Nomination deadline: 16 April 2009
Contact: Don Jackson
Mississippi State University Box 6960
Department of Wildlife and Fisheries
Mississippi State, MS 39762
Phone: 662/325-7493
Fax: 662/325-8726
E-mail: djackson@cfr.msstate.edu

Excellence in Public Outreach
Presented to an AFS member who goes the “extra mile” in sharing the value of fisheries science/research with the general public through the popular media and other communication channels. Two or more individuals may act as nominators, but at least one nominator must be an AFS member. Entries must include a biographical sketch of the nominee (not to exceed three pages) and supporting evidence of communicating the value of fisheries issues/research to the general public through the media and other communication channels, plus any evidence of teaching others about communication with the public.
Nomination deadline: 5 May 2009
Contact: Jan Konigsberg
E-mail: jkberg@gci.net

Distinguished Service Award
Recognizes outstanding contributions of time and energy for special projects or activities by AFS members. The number of recipients may vary.
Nomination deadline: 31 January 2009
Contact: Don Jackson

Honorary Membership
Presented to individuals who have achieved outstanding professional accomplishments or have given outstanding service to the Society. Honorary Members must be nominated by at least 100 active members and elected by a 2/3 majority of active members online.
Nomination deadline: 1 May 2009
Contact: Gail Goldberg
American Fisheries Society
5410 Grosvenor Lane, Suite 110
Bethesda, MD 20815
Phone: 301/897-8616 x201
E-mail: ggoldberg@fisheries.org
**Meritorious Service Award**
Presented to an individual for loyalty, dedication, and meritorious service to the Society throughout the years and for exceptional commitment to AFS’s programs, objectives, and goals.
Nomination deadline: 1 May 2009
Contact: Patricia M. Mazik
West Virginia University
WVCFWRU
322 Percival Hall
Morgantown, WV 26506-6125
Phone: 304/293-3794 x2431
Fax: 304/293-4826
E-mail: pmazik@wvu.edu

**Outstanding Chapter Award**
Recognizes outstanding professionalism, active resource protection, and enhancement programs, as well as a strong commitment to the mission of the Society. Three awards are given, one for small Chapters, one for large Chapters, and one for a Student Subunit of a Chapter. Chapters should submit an application to their Division presidents to be considered. Division presidents must nominate two best Chapters from their Divisions, one with less than 100 members and another with 100 members or more by 1 June 2009.
Applications can be obtained from the AFS website (see the main awards page for more information).
Nomination deadline: 1 June 2009
Contact: Desmond Kahn
Delaware Fish and Wildlife
P.O. Box 330
Little Creek, DE 19961-0330
Phone: 302/739-4782
Fax: 302/739-6780
E-mail: Desmond.kahn@state.de.us

**President’s Fishery Conservation Award**
Presented in two categories: (1) an AFS individual or Unit, or (2) a non-AFS individual or entity, for singular accomplishments or long-term contributions that advance aquatic resource conservation at a regional or local level. The award is administered by the Past President’s Advisory Council. A nomination package should include a strong and detailed letter describing the nominee’s accomplishments and the evidence for being “significant at a national or international level.” If the nomination is for an individual, include a CV if possible. Nominations may be supported by multiple individuals by signing one letter, or by submitting supporting letters in addition to the main nomination letter. Include the nominee’s title and full contact information (address, e-mail, phone).
Nomination deadline: 15 May 2009
Contact: Mary C. Fabrizio
Virginia Institute of Marine Science
Department of Fisheries Science
Box 1346
Gloucester Point, VA 23062
Phone: 804/684-7308
Fax: 804/684-7327
E-mail: mfabrizio@vims.edu

**Retired Members Travel Award for the AFS Annual Meeting**
The American Fisheries Society has established this travel award to encourage and enable members of the Society to attend Annual Meetings, particularly those members who might play a more active role in the meeting. The Society recognizes that some retired members who desire to participate in the Annual Meeting might be inhibited for financial reasons. Retired members may not have funds for travel to meetings that were available to them while employed. Therefore, this award is meant for those members who truly have a need for financial assistance. The Society has neither means nor desire to verify financial need, so that your request for support is based on an honor system. However, you must be a dues-paying retired member of the American Fisheries Society to apply. A maximum of $1,500 may be awarded for reimbursable expenses. See the main awards page on the AFS website for the application form.
Nomination deadline: 9 June 2009
Student Writing Contest
Recognizes students for excellence in the communication of fisheries research to the general public. Undergraduate and graduate students are asked to submit a 500- to 700-word article explaining their own research or a research project in their lab or school. The article must be written in language understandable to the general public (i.e., journalistic style). The winning article will be published in Fisheries. Students may write about research that has been completed, is in progress, or is in the planning stages. The papers will be judged according to their quality and their ability to turn a scientific research topic into a paper for the general public.
Submission deadline: 5 May 2009
Contact: Jan Konigsberg
E-mail: jkberg@gci.net

AWARD ADMINISTERED BY EDUCATION SECTION

Excellence in Fisheries Education Award
The Excellence in Fisheries Education Award was established in 1988. The award is administered by the Education Section and is presented to an individual to recognize excellence in organized teaching and advising in some aspect of fisheries education. Nominees may be involved in extension or continuing education, as well as traditional college and university instruction. Nominees must be AFS members, have been actively engaged in fisheries education within the last 5 years, and have had at least 10 years of professional employment experience in fisheries education. Two or more people may act as nominators, but at least one nominator must be an AFS member. The nominator(s) is responsible for compiling supporting material and submitting the application. The suggested format for applications can be found on the Education Section web site. Application materials should be sent to Michael Quist (mcquist@iastate.edu) in digital form. Nomination deadline: 15 May 2009.
Contact: Michael Quist
Department. of Natural Resource Ecology and Management
Iowa State University
339 Science II
Ames, IA 50011
Phone: 515/294-9682
Fax: 515/294-2995
E-mail: mcquist@iastate.edu

J. Frances Allen Scholarship Award
The American Fisheries Society (AFS) is pleased to announce that applications are being accepted until 6 March 2009 (received electronically by this date) for the J. Frances Allen Scholarship for a female doctoral fisheries student. The Allen Scholarship was established in 1986 to honor Allen, who pioneered women’s involvement in the AFS and in the field of fisheries. Eligibility: The qualified applicant must be a female Ph.D. student who was an AFS member as of 31 December 2008. The applicant must be conducting aquatic research in line with AFS objectives, which include “all branches of fisheries science, including but not limited to aquatic biology, engineering, fish culture, limnology, oceanography, and sociology.” Application: To apply, submit items A through D electronically, in an e-mail:
A. **Resume** with information in the following format:
- Educational history: degrees, grade point average for each degree (overall and in major), relevant courses taken;
- Professional experience: positions held, level of position, years of experience at each level;
- Publications: separated into refereed and other;
- Presentations: “first author” implies you presented it, “second author” assumes you did not, specify if otherwise, and;
- AFS participation: year joined, meeting attendance and participation, committee involvement, presentations at AFS meetings.

B. **Transcripts** from all institutions of higher education attended; include enrollment in Ph.D. program. High quality photocopies are acceptable. Please include transcripts; do not have them sent separately. You may scan official transcripts as long as it is of high quality.

C. **Dissertation research proposal** not to exceed four single-spaced pages (excluding separate title page, abstract, and references). The proposal must be submitted in the following single-spaced format with headings:
- Title page with project title, area of research (e.g., genetics, ecology, modeling, applicant's name, university, and department);
- Abstract, not to exceed one half-page, describing research proposed;
- Introduction of project with background and project justification;
- Problem statement with specific objectives or hypotheses;
- Summary of procedures and methods with justification for choices, including preliminary testing, literature references;
- Expected and preliminary results;
- Significance of research or anticipated application of findings; and,
- Literature cited (follow format for *Transactions of the American Fisheries Society*).

D. **Three letters of recommendation**, one of which must be from the applicant's major advisor. One letter must be from an AFS member. Each letter should address the
1. Applicant's promise as a fisheries scientist,
2. Potential of applicant to complete their proposed work, and
3. Significance of the applicant's proposed research to the advancement of fisheries science.

If those writing letters prefer, they may e-mail letters separately to the address below, but must be received by the deadline and should contain the applicants name along with J. F. Allen Scholarship in the subject heading. Send electronic applications and recommendations (in one mailing), to be received no later than **6 March 2009** to:

Shannon Brewer
Shannon_brewer@fws.gov
Subject: J. Frances Allen Scholarship

An application will not be reviewed if any part is missing, or if it is received after the deadline.

**Criteria for Selection:** Selection will be made by the J. Frances Allen Scholarship Committee of the AFS Equal Opportunities Section (www.fisheries.org_UNITS/EOs/). Proposal reviews by scientists in appropriate fields will be solicited by the committee. The awardee will be selected on a competitive basis, with emphasis placed on research promise, scientific merit, and academic achievement. Submission of an application acknowledges the applicant's acceptance of the committee's decision as final.

**Public Announcement and Notification:** Public announcement of the recipient of the J. Frances Allen Scholarship will be made at the 2009 AFS Annual Meeting in Nashville, Tennessee. In addition a written announcement will appear in *Fisheries* and the recipient will receive an official letter of award. The recipient is encouraged to present the results of her research at an Annual Meeting of the Society. It is expected that the research findings will be published in an appropriate fisheries journal upon project completion, at which time the support from this scholarship and AFS will be acknowledged.

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included high-profile papers and international collaborations in landscape ecology, invasion biology, conservation biology, and trophic linkages between terrestrial and aquatic ecosystems. Although Fausch has been sought as an advisor and colleague by highly regarded scientists in many countries, perhaps his most important and personal exchanges have been with scientists and students in Japan. Early in his own influential career, the late Shigeru Nakano approached Fausch to explore ideas in stream ecology. That meeting led to a long-term relationship between Japanese and U.S. scientists and students and a remarkable legacy in stream ecology and conservation biology, as documented in the recent movie “RiverWebs” which celebrates Nakano’s life and work and was produced principally through Fausch's efforts.

At the World Council of Fisheries Societies meeting held at the Congress, the Fisheries Society of the British Isles’ bid to host the Sixth World Fisheries Congress in Edinburgh, Scotland, in May 2012 was accepted. The theme will be “Fisheries Sustainability in a Changing World.” International Fisheries Section Past President Doug Beard was elected as the new vice president of the World Council, while Felicity Huntingford of the Fisheries Society of the British Isles was elected as president. More photos of the Fifth World Fisheries Congress are available online at www.flickr.com/photos/americanfisherisessociety/.
The mid-day sun beats down on me as I’m standing with my feet firmly nestled in the sand of a tidal creek in Eleuthera, The Bahamas. I look down and notice that the water once above my knees has dropped to mid-calf. I cast my gaze back towards the mangroves where the previously flooded root system is becoming fully exposed to the light breeze that moves my hair. “They’re coming,” reassures Andy, who’s poised like a stork in a quick-dry shirt. I watch in anticipation, scanning the fleeting water looking for movement and flashes of silver. I realize we aren’t the only ones waiting patiently as a juvenile lemon shark swims by. Hairs stand on my arms as an hour has ticked away while I remain almost motionless, like a mannequin in a store-front window. Then it appears, a wave of movement coming towards me! I stiffen and then move slightly into my strike pose. “Okay, now!” signals Andy as we rush to close the seine net on our well-stalked prey. Minutes later the net is alive with action and adrenalin courses through our veins as we hurry to release the bycatch and extract our target species, bonefish.

With the bonefish in submerged holding pens, I prepare for surgery. One by one we surgically implant the bonefish with ultrasonic transmitters and release them so that we can track their movements. To do this, listening stations strategically placed along the coastline and in multiple tidal creeks are used, like a scanner along the coastline and in multiple listening stations strategically placed to track their movements. To do this, we may use the movement of these species, populations throughout their circumtropical distribution are on the decline in many of the developed/older fisheries. Unfortunately, limited scientific data exists on bonefish, as much of the research has been aimed at closing the gap in knowledge of bonefish.

Karen J. Murchie

Murchie is an National Sciences and Engineering Research Council of Canada Ph.D. student in the Fish Ecology and Conservation Physiology Laboratory at Carleton University in Ottawa, Canada. She is also a member of the Flats Ecology and Conservation Program at Cape Eleuthera Institute in The Bahamas where she conducts field studies. She can be contacted at kmurchie@connect.carleton.ca.
What Doesn’t Kill Fish Doesn’t Necessarily Make Them Stronger: Understanding the Long-term Population Consequences of Stress

When considering human impacts on freshwater ecosystems, the adage, “What doesn’t kill you, makes you stronger” can be reversed; sub-lethal stressors have lasting impacts on the health of individuals and the dynamics of populations. In order to prevent human activities from depleting fish populations, we need to accurately predict the effects of stress. From the chemical runoff of a factory to the noise of a cattager using an outboard motor, fish experience a wide range of stress as a result of human activity. These stressors may not directly kill a fish, but they can cause a myriad of other problems, such as reducing the ability to escape predators or to acquire food. The effects of stress on an individual fish have been measured extensively, but extrapolating these effects to a population remains one of the biggest challenges in ecological research.

To illustrate the complexity of the problem, imagine a watershed that has recently been developed. To determine the effect on trout, many variables can be measured: chemical levels in the water, the effect of these chemicals on trout in a laboratory, or capturing minnows at the site and comparing their numbers and health to minnows from an undeveloped site. However, to definitively state that the population was affected by the development using traditional methods, it would be necessary to have before and after comparisons of the same population within the river, as well as comparisons between populations at multiple developed and undeveloped sites. As a consequence of the financial and logistic difficulties involved with conducting studies of this scale, the effects beyond the individual are rarely determined.

Using hormone manipulation techniques that have previously been reserved for the laboratory, my research investigates the long-term population effects of stress in wild freshwater fish in their natural environment. In fish, as in humans, any stressor will elevate cortisol, the primary stress hormone. This in turn is correlated with a whole suite of effects that range from changes in immune function to changes in behavior. By using an injection of cortisol, it is possible to stress fish in a standardized manner. The results can then be applied to any stressful situation; changes in water flow or quality, habitat degradation, or any unpredictable disturbance will all cause elevations of cortisol.

For my research, I used largemouth bass as a model to look at how a short-term stress can have long-term impacts in a population. I injected cortisol into a group of largemouth bass in a closed freshwater lake. I am directly comparing the growth, reproductive activity, and survival of the stressed individuals to unstressed fish in their natural environment. Since the stressed and unstressed fish are in the same lake, under identical conditions, any effects I see will be due to stress, rather than an effect of other uncontrollable environmental factors.

I gave the “stressed” fish a cortisol injection that caused them to be stressed for five days in the early summer, and then recaptured both stressed and unstressed fish in the fall, measured them, and took blood samples. In the fall, there was no delayed mortality as a result of the five-day stress. However, the short-term stress was sufficient to reduce growth throughout the summer, and stressed fish had lower reserves of stored energy than unstressed fish. In the spring, I will again recapture these fish, take measurements and blood samples, and monitor reproductive activity. I would like to know whether the fish are able to recover from the stress by the spring, or if their growth and body condition are still affected. I will discover whether relatively short-term exposure to a stressor in early summer can cause increased over-winter mortality, and decreased reproduction the following spring.

Human activity will inevitably stress fish. However, the negative impacts of stress can be managed if we have comprehensive knowledge of how stress affects wild fish. My research will contribute by providing an understanding of the long-term consequences of stress on a wild population of fish. My hope is that ultimately, this understanding will be translated into more effective conservation methods. With knowledge of the consequences of our actions, we can ensure that fish populations stay strong, and our freshwater ecosystems recover and persist.

Constance M. O’Connor
O’Connor is a Ph.D. candidate at the Fish Ecology and Conservation Physiology Lab, Carleton University, Ottawa, Canada, and can be contacted at coconno4@connect.carleton.ca.
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<tr>
<th>Chapter/Division</th>
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<th>Contact Information</th>
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<tr>
<td>Arizona-New Mexico</td>
<td>Feb 5-Feb 7</td>
<td>Gallup, NM</td>
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<td>Feb 3-Feb 6</td>
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<td>California-Nevada</td>
<td>Apr 1 - Apr 4</td>
<td>Santa Rosa, CA</td>
<td><a href="http://www.afs-calnea.org">www.afs-calnea.org</a></td>
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<tr>
<td>Colorado-Wyoming</td>
<td>Feb 23-Feb 27</td>
<td>Loveland, CO</td>
<td>Kathy Foster, 307/775-9166, <a href="mailto:kafoster@usgs.gov">kafoster@usgs.gov</a></td>
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<tr>
<td>Dakota</td>
<td>Feb 23-Feb 25</td>
<td>Bismarck, ND</td>
<td>Randy Hiltner, 701/662-3617, <a href="mailto:rhiltner@nd.gov">rhiltner@nd.gov</a></td>
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<tr>
<td>Florida</td>
<td>Feb 17-Feb 19</td>
<td>Ocala</td>
<td><a href="http://www.sdafs.org/Flafs/">www.sdafs.org/Flafs/</a></td>
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<td>Georgia</td>
<td>Jan 27-Jan 28</td>
<td>Perry</td>
<td><a href="http://www.uga.edu/ugafishga-afs/home.htm">www.uga.edu/ugafishga-afs/home.htm</a></td>
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<td>Idaho</td>
<td>Mar 4-Mar 6</td>
<td>Boise</td>
<td><a href="http://www.idaofafs.org/annualmeeting.php">www.idaofafs.org/annualmeeting.php</a></td>
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<tr>
<td>Illinois</td>
<td>Feb 24-Feb 26</td>
<td>Moline</td>
<td>Jeremiah Haas, 309/227-2867, <a href="mailto:jeremiah.haas@exeloncorp.com">jeremiah.haas@exeloncorp.com</a></td>
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<tr>
<td>Indiana</td>
<td>Jan 29-Jan 31</td>
<td>Indianapolis</td>
<td>Jason Doll, 765/285-8803, <a href="mailto:jcdoll@bsu.edu">jcdoll@bsu.edu</a></td>
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<tr>
<td>Kansas</td>
<td>Jan 29-Jan 30</td>
<td>Wichita</td>
<td>Jessica Mounts, <a href="mailto:jessicam@wp.state.ks.us">jessicam@wp.state.ks.us</a></td>
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<tr>
<td>Louisiana joint with Southern Division</td>
<td>Jan 15-Jan 18</td>
<td>New Orleans</td>
<td><a href="http://www.sdafs.org/meetings">www.sdafs.org/meetings</a></td>
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<td>Mexico</td>
<td>May 12-May 14</td>
<td>Ensenada</td>
<td><a href="http://www.ecosistemico.org/afs_mechap/meetings.htm">www.ecosistemico.org/afs_mechap/meetings.htm</a></td>
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<td>Minnesota joint with Wisconsin and Ontario</td>
<td>Feb 2-Feb 4</td>
<td>Duluth, MN</td>
<td>Tim Cross, 320/234-2550 x233, <a href="mailto:tcross233@gmail.com">tcross233@gmail.com</a></td>
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<td>Missouri joint with Missouri Natural Resources</td>
<td>Feb 5</td>
<td>Osage Beach</td>
<td><a href="http://www.mnrr.org">www.mnrr.org</a></td>
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<td>Montana</td>
<td>Feb 9-Feb 13</td>
<td>Kalispell</td>
<td>Scott Barndt, <a href="mailto:sbarndt@fs.fed.us">sbarndt@fs.fed.us</a></td>
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<tr>
<td>Nebraska</td>
<td>Feb 10-Feb 11</td>
<td>Gretna</td>
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<td>New York joint with Pennsylvania</td>
<td>Feb 4-Feb 6</td>
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<td><a href="http://www.newyorkafs.org/meet.html">www.newyorkafs.org/meet.html</a></td>
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<td>Northeastern Division joint with Northeast Fish and</td>
<td>Apr 26-Apr 29</td>
<td>Lancaster, PA</td>
<td><a href="http://www.neafwa.org">www.neafwa.org</a></td>
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<td>North Central Division joint with Midwest Fish and</td>
<td>Dec 6-Dec 9</td>
<td>Springfield, IL</td>
<td><a href="http://www.sdafs.org/">www.sdafs.org/</a></td>
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<td>Wildlife Conference</td>
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<td>Ohio joint with Ohio Fish and Wildlife Management</td>
<td>Feb 6-Feb 6</td>
<td>Columbus</td>
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<td>Association Conference</td>
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<tr>
<td>Ontario joint with Wisconsin and Minnesota</td>
<td>Feb 2-Feb 4</td>
<td>Duluth, MN</td>
<td>Tim Cross, 320/234-2550 x233, <a href="mailto:tcross233@gmail.com">tcross233@gmail.com</a></td>
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<td>Oregon</td>
<td>Feb 24-Feb 27</td>
<td>Bend</td>
<td><a href="http://www.orafs.org/meeting2009/Annual09.htm">www.orafs.org/meeting2009/Annual09.htm</a></td>
</tr>
<tr>
<td>Pennsylvania joint with New York</td>
<td>Feb 4-Feb 6</td>
<td>Oswego, NY</td>
<td><a href="http://www.newyorkafs.org/meet.html">www.newyorkafs.org/meet.html</a></td>
</tr>
<tr>
<td>South Carolina</td>
<td>Feb 12-Feb 13</td>
<td>Clemson</td>
<td><a href="http://www.scafs.org/">www.scafs.org/</a></td>
</tr>
<tr>
<td>Southern Division joint with Louisiana</td>
<td>Jan 15-Jan 18</td>
<td>New Orleans</td>
<td><a href="http://www.sdafs.org/meetings">www.sdafs.org/meetings</a></td>
</tr>
<tr>
<td>Tennessee</td>
<td>Mar 3-Mar 4</td>
<td>Montgomery Bell State Park</td>
<td><a href="http://www.tn-afs.org/Events/2009meeting_announc.html">www.tn-afs.org/Events/2009meeting_announc.html</a></td>
</tr>
<tr>
<td>Texas</td>
<td>Jan 27-Jan 31</td>
<td>Fort Worth</td>
<td><a href="mailto:Fred.Janssen@tpwd.state.tx.us">Fred.Janssen@tpwd.state.tx.us</a></td>
</tr>
<tr>
<td>Tidewater</td>
<td>Mar 12-Mar 14</td>
<td>Wilmington, NC</td>
<td></td>
</tr>
<tr>
<td>Utah</td>
<td>Feb 17-Feb 19</td>
<td>Moab</td>
<td><a href="http://www.fisheries.org/units/Bonneville/">www.fisheries.org/units/Bonneville/</a></td>
</tr>
<tr>
<td>Washington-British Columbia</td>
<td>Apr 20-Apr 23</td>
<td>Shelton, WA</td>
<td><a href="http://www.npic-afs.org/agm/">www.npic-afs.org/agm/</a></td>
</tr>
<tr>
<td>Western Division</td>
<td>May 3-May 7</td>
<td>Albuquerque, NM</td>
<td><a href="http://www.azmfnishsoup.org/wdafs09/index.htm">www.azmfnishsoup.org/wdafs09/index.htm</a></td>
</tr>
<tr>
<td>West Virginia</td>
<td>Mar 5-Mar 6</td>
<td>Huntington</td>
<td><a href="http://www.sdafs.org/Wafs/">www.sdafs.org/Wafs/</a></td>
</tr>
<tr>
<td>Wisconsin joint with Minnesota and Ontario</td>
<td>Feb 2-Feb 4</td>
<td>Duluth, MN</td>
<td>Tim Cross, 320/234-2550 x233, <a href="mailto:tcross233@gmail.com">tcross233@gmail.com</a></td>
</tr>
</tbody>
</table>
### CALENDAR: FISHERIES EVENTS

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 cworth@fisheries.org. (If space is available, events will also be printed in *Fisheries* magazine.)

More events listed at www.fisheries.org click "Who We Are" click "Calendar"

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Location</th>
<th>Event Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 5-6</td>
<td>Using Acoustic Tags to Track Fish</td>
<td>Seattle, Washington</td>
<td><a href="http://www.hisonar.com/at_short_course.htm">www.hisonar.com/at_short_course.htm</a></td>
</tr>
<tr>
<td>Feb 15-18</td>
<td>Aquaculture America 2009</td>
<td>Seattle, Washington</td>
<td><a href="http://www.was.org">www.was.org</a></td>
</tr>
<tr>
<td>Mar 27-29</td>
<td>Midwest Ecology and Evolution Conference</td>
<td>Lincoln, Nebraska</td>
<td><a href="http://midwesteec.org">midwesteec.org</a></td>
</tr>
<tr>
<td>Mar 30-Apr 3</td>
<td>Improving the Ecological Status of Fish Communities in Inland Waters: International Symposium and EFI+ Workshop,</td>
<td>Hull, United Kingdom</td>
<td><a href="http://www.hull.ac.uk/hifi/events/index.html">www.hull.ac.uk/hifi/events/index.html</a></td>
</tr>
</tbody>
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### MAKE THE MOST OF YOUR VALUABLE DATA!

**Online Course – Maximum Likelihood Estimation for Natural Resources and Ecology**

This online non-credit course offered by the Quantitative Fisheries Center at Michigan State University will introduce fisheries biologists and ecologists to maximum likelihood estimation. The course covers nonlinear model fitting, estimation of uncertainty in model estimates (e.g., likelihood profiling), and methods of inference using multiple models (e.g., AIC model averaging). The course complements materials presented in the “The Ecological Detective” by R. Hilborn and M. Mangel, and is self-paced, with worked Microsoft® Excel exercises using ecological and fishery related data.

Enrollment cost: $470 per person. Please go to [http://qfc.fw.msu.edu/courses_mle.asp](http://qfc.fw.msu.edu/courses_mle.asp) to learn more or to enroll.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Location</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 26-29</td>
<td>65th Annual Northeast Fish and Wildlife Conference and AFS Northeastern Division Annual Meeting</td>
<td>Lancaster, Pennsylvania</td>
<td><a href="http://www.neafwa.org">www.neafwa.org</a></td>
</tr>
<tr>
<td>May 3-7</td>
<td>Western Division Annual Meeting—Evolution of the Western Landscape: Balancing Habitat, Land, and Water Management for Fish</td>
<td>Albuquerque, New Mexico</td>
<td><a href="http://www.aznmfishsoup.org/wdafs09/index.htm">www.aznmfishsoup.org/wdafs09/index.htm</a></td>
</tr>
<tr>
<td>May 22-26</td>
<td>Third and Last GLOBEC Open Science Meeting</td>
<td>Victoria, British Columbia, Canada</td>
<td><a href="http://www.globec.org">www.globec.org</a></td>
</tr>
<tr>
<td>May 25-29</td>
<td>World Aquaculture 2009</td>
<td>Veracruz, Mexico</td>
<td><a href="http://www.was.org">www.was.org</a></td>
</tr>
<tr>
<td>Jun 1-11</td>
<td>Indo Pacific Fish Conference and Australian Society for Fish Biology</td>
<td>Fremantle, Western Australia</td>
<td><a href="http://www.asfb.org/au/events">www.asfb.org/au/events</a></td>
</tr>
<tr>
<td>Jun 14-19</td>
<td>Seventh International Conference on Molluscan Shellfish Safety</td>
<td>Nantes, France</td>
<td><a href="http://www.icmss09.com">www.icmss09.com</a></td>
</tr>
<tr>
<td>Jun 23-26</td>
<td>International Paleolimnology Symposium</td>
<td>Guadalajara, Jalisco, Mexico</td>
<td><a href="http://www.paleolim.org">www.paleolim.org</a></td>
</tr>
<tr>
<td>Aug 14-17</td>
<td>Aquaculture Europe 2009</td>
<td>Trondheim, Norway</td>
<td><a href="http://www.easonline.org">www.easonline.org</a></td>
</tr>
</tbody>
</table>
Increasing urban and suburban human populations and declines in fishing participation have reawakened an interest in urban and community fisheries programs. This work contains 40 papers presented at the September 2007 AFS Urban Fishing Symposium. Chapter authors synthesize current research and provide real world examples through case study analysis, review new management techniques, and offer topic insights. The book will appeal to fisheries managers, administrators, park superintendents, academics, researchers, and students.
The Student Subsection of the Education Section of AFS

Melissa R. Wuellner and Kristal N. Schneider

Wuellner is a Ph.D. student in the Department of Wildlife and Fisheries Sciences at South Dakota State University, Brookings, and is past president of the AFS Student Subsection of the Education Section. Schneider is a M.S. student in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota, Twin Cities, and serves as the current president of the Student Subsection.

The American Fisheries Society is comprised of 21 Sections that represent different aspects of fisheries research, technology, or employment services. Of these 21 Sections, only 1 Subsection currently exists: the Student Subsection of the Education Section. The Subsection was founded in 1991 to serve as a liaison between student members of AFS and the parent Society. The objective of this article is to tell the story of the Subsection—its history, its current work, and how members of AFS can benefit from the work of and from membership within the Subsection.

Who (or what) is the Student Subsection?

Students have always been regarded as an integral membership segment of the parent Society (Kohler 2005). In fact, students compose 10–15% of the total membership in the Society on an annual basis, and student memberships have steadily increased since 2005 when AFS first offered reduced membership rates and free online access to AFS journals as a reward for membership (Gus Rassam, AFS Executive Director, pers. comm.). To address the needs of students within AFS, the Education Section fostered the creation of the Subsection in 1991.

What does the Subsection do?

Serving Students Directly

The objectives of the Subsection as listed in its bylaws include providing a means of communication between students and the parent Society and to encourage student involvement in AFS. As a “voice of the students,” the Subsection solicits needs and desires from all AFS student members and works with the Society to address those needs. The Subsection traditionally works with the Annual Meeting planning committee to help ensure that students will have a memorable experience during this keystone event. The Subsection offers its services in coordinating the logistics for the Student-Mentor Lunch and the Student Social, which are held during “Student Day” at the Annual Meeting. The Subsection also hosts the Student Colloquium during the Annual Meeting. Duties associated with this event include identifying a topic of student interest (e.g., the importance of publishing research, the peer review process for AFS journals, job opportunities in the United States and Canada), finding volunteers to serve on our panel of experts for that topic, advertising the event, and soliciting feedback from the attendees. The Subsection president and his/her committee work diligently each year to ensure that students will benefit from and enjoy attending the Student Colloquium.

The Subsection is also in charge of the “Students’ Angle” column of Fisheries magazine. Since the inception of the Subsection, the editors of Fisheries have devoted writing space to issues and topics relevant to students. At least one “Students’ Angle” has been published per year since 1991. Topics covered depend on student interests at the time. Between 2007 and 2008, “Students’ Angles” have included information on the benefits of study abroad programs to fisheries education, celebrations of AFS student Units of excellence, and the development of programs to help students connect within the AFS hierarchy and with their own college communities. The president of the Subsection solicits and edits all “Students’ Angles,” but free submissions from any student members of AFS are always welcomed!

Collaborating within the Parent Society for Student Gain

Over the past year, the Subsection has worked to connect itself with the Parent Society in new and exciting ways that may provide new benefits to students. Knowing that students can learn first-hand the elements of good writing and that they can accelerate their professional development by serving as peer reviewers for AFS journals, the Subsection has created a database of student expertise for use by editors of these journals. Information on the intricacies of this database and how students can enroll was published in Ranney (2008). However, it’s not too late to sign up as an AFS peer reviewer or change the contact information in the expertise database for those already enrolled. Instructions to enroll or edit the database can be found on the Subsection database expertise website (www.fisheries.org/units/edustu/student%20reviewers%20needed.pdf).

More recently, the Subsection has worked with other AFS committees and Sections to help address concerns within the Society. Many AFS members have identified the “graying” of...
the fisheries profession as a threat to the preservation of AFS (Kohler 2005); increasing recruitment and retention of students in AFS was identified as a means to solve this issue. In August 2008, the Subsection distributed a survey to presidents and faculty advisors of AFS student Units to assess their recruitment and retention needs. Results from this survey have guided very recent efforts of the Subsection, the Education Section, and the AFS Membership Committee in their endeavors to help AFS student Units. More information on these initiatives will be provided in the coming months, but the goal is to provide recruitment- and retention-related materials to AFS student Units before fall 2009.

**How does the Subsection communicate with students across AFS?**

Student membership in the Subsection expands across the globe, so electronic communication is vitally important. In 2007, the Subsection launched its first website (www.fisheries.org/units/edustu). The website displays information for students about scholarships and awards, announcements of AFS activities and opportunities, and links to other fisheries-related websites. Additionally, the Subsection proctors two listservs: one for Subsection members (studentsubsection@lists.fisheries.org) and one for all student members of AFS (students@lists.fisheries.org). The listservs are used to conduct business, such as voting or the distribution of survey materials, and to inform students of employment opportunities or AFS activities. Anyone can post messages to the listservs by sending an e-mail to the above addresses, but messages require approval from the administrator of the listserv, who is also a Subsection member. If you would like more information on how to enroll or remove your name from either listserv, please visit the Subsection listserv directions website (www.fisheries.org/units/edustu/listservInstructions.pdf).

In addition to conducting business and distributing information electronically throughout the year, the Subsection also meets face-to-face during its business meeting at the AFS Annual Meeting. During the Annual Meeting, the Subsection discusses past and future goals, addresses additional issues that require voting, and allows time for new and potential members to meet and ask questions to seasoned members. Any AFS member, whether a student or not, is encouraged! Anyone wanting to help should contact the Subsection president for more information.

**How can I get involved in the Subsection and what are the benefits of membership?**

The Subsection is always looking for enthusiastic members to help in the planning and implementation of annual events and initiatives. The most visible means of getting involved are to serve as a Subsection officer and to attend the annual business meeting. Elected offices include: president, president elect, secretary-treasurer, and Division representatives. Division representatives serve as a liaison between students within AFS geographic divisions (North Central, Northeastern, Southern, and Western) and the Subsection. All elected officers serve a one-year term. More detail on the duties of each office can be found in the Subsection bylaws online (www.fisheries.org/units/edustubylaws.htm).

In addition to officer positions, the Subsection is in constant need of motivated volunteers to help maintain the website and listservs, plan events for “Student Day” at the AFS Annual Meeting, and help with new initiatives, such as the expertise database and the development of recruitment and retention materials for AFS student Units. Fresh ideas and perspectives are encouraged! Anyone wanting to help should contact the Subsection president for more information.

Just as with most professional organizations, the level of involvement by members is a personal choice. Regardless of whether you are able to devote a few hours a month or a couple of hours per year to the Subsection, you will benefit from membership in this Unit. The Subsection provides ample opportunities for students to interact with seasoned fisheries professionals across all areas of expertise, not just academia. In addition, the Subsection provides a supportive network of students who are often experiencing the same issues and anxieties that are common to all students, whether undergraduate or graduate. Finally, the Subsection provides another means for students to get involved in the parent Society. Many students have been active in their local student Unit or even their local Chapter, but the Subsection provides new opportunities for students to get involved within the profession at a higher level.

Any member of AFS is eligible for membership in the Subsection. Simply sign up for the Subsection when you renew your annual memberships for the parent Society and other AFS Sections online. Dues are only $5 per year but the rewards are priceless!

**REFERENCES**


The AFS 2009 Planning Committee has already lined up most of the details for the social events for the Nashville meeting. The unofficial theme of “no drink tickets” will apply to all of the socials for the week, and the Welcome Social will kick off the meeting on Sunday August 30 at the conference hotel with plenty of food and beverages. But that’s only the beginning! Later in the evening you will have the opportunity to walk across the street and be entertained at the Mother Church of Country Music, the historic Ryman Auditorium. You don’t have to be a country music fan to enjoy some of the acts that we have lined up for the night’s entertainment.

The Monday night Trade Show Social will be similar to other AFS Trade Show socials in that it will be held in the auditorium with all the vendors and sponsors. Good food and abundant beer and wine will be available. The Trade Show Social will be followed up on Tuesday, 1 September, with a Student's-Only Social that will be held locally and allow the next generation of fisheries scientists to interact and network in a casual setting.

The Wednesday Night Social will be the signature event for the week. Attendees will take a short bus trip to the Tennessee countryside to a place called Smiley Hollow. If you’ve heard of southern cooking, then you know about mouthwatering morsels that'll warm the cockles of your heart. At Smiley Hollow, they’ve got some of the best comfort food south of the Mason-Dixon Line and their barbeque is world-class. This family farm has been around for about 55 years producing and serving various vegetables such as corn, tomatoes, bell peppers, yellow squash, and turnip greens, as well as many other vegetables that grow in this area. In addition to Smiley Hollow activities such as hayrides, putt-putt golf, and horseshoes, be prepared to be entertained by some of Nashville’s best “up and coming” bands. For those who are not musically inclined there is plenty of room to explore or simply have a quiet conversation with a friend.

The Thursday night Going-Away Social will take place at the Convention Center attached to the conference hotel. It will be a good setting for saying goodbye to Nashville and hello to Pittsburgh.

Our social events, as well as the numerous honky-tonsks, bars, and restaurants in the downtown area, will make the AFS 2009 meeting in downtown Nashville a pleasant experience that you won’t want to miss. For those wanting to experience other sights and sounds in Tennessee, tours of antebellum mansions, Civil War battlefields, and the historic Jack Daniel’s distillery all await you. If you want to see even more countryside, the Natchez-Trace Parkway, a National Scenic Byway and All-American Road, starts just outside Nashville and follows an ancient trail used by Native Americans. Late summer fishing opportunities also abound less than an hour from downtown Nashville. Check out our website for more details on touring and fishing opportunities at www.fisheries.org/afs09/.
advertisements, and the Internet to publicize the information that the society believes is important to a discussion. Here the policy becomes one of making sure an important issue receives the public exposure that it deserves with the purpose of engaging policy makers and stakeholders in informed decision making with respect to an issue.

In their article, Scott et al. (2008) also analyzed the level of contribution of several professional societies to natural resource policy development, including AFS. They found us to be at a level similar to most of the other societies that share a natural resource focus. Scott et al. (2008) conclude their article with the statement that scientific societies should continue to do what they do best: provide high quality, policy-relevant science and to aggressively present that science with unbiased policy implications to decision makers, and to the conservation groups and the public who lobby those decision makers. I encourage AFS members to read the references below to more fully inform yourselves about this important issue.

**LITERATURE CITED**


Assistant Professor, Vertebrate Physiological Ecology, University of California, Davis, Department of Wildlife, Fish, Conservation Biology.

**Responsibilities:** Develop a vigorous, extramurally-funded research program that addresses questions relevant to the physiological ecology of vertebrates in the diverse aquatic ecosystems of California and the region. Collaborate in research on themes such as climate change and water resource and management, and threatened and endangered species, in concert with faculty in the Center for Watershed Science, Center for Aquatic Biology and Aquaculture, Tahoe Environmental Research Center, Bodega Marine Laboratory, and elsewhere. Teaching responsibilities will be determined in consultation with the department chair, but will include an upper division undergraduate course that integrates physiological ecology across vertebrate groups from fish to mammals, and other undergraduate and graduate courses that reflect the candidate’s expertise and contribute to the department’s mission, as well as participate in departmental team-taught courses. Collegiality and good teaching are valued highly in the department, and the appointee will be expected to participate in committee work, administration, undergraduate and graduate advising, and other tasks that are shared by department faculty. Tenure-track assistant professor level, nine-month position, with the possibility of an appointment in the California Agricultural Experiment Station.

**Qualifications:** Ph.D. in a biological discipline relevant to vertebrate physiological ecology. Evidence of research excellence in the discipline of vertebrate physiological ecology, emphasizing aquatic species or systems, and ability to obtain extramural support for research activities. Interest in developing a research program relevant to vertebrate physiological ecology in aquatic ecosystems of California. Evidence of potential for excellence in teaching, e.g., experience, awards, course reviews, letters from colleagues. Demonstrated oral and written communication skills, including the ability to present information to non-scientific and public audiences. Evidence of collegiality and professional service consistent with departmental, campus, and professional citizenship. Interest in training/mentoring graduate students and in advising undergraduate students.

**Closing date:** 30 January 2009.

**Contact:** Committee Chair Deborah Elliott-Fisk, Department of Wildlife, Fish, Conservation Biology, One Shields Avenue, Davis, California 95616; 530/574-5256; 530/752-4154; delliottfisk@ucdavis.edu.

**Seasonal (Temporary) Fisheries Aide,** Game and Fish Department, North Dakota.

**Responsibilities:** Assist fisheries personnel with reproduction and population test netting, trap and transport of different fish species, limnological sampling, spawning and data compilation, includes loading and unloading boats, nets, and other equipment. Assist with the construction of fisheries development projects. Maintain equipment of various types of gear including net repair. Vehicles provided for required overnight travel.

**Qualifications:** Student enrolled at a college or university majoring in an aquatic biology related field and be in good academic standing with at least one college level course of ichthyology, chemistry, and math. Ability to lift at least 50 pounds. Valid driver’s license. Ability to work outdoors in varying weather conditions.

**Salary:** $8.25-$13.50 plus expenses while away from main work station.

**Closing date:** 1 February 2008.

**Contact:** Paul Schadewald, 100 North Bismarck Expressway, Bismarck, North Dakota 58501. See applications at www.nd.gov/hrms/jobs/appforms.html.

**M.S. or Ph.D. Assistantship in Fisheries or Aquatic Ecology,** Natural History Survey, University of Illinois.

**Responsibilities:** Research topics are varied and flexible, but individuals with interests related to the following two projects are preferred: (1) recruitment, behavior, reproductive strategies, and management of largemouth bass; and (2) population ecology of muskellunge.

**Starting dates:** June through August 2009.

**Qualifications:** B.S. or M.S. in fisheries or aquatic ecology.

**Salary:** $17,000 per year including tuition waiver.
Contact: Send a cover letter, resume, copies of transcripts, GRE scores, and three letters of reference to David H. Wahl, University of Illinois, 1816 S. Oak Street, Champaign, Illinois 61820; d-wahl@uiuc.edu; 217/728-4400.

Project Water Resources Engineer, GeoEngineers, Idaho.
Responsibilities: Restore stream and rivers by performing hydrologic, hydraulic, or geomorphic analyses. Manage and participate in the collection of field data. Complete complex analyses and designs with supervision. Write technical reports and coordinate full report production activities. Assist in the development of proposals and project budgets.
Qualifications: B.S. in engineering with emphasis on hydrology, hydraulics, or fluvial geomorphology. Minimum four years of consulting or related professional experience with professional engineer registration. Expertise with stream and river restoration, and coastal and estuarine systems plus experience with ArcView, ArcMap, AutoCAD, and standard hydrologic, hydraulic and data analysis software. Knowledge of Idaho environmental planning and regulatory environment and a general knowledge of fisheries biology in the Pacific Northwest desired. Professional level verbal and written communication skills. Experience preparing plans, specifications, and cost estimates.
Contact: www.geoengineers.com.

Programmer Analyst (Information Systems Specialist 4), Fish Division, Marine Resources Program, Oregon Department of Fish and Wildlife.
Responsibilities: See www.dfw.state.or.us/hr.
Qualifications: Two years of professional information systems experience which includes analyzing, developing, maintaining, and installing information systems, and analyzing systems. Experience must include designing, coding, testing, and implementing applications in Visual Basic, ASP, HTML, and ADO and at least 30 quarter 20 semester credits in computer science or two more years of information systems experience.
Salary: $3,116–4,493 per month.
Contact: For application materials see www.dfw.state.or.us.

Seasonal Field Technician, Utah Division of Wildlife Resources (temporary).
Responsibilities: Assist with field projects involving native fish populations in the upper Colorado River Basin. Monitor native and nonnative fishes using a variety of electrofishing techniques, seining, and PIT-technology and conducting high elevation amphibian surveys.
Qualifications: B.S. or degree-seeking in biological sciences. Preference may be given to applicants with electrofishing experience, boating/rafting experience, and demonstrated ability to work well independently and with others. Strenuous physical activity, long hours of operation, backpacking, rafting, and overnight camping is common
Employment dates: 4 May–20 August (2 positions) and 9 September (one position).
Salary: $10.99–13.65 per hour, housing provided.
Contact: Send resume, transcripts, and letter of interest with qualifications and availability to Matthew J. Breen, mattbreen@utah.gov; Native Aquatics Biologist Utah Department of Natural Resources, 152 East 100 North Vernal, Utah 84078; 435-781-5317. See www.naturalresources.utah.gov.

Native Aquatics—Wildlife Technician I, Division of Wildlife Resources, Utah.
Responsibilities: Assists field biologists and/or field crew leaders in sampling and monitoring native state and federally listed amphibian and fish species in central Utah. Conducts research, monitoring and surveys of wildlife populations and related habitats using a variety of sampling techniques and gear. Maintain equipment and assists in the analysis of samples duties may also include data entry and various other related tasks.
Qualifications: Enthusiasm, solid work ethic, ability to communicate and work safely both independently and with others, good physical condition, ability to hike 6–8 miles per day. Background in biology or ecology desired.
Contact: Send resume and cover letter to Julie Stahl; juliestahli@utah.gov, UDWR, Central Region, 1115 N Main Street, Springville, Utah 84663; 801/491-5660.
Biological Technician Fisheries or Biological Technician General  U.S. Forest Service, Rocky Mountain Research Station, Utah.

Responsibilities: All field work is done in Idaho, Montana, eastern Oregon, eastern Washington, and northern Nevada. PIBO effectiveness monitoring implements an intensive reach scale stream survey. Using one of the most rigorously tested sampling protocols available. Technicians collect information on a variety of stream attributes including pools, channel geometry, substrate, streambank characteristics, gradient, water chemistry, large woody debris, and macroinvertebrates.

Salary: Depending upon your qualifications, the job grade and corresponding pay range are: GS-3 $11.74 per hour, GS-04 $13.18 per hour, and GS-5 $14.74 per hour. In addition, employees receive a travel per diem of $16, $128 every pay period for each work day.

Deadline: Hiring begins in January and continues until positions are filled or until the field season starts in May. It is highly recommended that applications be submitted by 1 March 2009.

Qualifications: Course work or experience in natural resource management and outdoor/field experience. Ability to camp for extended periods of time and the ability to hike extended distances with a 40-pound backpack. Excellent attitude and willingness to learn.

Contact: For more information, job description, job announcement numbers, and how to apply www.fs.fed.us/biology/fishecology/emp/index.html and click on ‘Employment-2009’. Send cover letter, resume, unofficial transcripts, and reference to Ryan Leary; rleary@fs.fed.us; USDA Forest Service, Forestry Science Lab, 860 N 1200 East Logan, Utah 84321.
Equipment, apparatus or gear for fish related field research projects. From tracking the location and depths of individual fish to collecting spawning and migratory data on juveniles and adults in rivers and lakes, no one offers you more freshwater fish knowledge than ATS.
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   If for any reason power fails or the equipment stops working, learn how you can be instantly notified on your mobile phone.

Learn more about **Using Acoustic Tags for Tracking Fish** at [HTIsonar.com/training.htm](http://www.HTIsonar.com/training.htm).

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- Paul Cadrett, U.S. Fish and Wildlife Service

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