

AFS Physiology Section



NEWSLETTER WINTER 2002



Randall to be Feted.

One of the highlights of the 5th International Congress on the Biology of Fish is a day-long symposium to commemorate the long and distinguished career of David John Randall at the University of British Columbia. Dave's friend and colleague Ted Taylor (Birmingham) has organized a symposium entitled "**Fish Physiology: Mechanisms and Adaptations**". An impressive list of current and former Randall collaborators will speak about their work and how Dave contributed to their professional growth during the Monday morning plenary session and then continuing into Monday afternoon as a regular session. The odd amusing anecdote about Dave might happen to emerge from some of these talks.

Dave Randall received his PhD from the University of Southampton, UK in 1963 and then joined the Faculty of the University of British Columbia, where he was appointed Professor in 1973. He joined the City University of Hong Kong in August 2000. He has been a Guggenheim fellow (1968) and a Killam fellow (1981) and was elected a fellow of the Royal Society of Canada in 1981. He received the Fry Medal from the Canadian Society of Zoologists in 1993 and an Award of Excellence from the American Fisheries Society in 1994. David Randall has been a visiting Professor at Universities of Nairobi (1988); George Washington (1988/89); and in Biology and Chemistry, City University of Hong

Kong (1997). He was appointed distinguished visiting professor, National University of Singapore, (1999/2000). He was on the Executive (1979/85) and subsequently elected President (1985) of the Canadian Society of Zoologists. He was President of the Western Canadian Universities Marine Biological Society (1998-2000). Dave is a staunch supporter of our section; he is one of only a handful of fish scientists to attend all five International Congresses on the Biology of Fish (assuming that he doesn't skip out on this one!)

Dave probably reflects the international flavour of our discipline and section better than anyone does. He has worked in many institutions around the world including the Max Planck Institute; marine stations in Naples, Italy; Plymouth, UK; Port Aransas, Texas; USA; and Bamfield, BC, Canada. More recently, he was involved with the establishment of the Alert Bay Marine Lab, BC, Canada. He has also worked at the Universities of Birmingham, UK; Flinders, Adelaide, Australia; Zhongshan, Guangzhou, China; Nairobi, Kenya; Milan, Italy; George Washington, Washington, DC, USA. In 1976, he organized and led a scientific expedition to the Amazon River that produced a famous soccer game and continues to supply good drinking stories to this day! David Randall has authored about two hundred original papers and has edited and contributed to many books, including the series on Fish Physiology (19+ volumes) because of which, he is arguably the best-known fish physiologist on the planet. He is or has been a member of several editorial boards and many peer review committees. He has organized many national and international conferences and symposia.

Dave's research interests concern oxygen, carbon dioxide and ammonia transfer in fish. He is also interested in aquatic toxicology especially the actions of ammonia and hypoxia. On a personal note, I have never had the pleasure of working with Dave, but I have interacted with him at many meetings. Despite his myriad accomplishments, a more humble, self-effacing, humorous man you are unlikely to meet. I am sure that I speak for the entire section when I thank Dave for his indefatigable support of our Section and wish him many years of continued success as life and career take him down new paths.

-Jay Nelson

5th International Congress on the Biology of Fish Returns Home

Like an ardent salmon, the 5th International Congress on the Biology of Fish is returning, whence it was spawned 8 years ago, to the University of British Columbia in beautiful Vancouver, B.C. Canada. In the intervening years, we have gone further a field than your average salmon, holding our Congress in San Francisco California, Towson, Maryland and Aberdeen, Scotland. The Congress is sponsored by our section, but Past-President Don MacKinlay has been in charge of organizing the scientific program for all of the Congresses and bears most of the responsibility for their popularity. Past meetings have had about 300 attendees each, representing over 45 countries.

An impressive list of proposed symposia, the many attractions in and around Vancouver and, of course, the conviviality of our membership make this year's

meeting one not to be missed. Please visit <<http://www.conferences.ubc.ca>> if you are interested in previewing the conference facilities at UBC. The dates for the Congress are July 21-26, 2002, with symposia beginning on the 22nd. Symposia planned for the 2002 meeting include: *Advances in Marine Fish Culture*; *Aquatic Toxicology: Mechanisms and Consequences*; *Biochemistry and Physiology of Aquaculture*; *Biology of Deep Sea Sharks*; *Cardiovascular Physiology of Fish*; *Developments in Understanding Fish Growth*; *Endocrine Disrupters and Impacts on Fish Populations*; *Evaluation of Environmental Health of Fish*; *Evolutionary Biology of Fish*; *Fish Migration and Passage: Physiology and Behavior*; *Fish Neurobiology*; *Hatchery and Wild Fish: the science behind the rhetoric*; *Hypoxia: Impacts and Adaptations for Fish*; *Ion Regulation in Fish*; *Lamprey Biology*; *Metabolism of Fish Eggs and Fry*; *Nitrogen Excretion in Fish*; *Respiration in Fish*; *Tropical Fish: News and Reviews*, plus symposia to honor two great fish scientists, Dave Randall and Bill Ricker (see articles in this issue). Continuing education courses and a conference trade show are also planned. The 5th Congress will include a dedicated evening for poster-viewing and visiting the trade show.

To better plan the Congress, Don has requested that you submit your titles by February 15, 2002. Extended abstracts for inclusion in a symposium volume need to be submitted by April 15, 2002.

For more information, visit the Congress Web site at:
<http://www.fishbiologycongress.org> or contact

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-Jay Nelson

Symposium to Honor Ricker

Dick Beamish and Brian Riddell have organized a symposium for the 5th International Congress on the Biology of Fish to memorialize Dr. William E. Ricker who passed away this year (see obituaries in the November 2001 and January 2002 issues of *Fisheries*). The symposium " *Rethinking Stock Recruitment - in memoriam to Bill Ricker*" will explore that facet of Ricker's career most familiar to many of us, but he was a true renaissance man. Besides his groundbreaking work on stock-recruitment, Bill Ricker published in entomology and limnology, collaborated with Alfred Kinsey on his pioneering work on human sexual behavior, translated a multitude of Russian works into English, wrote poetry, fiction and nature guides and, on top of all that, was a musician. He edited the Journal of the Fisheries Research Board of Canada at a time when that publication rose to preeminence in the fisheries world. Bill Ricker won more awards and honors than can be recounted here, including the

American Fisheries Society's very first "Award of Excellence". Please come to this symposium to learn more about this fascinating man.

-Jay Nelson

Support for Student and Postdoctoral Travel to Vancouver

Past President Michael Redding has submitted proposals to the U.S. Geological Survey and the U.S. Department of Agriculture requesting funds to support travel expenses of graduate students and post-doctoral researchers to attend and present their research at the upcoming International Congress on the Biology of Fishes in Vancouver, Canada. The USGS has already funded us, and the USDA is still pending. Congratulations Mike ! The Section hopes to sponsor a minimum of 20 individuals, but the actual number will depend on the amount of funds available. Travel awards will be competitive and based on the selection committee's evaluation of the potential scientific value of the individual's contribution to the Congress and on financial need. The organizers are intent on maintaining the international nature of the Congress; thus, individuals from all countries will be eligible for the travel awards. Check the Congress website (www.fishcongress.org) after your February 15, title submission for details on the travel awards.

-Jay Nelson, Michael Redding

Physiology Section to Sponsor Trade Show

The Physiology Section of the American Fisheries Society will sponsor its first Trade Show at the 5th International Congress on the Biology of Fish. Exhibitions are solicited from any company whose products are used by fish biologists or publishers that produce fish books. Examples include: software developers, producers of analog/digital data collection equipment, fish tagging equipment, radio and ultrasonic tags, aquatic gas and ion sensing equipment, laboratory equipment, field gear, as well as manufacturers of boats, fish capture and holding systems. Since this is our first Trade Show, we encourage you to make your favorite vendors aware of this advertising opportunity.

The Trade Show will be located in a heavy-traffic area between the symposium meeting rooms and the accommodations. The Trade Show site is also the location of catered lunches for the delegates and research posters. An evening of the meeting will also be dedicated to the Trade Show and poster viewing. A hosted cash-bar reception with refreshments and entertainment will accompany this evening. An 8'x10' draped booth with skirted tables, chairs, lights and electrical outlets (110V) will cost 700(1000)US(CAN) dollars for 3 days (July 23-25), with substantial discounts for early reservations. Please visit

<<http://www.conferences.ubc.ca> > if you are interested in previewing the conference facilities at UBC. Please visit<<http://www.towson.edu/~nelson/main/Vantradeteas.htm> > if you want more information about the trade show or wish to order a booth.

-Jay Nelson

Phoenix 2001 - AFS Governing Board Meeting

Past President Michael Redding attended the Governing Board Retreat and Meeting preceding the 2001 AFS Annual Meeting in Phoenix. He reports that the parent society appears to be on solid financial footing once again. Revenue from membership has held steady while revenue from publications and services has increased slightly. After subtracting expenses there was a small surplus (\$68,000) for the third consecutive year. Because of the society's fiscal solvency, membership dues will remain unchanged for the third consecutive year, and students will be allowed to continue paying the student member rate for two years following their graduation.

Final approval was granted by the Governing Board to present to the membership a newly revised Constitution, essentially the document published in Fisheries (June 2001) with minor modifications. Much discussion concerned implementation of an earlier (1998) decision to eliminate page charges for the North American Journal of Aquaculture and the Journal of Aquatic Animal Health in 2002. The Board rescinded that decision but agreed to continue the current charge (half the regular page charge rate) for one additional year, plus infuse \$125,000 over five years to promote the quality of these journals. This was a very contentious issue since it seems to favor a subset of the Society that might utilize these journals, notably the Fish Culture and Fish Health Sections. These Sections' representatives argued that their membership has a declining affinity for the AFS and that this page charge concession might encourage some members to utilize these journals and strengthen their interest in the AFS. It should be noted that page-charges are now waived automatically for any member who requests this courtesy when other funds are lacking.

The InfoBase Project is still on track to provide an electronic, searchable database with new and archived editions of all AFS journals for the last 10 years. Eventually the full historical publication record will be included as resources permit. The AFS anticipates that the search function would be available to anyone, but that a fee would be charged to retrieve a full article.

On a topic of considerable importance to our Section, John Nickum reported that the Committee on the Use of Fishes in Research was nearing a final draft of a proposed policy statement for the humane use of fishes as research subjects. There is still some disagreement about wording relating to the issues of "stress" and "pain" in fishes. The Committee anticipates finalizing their document after meeting to discuss the soon-to-be-published review of pain perception in fishes by James D. Rose. Nickum hinted that the consensus scientific opinion at this time is that fish are incapable of "feeling" pain in a manner consistent with that

of mammals because they lack the basic neural circuitry associated with pain in the mammalian model.

Section member Gary Carmichael and Vince Mudrak presented a proposal emanating from the Fish Culture Section to organize, under the banner of AFS, a symposium entitled "Uses and Effects of Cultured Fishes in Aquatic Ecosystems." This symposium is to be modeled after a similarly named symposium in Albuquerque in 1994. In addition to a symposium, they propose to organize a Follow-up Workshop on the subject leading to an AFS policy document presented at Aquaculture 2004. [Note: President Jay Nelson has nominated Section members Don MacKinlay and Colleen Caldwell for inclusion on the organizing committee].

One final observation: Michael Redding "presided" over the Section Business Meeting in Phoenix, but no other member chose to attend! Depending on the cost of room rental, it may be wise not to schedule such meetings in the future.

–Michael Redding

Colin Brauner Studies Air-Breathing Fishes of the Amazon

Colin Brauner, San Diego State University



The Amazon River basin is unparalleled in terms of fish biodiversity, containing 20% of the world's described freshwater fish species. The Amazon is responsible for transporting 20% of all fresh water entering the world's oceans, however, the composition of that water is extremely variable by region. Oxygen levels can range from supersaturated to almost zero, ion levels can range from "average" fresh water values to levels approaching that found in distilled water, water pH can drop to 4.0, and seasonally, hydrogen sulfide can reach toxic levels.

Certainly by temperate fish standards, these conditions are extreme! Due to these extreme variations in water composition, this river system provides a unique opportunity to study physiological adaptation (both mechanistic and evolutionary) in fishes, which has been an integral part of my research program over the last 9 years. This research has been conducted in close collaboration with AFS Physiology Section members Drs. A.L Val and V.M.F. Almeida-Val at the National Institute for Research of the Amazon (INPA).

The most extreme adaptation to hypoxia in fishes is air-breathing, of which the Amazon has the worlds greatest abundance. In water-breathing fishes, gas exchange, acid-base balance, ionoregulation and nitrogenous waste excretion all occur at the gills resulting in a tight coupling among these processes. In most airbreathing vertebrates, from amphibians to mammals, these processes are shared between the lungs and kidney. One greatly neglected area of research in the evolution of air-breathing in fishes is the relative role of the gills and kidney in the transition from water to air-breathing. To gain insight into this, we (Brauner, Matey, Wilson, Bernier and Val) have been conducting research on the gills of two closely related osteoglossid teleost fish species indigenous to the Amazon River basin. The first is a water-breathing fish, aruana (*Osteoglossum bicirrhosum*), and the second, an obligate air-breather, *Arapaima gigas*. *A. gigas* is arguably the worlds largest freshwater fish, reaching up to 13 ft in length and over 400 lbs in weight. *A. gigas* is so dependent upon aerial respiration that if denied access to air, it drowns in 10 mins! It uses a highly vascularized swim-bladder as an air-breathing organ which is responsible for 80% of all O₂ uptake. Interestingly, 80% of CO₂ is excreted across the gills and thus gas exchange is spatially uncoupled.

When *A. gigas* are small (10g; but still obligative air-breathers) they possess well developed secondary lamellae in the gills, similar to that of aruana and other water-breathing fishes. However, within a few months (ie 100g), the spaces between the secondary lamellae become filled and by 1-2 years (0.5-1 kg), the secondary lamellae have completely disappeared, leaving only the pillar like primary filaments. Despite the absence of secondary lamellae, there is a relatively high density of mitochondria rich cells and Na⁺,K⁺ATPase, as indicated by immunohistolocalization, implicating a role for the gills in ionoregulation despite the great reduction in surface area. The kidney is greatly enlarged in *A. gigas* relative to that in aruana, and thus both the gills and kidney may play important roles in ionoregulation, however, the relative importance of each remains to be investigated on the next trip to the Amazon.



Pirarucu (*Arapaima gigas*)

Aruana (*Osteoglossum bicirrhosum*)

Kurt Gamperl: On the Move



Kurt Gamperl, now at Memorial University's Ocean Sciences Centre

Physiology section stalwart Kurt Gamperl has relocated to Memorial University's Ocean Sciences Centre. Kurt is a comparative physiologist whose main research interest is to understand how environmental and physiological

variables interact to affect fish biology. Central to this research are the role that blood oxygen transport, cardiac function, stress (catecholamines, cortisol, the β -adrenergic system, stress proteins) and humoral and/or biochemical factors play in mediating fish "performance" (swimming ability, growth, reproductive success, metabolic capacity etc.) under varied environmental conditions. He uses (and eats) a variety of marine and freshwater fishes in his research, and the questions he addresses often have implications for fish ecology and/or aquaculture. Visit him on the web at: <www.ucs.mun.ca/~kgamperl>

Dr. Matt M. Vijayan: Stressed Out

The focus of my laboratory at the University of Waterloo is elucidating the molecular and biochemical strategies involved in allowing animals to cope with stress. Using fish as a model, studies (both *in vivo* and *in vitro*) are aimed at understanding the mechanisms of action of endogenous (stress hormones) and exogenous (temperature, salinity and xenobiotics) signals on the cellular stress response. Research includes characterization of glucocorticoid receptor (GR) dynamics and GR signaling pathways as well as the interaction of GR and heat shock proteins in the cellular stress response process. My research also utilizes comparative functional genomics and proteomics approaches to understand the impact of environmental stressors on aquatic organisms. Towards this end, we have developed a trout-specific DNA micorarray (~150 rainbow trout genes) for examining the gene expression profiles with stressors, including endocrine disruptors. In addition, we are developing rainbow trout DNA microarray chips for use as a powerful gene discovery tool in order to identify and characterize novel stress-responsive genes that are involved in environmental stress adaptation. Specific research projects include:

- Characterizing the role of genomic and non-genomic glucocorticoid receptor (GR) signaling in the stress response process
- Modulation of the cellular stress response by glucocorticoids, including transcriptional and translational regulation of heat shock proteins
- The use of DNA microarray technology for the detection of stressors, including endocrine disruptors
- The role of contaminants on adrenal steroidogenesis

Change to section leadership policy to be voted on in Vancouver

One of Mike Redding's initiatives was to amend our bylaws to create a two-year presidential term effective August 2002. Moreover, the position of Vice President will be abolished and replaced by a two-year term for the President Elect. Likewise, the term of the Past-President will be two years.

The main rationale for this change is that a two-year term would allow each President to preside during the two years before a Congress, allowing for better continuity and planning for each Congress. If implemented, each future

President will have the opportunity to put his/her personal stamp on the Congress and hopefully create a greater sense of ownership and responsibility for each Congress. Such a change will also facilitate participation of Section members in the election of new officers since it is likely that many more of our members will attend and vote at the business meeting at the Congresses than have been participating in the e-mail votes. Another benefit will be that each President will have a longer term to affiliate with members of the AFS Governing Board, promoting better communication and greater involvement with the parent society.

The executive committee has agreed to try to implement this change at the 2002 AFS Annual Meeting. President Elect Chris Kennedy has consented to serve as our first two-year President, and current President Jay Nelson is willing to serve two years as Past President. According to our bylaws, an amendment requires a two-thirds plurality of a quorum of members (minimum 10) present at an annual meeting or 10% of the active members if done by mail ballot. It also requires review and approval of the AFS Governing Board. The Section EXCOM has agreed to have this proposal reviewed by the AFS Constitutional Consultant before the mid-year meeting in March 2002 and ready for a vote when the Section holds its business meeting at the Vancouver Congress. This explains why there are no ballots and candidate announcements in this year's newsletter. Candidate statements of the nominees and for the next President Elect (to follow Chris Kennedy and preside over the 2006 meeting in eastern North America) will be part of the meeting registration package in Vancouver. Presently, the office of Vice President is vacant. Inasmuch as this proposal would make that position obsolete, the Section EXCOM proposes not to fill the position this year.

Contact Jay Nelson if you wish to voice an opinion about this proposal or want to nominate yourself or another for President-elect.

–Michael Redding

President's Message

I hope that this finds everyone off to a happy, healthy and productive beginning to 2002. The world is certainly a different place from last year at this time when I read past President Mike Redding's address lauding our International focus. I was in France when the terror struck; not having fellow Americans to commiserate with was difficult, but the outpouring of sympathy from the French made me realize more than ever how human bonds transcend national boundaries. Now as we look forward to our Section's 5th International Congress on the Biology of Fish (see accompanying article) this coming summer, I cannot help but wonder how the changing world will influence our Section and meeting. Vancouver is truly a city with an international reputation. Couple that with an impressive slate of proposed symposia, our first ever trade show (see accompanying article), commemorative symposia for two great fish biologists (see accompanying articles) and some interesting continuing education courses, and this Congress holds the potential to be our best ever. I sincerely hope that all are making plans to be there. Yet, recession deepens and economies collapse; many of our colleagues may be faced with evaporating sources of funding for their travel to Vancouver. Still others may eschew the trip because of concerns

over the safety of travel. How this plays out, only time will tell. All I know, is that the fish are still out there, many of them are threatened in various ways, while others may go extinct before being described or having their novel biology discovered. Internationalization is the future of fish biology and science in general. Our duty is clear: we need to press on.

Your officers have not been standing pat through the past year. Following Steve McCormick's successful initiative from the Aberdeen Congress, Past-President Mike Redding has submitted two grant proposals to help fund student travel to the 5th ICBF (see accompanying article), one of which has already been funded. I have been busy organizing a trade show for the Congress; success of this endeavor will allow us to sponsor speakers and keep registration costs low. Please assist my efforts with your valuable "word of mouth" advertising. Publishers, graduate programs, purveyors of summer courses and vendors will all possibly benefit from having booths at our meeting. Past President Don MacKinlay has secured funding from Canada's Department of Fisheries and Oceans for the meeting while past and future Presidents George Iwama and Chris Kennedy are exploring other funding opportunities. We are working hard to make this an affordable, dynamic and fun meeting. Now all you need to do is come!

The EXCOM has approved changes in how we elect our officers and when we hold the elections. You will have the opportunity to vote on these changes in Vancouver. These actions were taken to directly involve more of you in Section affairs (see accompanying article). You will also have the opportunity to vote for who will succeed Chris Kennedy as President in Vancouver. Given the changes to the world that have taken place over the past year and our proposed placing of the 6th International Congress on the Biology of Fish in the southern hemisphere, we are entering a challenging time for our section. I hope that you take these votes seriously, nominate some fine individuals for President and attend the business meeting in Vancouver.

Finally, let me close by thanking you for entrusting me with the Section reins for a year. I hope to see everyone in Vancouver. A good time will be had by all, guaranteed!

Physiology Section Business

Report of Secretary/Treasurer
Gail Dethloff

	Saving
Checking	
Starting	\$6,173.00
\$4,001.47	
Ending	\$6,357.39
\$738.71	
Additions (+)	
Interest	\$184.39
Book sale	
\$40.00	

AFS dues
\$605.00
Uncashed
\$100.00
check

Subtractions (-)
Newsletter
\$523.32
Officer travel
\$1,042.65
AFS website hosting
\$105.00
Award for travel
\$100.00
Aberdeen expenses
\$2,216.79
Bank fee
\$20.00

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Summer Course at Friday Harbor Laboratories, WA

Fish 565 (9 credits): Fish Swimming: Kinematics, Ecomorphology, Behavior & Environmental Physiology

June 10-July 13, 2002, M-F 8-5; S 8-12, Instructors: Dr. Paolo Domenici (International Marine Centre, Italy) Dr. Guy Claireaux (Crema, La Rochelle, France) Dr. John Steffensen (University of Copenhagen, Denmark) Course description: Subjects will be 1) the kinematics and performance of swimming in fish using various locomotory modes, 2) the ecomorphology of fish locomotion, 3) locomotor strategies, 4) metabolic aspects of fish swimming, and 5) the effect of various environmental factors on fish swimming. These topics will be treated in lectures and laboratory/field sessions. Students will learn techniques of video analysis, telemetry (in the lab and in the field) and respirometry. The first half of the course will have an emphasis on lectures and explanations of techniques for studying fish swimming in the laboratory and in the field. In the second half of the course, emphasis will be placed on laboratory and field work. Students will pursue independent research projects. These will be discussed between each student and the instructors, who will also suggest a number of relevant projects. Original projects on fish locomotion, based on the student's personal background and interest, will also be welcomed. At the end of the course, students are expected to present the results of their independent projects orally and as a written report in the format of a scientific paper. Enrollment will be limited to 12 students. Please contact <domenici@barolo.icb.ge.cnr.it> or <guy.claireaux@ifremer.fr> or <JFSteffensen@zi.ku.dk> Information for applicants

(including tuition and financial aid) at
<http://depts.washington.edu/fhl/classinfo.html>
<http://depts.washington.edu/fhl/StudentApplicationForm.html>

Applications are due March 1 2002

AFS Announces Hutton Program

Recruiting of students and mentors is underway for the 2002 Hutton Junior Fisheries Biology Program. The program is designed primarily to develop interest in the fisheries profession among underrepresented minorities and women and provides high school students with a professional mentor and a summer-long, hands-on experience in fisheries science. A scholarship of up to \$3,000 is provided to students accepted into the program. The deadline for mentor and student applications is March 1, 2002.

More information and application materials are available on the AFS website at: <www.fisheries.org/Hutton.shtml>

If you have any questions about the Hutton Program, contact

Jan Lubeck
301/897-8616, ext. 206

email to jlubeck@fisheries.org

Graduate Assistantships:

Study the response of cyprinid fishes to urbanization while earning money for college!

The Department of Biological Sciences at Towson University has a number of competitive teaching assistantships available and there are potential research assistantships available for students pursuing a Master of Science degree. The Assistantships include a stipend of \$8000, a tuition waiver and minimum summer funding of \$3000. The research would either be in the area of fish physiological ecology with:

Dr. Jay Nelson

jnelson@towson.edu

<http://www.towson.edu/~nelson/>

or study fish conservation biology/ecology with:

Dr. Joel Snodgrass

JSnodgrass@towson.edu

<http://www.towson.edu/users/jsnodgra/>

Please contact these individuals or visit the departmental web site for graduate students at:

<http://www.towson.edu/biology/graduate.htm> for more information

Join AFS and Become a Voting Member Of The Physiology Section

Please visit the AFS website www.fisheries.org click "membership" from the menu and join online. Or contact American Fisheries Society, 5410 Grosvenor Lane, Bethesda, MD 20814, phone 301/897-8616, fax 301/897-8096 | Email main@fisheries.org for more information.
