Physiology Section Newsletter

THE PHYSIOLOGY SECTION OF THE AMERICAN FISHERIES SOCIETY

Volume 10, Issue 1 December, 2010

FROM THE PRESIDENT

Season's greetings from a very wintery Edinburgh!

As we slowly wind down in to Christmas and holiday mode, it's once again time to reflect on a very eventful year. Members have been busy organising symposia at other meetings, such as **Kurt Gamperl, Matt Rise** and **Brian Small** at the World Aquaculture Triennial meeting in San Diego (p8) and summer school courses, such as **Jay Nelson** and **Guy Claireaux** who took a class to the aftermath of the Gulf oil spill (p9). I also have the pleasure of reporting on yet another very successful International Congress on the Biology of Fish, in Barcelona, organised by **Luis Tort, Pat Wright, Mark Shrimpton** & **Don Mackinlay**, that attracted nearly 600 attendees from over 40 countries, making it a truly international event.

At the AFS Governing Board Meeting in Pittsburgh, I tabled the issue of a lack of online renewal facilities for international members. I was assured the society values its international as much as North American members and that this would be looked into. I therefore expect things to improve soon. I would appreciate receiving feedback on your online renewal experience, both from international and North American locations.

I am particularly happy about the submissions of reports of ongoing graduate student research activities: **Graham Raby** & **Michael Donaldson** report on the Fraser River Pacific Salmon Capture Fisheries (p10), and **Liane Nowell**, **Skylar Miller** & **Aaron Shultz** give an overview of their research at the Cape Eleuthera Institute (p12).

I would also like to join my predecessors in inviting and encouraging graduate students and early career researchers to get more involved in Physiology Section business. Contributions to the Newsletter and co-organising symposia at the ICBF are excellent opportunities to do so. In fact, a call is currently posted on the ICBF Madison 2012 website (p20) for symposia proposals. The deadline is 31st January 2011, so there's still time to muse over a mulled wine (or two) during the holidays.

All the best for 2011

Mark Hartl
President, AFS Physiology Section

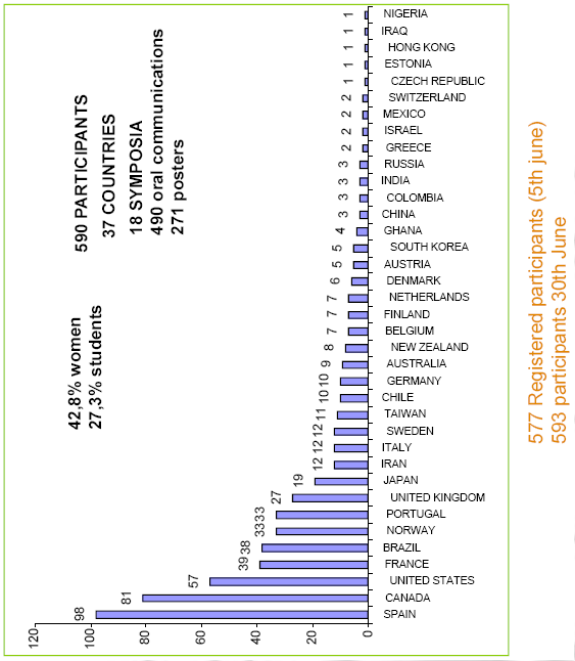
ORBITUARY

DAVE JONES, Killam Research Scholar and Professor Emeritus in the Department of Zoology at the University of British Columbia, died on the 19th of November, 2010 after a long battle with congenital emphysema. Although not specifically a fish physiologist, several of his seminal works were on fish and Dave attended the 2002 ICBF. He interacted with many of our current and past members at this meeting and many others. To quote one of our former Presidents: "He was a giant, after all. I, for one, consider it an honour to have had him as a 'meeting mate', he was an incredibly funny guy and a great scientist." A tribute to Dave is being planned for January 28th (what would have been his 70th birthday) in Vancouver. Anyone interested in attending should contact milsom@zoology.ubc.ca.

The full obituary by Bill Milsom will appear in the January edition of the JEB.

ICBF2010 report

The Physiology Section held the ninth International Congress on the Biology of Fishes at the University of Autònoma in Barcelona, Spain July 5-9th, 2010. The meeting was truly international with 585 attendees from 41 different countries.



Delegate spread

Award of Excellence

The highest honour of the Physiology Section is the Award of Excellence, a lifetime achievement award for outstanding contributions to fish physiology. The 2010 award was presented to **Dr Steve F. Perry** from University of Ottawa. Dr. Perry also gave a keynote talk in Barcelona


Outgoing President Dr Pat Wright presents Dr Steve Perry with the Award of Excellence

Plenary speakers

Dr Holly Shiels (Manchester University, UK) – "Temperature tolerance of the tuna heart" http://bit.ly/eMMB6M

Prof Gert Flik (University of Nijmegen, The Netherlands) –"Stress and feeding in fish" http://bit.ly/ehLjee

Prof Felicity Huntingford (University of Glasgow, UK) – "Why do some fish fight more than others and why does it matter?" http://bit.ly/gRJrJm

Prof Charles R. Tyler (University of Exeter, UK) – "Endocrine disruption in fish in UK rivers" http://bit.ly/hIjGIc

Dr Simon MacKenzie (Universitat Autònoma de Barcelona, Spain) – From behavior to gene discovery – exploring the potential of transcriptomics in fish biology"

Symposia

19 Symposia covering a wide range of topics

1. **Ion and acid-base regulation in fish** (Greg Goss, Colin Brauner, Steve McCormick)
2. **The physiology of climate change:** understanding the responses of fish to increased temperatures and the increased prevalence of aquatic hypoxic zones **(**Jay Nelson, M. Mesa, A.Maule)
3. **Fish living on the edge:** Mechanisms to cope with physiological and environmental extremes. (Suzie Currie)
4. **Fish in a toxic world:** Biomarkers and impacts of exposure. (Mark Hartl, Chris Kennedy, Alan Kolok)
5. **Sexual dimorphisms:** Knowns and unknowns. (Carl Schreck, Ken Rodnick)
6. **Stress axis regulation:** From molecules to fish. (Matt Vijayan, Neel Aluru, Lluis Tort)
7. **Keeping pace in a changing environment:** limits of regulatory control (Tony Farrell, Holly Shiels, Todd Gillis)
8. **Fish Habitat**: understanding and improving connectivity and suitability (Chris Katopodis, Chris Myrick)
9. **Zebrafish:** a model to study fish physiology and endocrinology (Nick Bernier, Steve Perry)
10. **Muscle development and growth** (Ian Johnston, Luisa Valente)
11. **Swimming physiology of fish**. (Josep Planas, Arjan Palstra)
12. **Fish immunological responses to pathogens:** From basics to vaccines (Oriol Sunyer)
13. **Winning the uphill battle:** strategies for salmonid spawning migrations (Mark Shrimpton, Andrea Morash)
14. **Tropical fish:** Diversity and adaptation (Dal Val, Vera Val)
15. **Physiological mechanisms underlying social interactions in fish** (Katie Gilmour, Shigal Balshine, Kath Sloman)
16. **The physiology of fish in aquaculture** (Juan Miguel Mancera, Marco Saroglia)
17. **Biology, fisheries and physiology of the Burbot** (Vaughn L. Paragamian)
18. **Behavioral Ecology**
19. **Contributed papers** (Don Mackinlay)

Abstracts (orals)

Ion regulation	50
Climate change	31
Living in the Edge	26
Fish in a Toxic world	48
Sex Dimorphism	16
Stress	27
Keeping pace in changing env.	25
Habitat	82
Zebrafish	21
Muscle	43
Swimming	17
Immune	40
Migration-spawning	17
Tropical	70
Social Interactions	30
Aquaculture	93
Burbot	13
Behavioural ecology	9
Contributed papers	46
Total number of oral papers	**704**

Best Student Presentations

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Oral

1st Prize $350 – **Erika Eliason**, University of British Columbia; "Intraspecific cardiac variation among adult sockeye salmon populations: keeping pace with the environment"

2nd Prize $250 - **Tammy Rodela**, University of Ottawa; "The effects of cortisol on rhesus glycoprotein and glutamine synthetase expression in the gulf toadfish, *Opsanus beta*"

3rd Prize $150 - **Christina Sørensen**, University of Oslo; "Social stress and cortisol reduces cell proliferation in the rainbow trout telencephalon"

Posters

1st Prize $350 – **Yusuke Ito**, Tokyo Institute of Technology; "Localization and roles of zebrafish carbonic anhydrases CA2A and CA15A in NHE3B-mediated sodium ion transport in gill and skin mitochondrion-rich cells"

2nd Prize $250 – **Carlos F. C. Lanes**, Bodø University College, Norway; "Biochemical composition and quality of atlantic cod (*Gadus morhua*) eggs: comparison between farmed and wild broodstock"

3rd Prize $150 - **Eduardo Fuentes Jofré**, Universidad Andrés Bello, Chile; "Plasmatic growth hormone levels in the fine flounder (paralichthys adspersus) are regulated time-dependently by fasting and refeeding."

Student Travel Awards

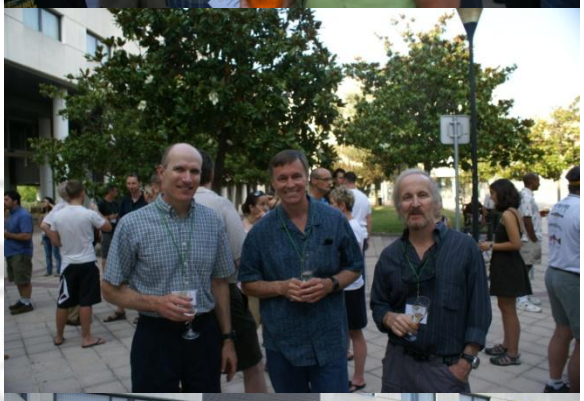
Funded by a grant from the USDA

The following 32 Students received travel grants valued $375 US each to attend the Barcelona meeting:

Daniel Baker; Anne-Laurence Bibost; Salvatore Blair; Julia Bradshaw; Denham Cooke; Isabel MariaCosta; Laura Dindia; Delphine Ditlecadet; Michael Donaldson; Agnieszka Dymowska; Erika Eliason; Fernando Fernandes Mendonça; Eduardo Fuentes; Tiago Hori; Katie Huynh; Fathima Iftikar; Nishad Jayasundara; Jennifer Jeffrey; Kimberley Johnstone; Lea Madeiros; Sarah McConnachie; Khaled Mohammed-Geba; Tracey Momoda; Andrea Morash; Dinu Nesan; Connie O'Connor; Tammy Rodela; Jodie Rummer; Navdeep Sandhu; Shelby Steele; Anneli Strobel; Velislava Tzaneva

Socials

Welcome reception



Conference Dinner

Lluis Tort, local organiser; Pat Wright, Past President; Mark Hartl, incoming President

Other Section Activity

Physiological Insights Towards Improving Fish Culture II

The Physiology Section's **Kurt Gamperl, Matt Rise** and **Brian Small**, and the Fish Culture Section's **Curry Woods**, co-organized the symposium "Physiological Insights Towards Improving Fish Culture II" at the World Aquaculture Triennial meeting in San Diego (March 1 - 5, 2010). This symposium consisted of 4 plenary lectures, 44 other presentations and a catered reception, and was made possible by generous support from a number of sponsors (**Applied Biosystems, Aquatic EcoSystems, Fisher Scientific, Genome Atlantic, Loligo Systems, and YSI**). Scientists from 6 countries participated in the symposium,including 12 post-docs and students. The winner of the best student/post-doc award (sponsored by Loligo Systems) was Dr. Yoji Yamamoto from the School of Aquatic and Fisheries Sciences, University of Washington. The title of his presentation was "Effect of feed restriction on ovarian development: changes in circulating

hormone levels and the identification of differentially expressed ovarian genes."

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Oiled up

BY JAY NELSON Towson University and University of Brest (France) students got the opportunity to visit the Gulf of Mexico this summer and observe first-hand the scientific efforts to understand the impact of the Deepwater Horizon oil spill. Funded by the Fisher College of Science of Math and the Department of Biological Sciences of Towson University, the students were accompanied by former AFS Physiology Section President **Dr Jay Nelson** and Fish Congress regular and oil spill expert **Dr. Guy Claireaux** (go to http://bit.ly/grbXd8 to learn more about the French students' visit to Towson). The group first toured the Dauphin Island (Alabama) marine lab and met with our host **Dr Bill Walton** (Auburn University) who along with crews of the Nature Conservancy showed us several experimental oyster restoration projects and where the oil spill had impacted their project.

The group in front of the Louisiana State University lab of Dr. Fernando Galvez along with one of Fernando's post-docs, graduate students and the flag of Bretagne.

The group was next hosted by Fish Congress regular **Dr. Fernando Galvez** (Louisiana State University) at the Louisiana Universities Marine Consortium laboratory in Cocodrie (LA). Graduate student **Benjamin Dubansky** and Post-doc **Charlotte Bodinier** showed the group the bayous and sampled fish; they were initiating experiments to assess the impacts of the oil spill and dispersants on marsh fishes.

The group's final visit was to the University of West Florida in Pensacola where they were hosted by **Drs Wade Jeffrey** & **Richard Snyder.** The group visited sampling sites along the beautiful, but oiled, Florida beaches where the UWF group had already been studying water and sediment chemistry before the spill and were thus well situated to gauge the effects. **Dr Snyder** gave the group an excellent lecture that summed up the scientific and political fallout from the spill in the region. The students also got to witness BP cleanup operations at all of the sites.

University of West Florida scientists demonstrate their water sampling techniques on Pensacola's city pier as members of the group look on.

Here, Dr. Jeff DeQuattro of the Nature Conservancy explains water movements in Mobile Bay to Jay Nelson, a couple of Towson students and a couple of the visiting French students.

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Introducing MASTS – Marine Alliance for Science & Technology Scotland Fisheries Joint Research Theme

Scotland's 18,000 km of coastline with its inshore and offshore areas face a variety of ecological, physical, economic, and demographic pressures. They also provide a range of ecological services, renewable resources and development opportunities beneficial to the Scottish economy. Fisheries research requires that many disciplines are brought together and the Marine Alliance for Science and Technology Scotland (MASTS) will facilitate this by promoting a responsive, agile marine science community.

The Fisheries Joint Research Theme (JRT) within MASTS aims to promote excellence in Integrated Fisheries & related marine research in Scotland under the framework of the MASTS marine pooling bid. The objective of the Fisheries JRT is to create a coherent linkage from the study of marine habitats & their occupants (biodiversity & behaviour), through ecosystem function (turnover and transformations) and through ecosystem services, and their economic values. The members also seek opportunities to pursue multidisciplinary research & share resources & skills to enhance scientific progress. Fisheries unites the science of ecosystem function & services with appropriate policy & governance structures to enable more effective communication between those generating the cross-disciplinary science base & those forming & implementing environmental policy.

The Annual MASTS Science meeting 29th Nov-01st Dec, 2010 was cancelled because of the extreme winter weather that dumped more than 1m of snow across Scotland. The meeting has been rescheduled for the Spring. Contact Mark Hartl for more details or visit the MASTS website: http://mss.st-andrews.ac.uk/

Spotlight on Members Research

Fraser River Pacific Salmon Capture Fisheries

BY GRAHAM RABY & MICHAEL DONALDSON

In one of nature's great spectacles, Pacific salmon migrate thousands of kilometres each year from their ocean feeding grounds and upstream to reach inland spawning areas. Layered onto the natural difficulty of a migration that pushes their physiological limits, each fish must negotiate a gauntlet of fisheries: purse seines, trolls, beach seines, gill nets, and anglers' hooks are deployed to capture these fish. Many fish are released, either because of regulations or due to conservation ethic, or are entangled but subsequently escape nets or hooks before being landed. How these gear encounters interact with the natural challenges of migration is poorly understood, and so beginning in 2009, a research program has been underway to understand the impacts of capture and release from multi-sector fisheries on Pacific salmon in the world's most productive salmon system, the Fraser River (British Columbia, Canada).

The research program is supported by the Natural Sciences and Engineering Research Council of Canada and led by **Steven Cooke** (Carleton University), **Scott Hinch** (University of British Columbia), **Tony Farrell** (UBC), **David Patterson** (Fisheries and Oceans Canada - DFO), and **Bill Willmore** (Carleton) and involves partnerships with the Pacific Salmon Commission, the Pacific Salmon Foundation, Fisheries and Oceans Canada, the Canadian Wildlife Federation, J.O. Thomas and Associates, and LGL Environmental Research Associates Ltd. The majority of this research group has been together for a number of years; coupling physiological biopsy with radio telemetry and lab experiments to better understand the causes of mortality during spawning migrations for sockeye salmon in the

Fraser River. The ongoing research opportunistically builds on the established techniques and existing collaborations to advance the understanding of capture stress on fish and its consequences at the organismal level

A First Nations beach seine being pulled to shore with hundreds of sockeye. Photo credit: Marion Dupoux

David Patterson and Scott Hinch blood sampling a freshly captured sockeye in the lower Fraser River.

The research is led on the ground by graduate students **Vivian Nguyen** (Carleton), **Kendra Robinson** (UBC), **Graham Raby** (Carleton), **Michael Donaldson** (UBC), and research associate **Tim Clark** (UBC) with substantial logistic support by DFO'S E-watch program (David Patterson and co.) and the DFO Cultus Lake Laboratory, where the lab components are carried out. The core of the program is observational studies using radio telemetry (supported by LGL Ltd.) to develop post-release survival estimates for different fishing gears, species, fishing techniques, and environmental conditions. Field telemetry projects are being coupled with field- and lab-based experimental work that measures physiological responses to compare the consequences of different capture techniques, methods for recovering exhausted salmon, and the role of temperature. In both the lab and the field, the use of neurological responses (reflexes, a.k.a. RAMP - Reflex Action Mortality Predictors) is being developed in collaboration with Michael Davis and compared with physiology for measuring stress and predicting mortality. Lab studies include monitoring the response and recovery of heart rate following a fisheries encounter using heart rate loggers that allow fish to swim freely without being tethered to recording equipment. To characterize the recovery profiles of Pacific salmon across temperatures, species, and levels of biological organization, a series of QPCR primers are being tested at DFO's Pacific Biological Station in Nanaimo, British Columbia. Establishing these primers will provide a better understanding of how migrating fish recover from exhaustive exercise stress under a series of environmental conditions. A novel field in itself, work on measuring indicators of oxidative stress (e.g., anti-oxidant capacity, damage from free radicals) in the tissues of fish is being led by **Bill Willmore** (Carleton) and will provide new insight on Pacific salmon migration physiology and the consequences of capture stress at the molecular level.

In annual meetings, results from the research are being fed back to fisheries managers, anglers' organizations, First Nations, and commercial fishers. In this way, stakeholders are kept abreast of recent data and can provide direct feedback that is incorporated into subsequent research. These meetings are an example of how stakeholders can be involved in physiological research when it is applied to

relevant conservation issues, in a time when many scientists in fisheries and conservation biology are struggling to engage policy makers and stakeholders. Engaging stakeholders and taking a multidisciplinary approach are necessary to carrying out a large-scale research program on the consequences of capture fisheries on migrating Pacific salmon. Identifying the factors contributing to mortality of released fish is essential to the long-term conservation and management of one of North America's highest profile wild fisheries resources.

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The Cape Eleuthera Institute Flats Ecology and Conservation Project



BY LIANE NOWELL, SKYLAR MILLER & AARON SHULTZ The Cape Eleuthera Institute (CEI) was born out of the desire to address pertinent environmental issues facing The Bahamas and the Caribbean. This facility strives to create intrinsic bonds between primary research and education in order to help create models of effective resource management and sustainable development. In turn, these model systems help to enhance conservation initiatives as well as address environmental and socioeconomic issues at local, regional, and

The Cape Eleuthera Institute

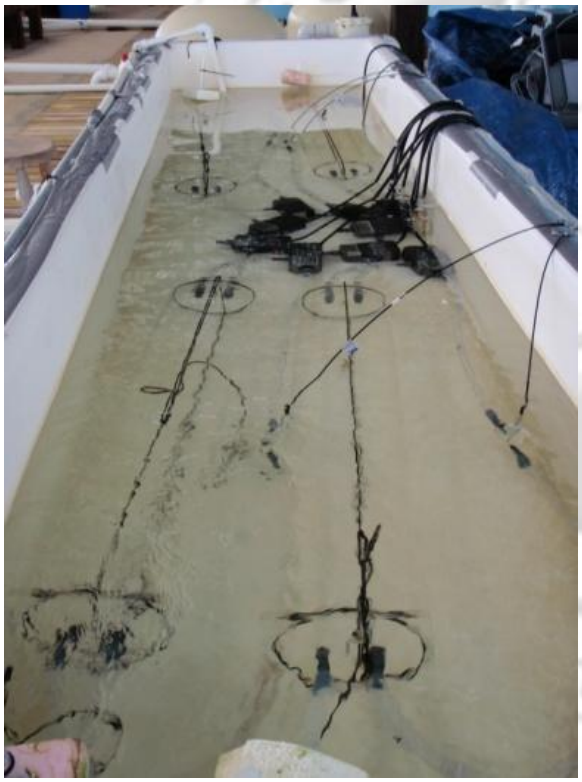
global scales. With a diverse array of virtually unexplored environments at our doorstep, CEI acts as a hub for exploration, primary research, and information exchange. Terrestrial and marine based research programs at CEI cover a wide range of topics encompassing human resource use and sustainable design. In this way, we are able to take a more holistic


Bonefish angler in flats tidal creek

approach to addressing environmental and socioeconomic issues in a broader integrated resource management context. As one of the most eco-friendly campuses in the world, CEI is contributing to the national dialogue and policy-making efforts to encourage more sustainable development both in The Bahamas and in similar coastal communities around the world. The Cape Eleuthera Institute is a grantee of The Cape Eleuthera Foundation, a U.S. based nonprofit organization. The Foundation depends on the generous support of visitors to provide unique learning opportunities and authentic research programs. If you would like to learn more about The Cape Eleuthera Institute or make a donation please visit our website at www.ceibahamas.org.

Recently there has been a need to focus on the threat of climate change on coastal habitats and the species that utilize these areas. Climate change is predicted to cause changes to a range of physical, biological, and chemical conditions within the marine environment. Currently, the Flats Ecology and Conservation Program in Collaboration with The University of Illinois is focusing on the physiological response of

nearshore fish and invertebrate species to future climate change scenarios predicted by the Intergovernmental Panel on Climate Change (IPCC). Tropical and subtropical nearshore flats provide habitat for many marine and coastal species. These habitats help support biodiversity and maintain important ecological functions. Many species inhabiting nearshore flats are also economically important and support commercial and recreational fisheries. The recreational bonefishing (*Albula* spp.) industry has become a popular activity that is estimated to generate over $141 million annually in The Bahamas. The revenues generated through bonefishing-related tourism can form the economic basis of entire local communities in the Bahamas. Unfortunately,



Respirometry equipment

these flats tend to be the focus of coastal development and other human activities, resulting in habitat destruction and a reduction in species diversity and abundance. Given their ecological and economic importance, strategic conservation initiatives are sorely needed to help protect tropical and subtropical

Bonefish (*Albula* spp.)

flats. The project assesses changes in metabolic rates (oxygen consumption) when animals are exposed to different climate change-related stressors such as increased temperature, salinity, and acidity. Measuring metabolic rate is an effective, non-lethal and non-intrusive way to quantify the response of animals to environmental stressors.

Our experimental species are collected from a number of local tidal creeks and brought to the Cape Eleuthera marine holding facility. Species include: the economically important bonefish, the checkered pufferfish, schoolmaster snapper, spiny lobster, milk and queen conch. After an acclimation period in holding tanks, water conditions are manipulated to replicate the conditions likely experienced by fish following alterations in the marine environment due to climate change (i.e., increased temperature, acidity, and salinity). Following a seven day acclimation period at these new water conditions, individuals are loaded into a respirometer. This respirometer consists of four individual chambers placed in a water bath. Each chamber is outfitted with a sensitive, fiber optic, dissolved oxygen probe which allows for simultaneous monitoring of oxygen consumption from four animals. Animals are left overnight to determine their resting oxygen consumption (metabolic rate). After being left overnight in the respirometry chambers,

animals are returned to the wild. Experiments are also run for control individuals, where the water conditions are kept the same as normal sea water.

All research data collected for the flats project contributes to a long-term study aimed at establishing the effects of climate change stressors on individual species, trophic webs, and general ecosystem integrity. The response of these few flats species to individual or combined climate change stressors could provide a better understanding of how flats ecosystem species will respond to changing environmental conditions and whether or not they have the ability to sustain healthy populations in the future. Having a greater understanding of the ecosystem processes and ecology of these species could provide information that supports the prevention of degradation and decline of these environments.

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Advertisements for member's courses

Summer 2011 Field Course:
Iceland: Fish and Other Fauna

The 2011 International Field Studies Program in the Biological Sciences at Salisbury University is offering a course in the biology of Icelandic animals. There are no prerequisites and all majors are welcomed. The course will focus on the fishes of Iceland, but will also spend some time examining the birds and invertebrates there. The course will be taught at Hólar University College in Iceland and will give students the opportunity to study the ecology, physiology, and evolution of Icelandic animals in their natural setting. Hólar is in northern Iceland in the Hjaltadalur valley of the Skagafjörður district. The area is renowned for horse breeding and training, and heritage tourism. The setting at Hólar University College provides a unique opportunity for students to study the biology of Arctic fishes within a few miles of the Arctic Circle while enjoying a mild climate and 24hrs of daylight.

CLASS: Students will receive three credits for BIOL 399: International Field Studies. Instruction will be over a two week period beginning June 3, 2011. **Dr. Bjarni K. Kristjánsson** of the Department of Aquaculture and Fish Biology at Hólar University College; Fish biologist and frequent Iceland visitor, **Dr. Jay Nelson** of Towson University, **Dr. Guy Claireaux** University of Brest, France and **Dr. E. Eugene Williams** of the Department of Biological Sciences at Salisbury University will jointly teach the course. The course will include lectures, laboratories and field activities, including trips to Lakes Mývatn and Thingvallavatn. Topics covered in the course include the evolutionary ecology of Icelandic fishes, Iceland's unique geology and its impact on the biology of Icelandic fishes, the evolution of Icelandic freshwater fishes, fish physiology at the organismal, cellular and molecular levels, mechanisms of acclimation and adaptation, and other topics.

EXCURSIONS: In addition to studying the biology of Icelandic fish, a significant portion of the course will focus on Icelandic culture. Group trips to see the work of local artists displayed in **Skagafjörður Library and Archives,** in the Safnahús in Sauðárkrókur, and to **the** Glaumbær Folk Museum (with an 18th century turf-house farm) are planned. Trips to Mývatn, Thingvallavatn, Thingvellir, Hvalfjörður, and the city of Blönduós are planned. We also plan to spend two

full Saturday and Saturday nights in Reykjavik to explore the world's most northern capital city with a vibrant nightlife. Students may also enjoy horseback riding, river rafting, and many hiking trails close to the University.

HOUSING: Students will live in the dormitories at Hólar University College and eat in the University cafeteria. You will live like an Icelandic student!

COST: Tuition and fees for the 2011 BIOL 399 course are estimated to be close to $3500. Final costs will be determined in spring 2011. The price will include all tuition, round-trip airfare, room and board in Iceland, all travel within Iceland, and international health insurance. Costs not included in the program fee are passport fees, costs for personal items purchased in Iceland, and some miscellaneous expenses. US citizens do not need visas to visit Iceland, but passports are required and must be valid for three months beyond the end of the intended stay.

DEPOSIT AND PAYMENT INFORMATION: An initial deposit of $250 is due at the time of application. This deposit is part of the total cost of the program. Once the Program Director academically admits a student, the initial non-refundable deposit is due to the Cashier's Office. The student will be automatically enrolled into the study abroad course. The University Billing Office will then bill each registered student for the total cost of the study abroad program (less the deposit amount) through the regular university billing system. Standard university deadlines for withdrawals do not apply to study abroad programs. ***Once the published Application Deadline occurs, the accepted student is responsible for the entire amount of the study abroad program charge.***

SCHOLARSHIPS: Towson University students are eligible for study abroad scholarships issued through Towson's Study Abroad Office; deadline for these applications is March 15, 2011.

APPLICATION INFORMATION: Application forms are available at the Center for International Education or from the faculty director. Completed application forms are currently being accepted by the faculty director or by the Center for International Education. Students should also submit a completed faculty recommendation form from a faculty member who knows the student well. Admission is competitive and enrollment is very limited. Students will be admitted to the program based on a number of factors including major (Biology majors have priority), GPA, class (seniors have priority), letter of recommendation, etc…**. The application deadline is April 1, 2011**. For more information see the program website at www.salisbury.edu/intled/studyabroad/summer/iceland/. All questions concerning the program should be addressed to the program director:

Dr. E. Eugene Williams Department of Biological Sciences Phone: 410-548-2062, e-mail: eewilliams@salisbury.edu	**Dr. Jay A. Nelson** Department of Biological Sciences (Towson University Instructor) Phone: 410-704-3945 e-mail: jnelson@towson.edu

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SUMMER GRADUATE COURSE
AT FRIDAY HARBOR LABORATORIES, WA, USA.
(FINANCIAL AID IS OFFERED).

FISH SWIMMING: Kinematics, Ecomorphology, Behavior & Environmental Physiology

July 25th - August 26th , 2011

5 weeks: M-F 8-5; S 8-12
Fish 565 (9 credits)
Instructors:
Dr. Paolo Domenici (CNR, Italy)
Dr. John Steffensen (University of Copenhagen, Denmark)

Course description: Fish swimming is a multidisciplinary area of research that encompasses biomechanics, physiology, ecology and behavior. Knowledge of fish swimming is relevant both for students interested in mechanisms of locomotion, and those interested in locomotor adaptations to the environment. The main 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 sessions. Students will learn techniques of video analysis, kinematics, energetics 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. In the second half of the course, emphasis will be placed on laboratory work. Students will pursue independent research projects. Enrolment will be limited to 15 graduate students.

For additional information contact: paolo.domenici@cnr.it or jfsteffensen@bio.ku.dk
Information for applicants (including tuition and financial aid) can be found at
http://depts.washington.edu/fhl/stu_index.html
http://depts.washington.edu/fhl/studentSummer2011.html#SumB-4
http://depts.washington.edu/fhl/StudentApplicationForm.html
http://depts.washington.edu/fhl/studentApplicationInfo.html
http://www.mbl.ku.dk/JFSteffensen/fhl

Deadline for application: February 1st 2011. Early applications are encouraged.

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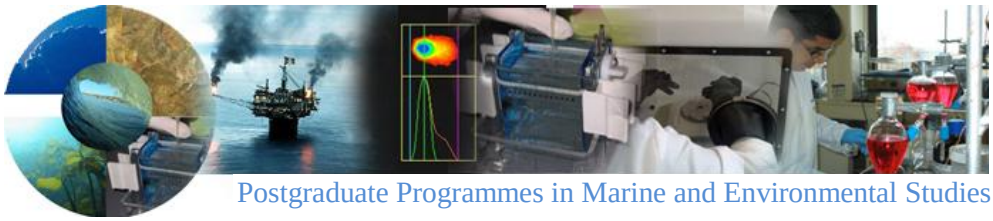

Postgraduate Programmes in Marine and Environmental Studies

A suite of multi-disciplinary 12-month Masters degree programmes is available at Heriot-Watt University, Edinburgh from September 2011.

www.sls.hw.ac.uk/marinemsc/Index.htm

MSc/Postgraduate Diploma Programmes:

Marine Resource Development and Protection
Marine Biodiversity & Biotechnology
Marine Spatial Planning
Climate Change: Managing the Marine Environment
Climate Change: Impacts and Mitigation

MRes programme in:

Environmental Analysis and Assessment

Scholarships are available

This suite of Masters degree programmes is constructed from a variety of core and optional taught and practical courses based at the School of Life Sciences with input from other Schools:

SEMESTER 1

Marine Resources and Sustainability
Diversity of Marine Organisms
Climate Change: Causes and Impacts
Practical Environmental Sampling and Analysis
Practical Marine Toxicology
Oceanography and Marine Ecology

SEMESTER 2

Coastal and Estuarine Monitoring and Pollution Control
Practical Skills in Marine Biotechnology
Climate Change: Mitigation and Adaptation Measures
Oilfield Chemicals: Nature and Fate in the Marine Environment
Fisheries and Bioresource Exploitation
Scientific Diving and Consultancy
Geographical Information Systems

The **Climate Change: Impacts and Mitigation** and the **Marine Spatial Planning** MSc programmes (being broader in scope) also have a range of optional courses from other Science, Engineering and Management Schools within the University (see website for more details).

How to apply and enquire about further details?

Follow the links:

www.sls.hw.ac.uk/marinemsc/Index.htm

or please contact:

Mrs Dorothy Haston, Postgraduate Administrator
School of Life Sciences
Heriot-Watt University
Edinburgh EH14 4AS
Scotland, UK
Tel: +44 (0)131 451 3456
Fax: +44 (0)131 451 3009
D.Haston@hw.ac.uk

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Vacancies

Research Fisheries Biologist

US Geological Survey, Columbia River Research Laboratory, Cook, WA. We are expecting funding (ca. 2 year tenure) for a person to develop and apply a bioenergetics model for a critically endangered desert fish, the Moapa dace. Project will involve intensive laboratory studies to parameterize and validate a model for this fish and application of the model to assess the impacts of environmental change. Much of the work will be done at a small wildlife refuge where the fish is found, about 60 miles north of Las Vegas, NV. Qualifications should include a college degree (MS or higher degree preferred) in the biological sciences and experience with bioenergetics modeling and laboratory experimentation. Interested persons should contact Dr. Matthew Mesa at mmesa@usgs.gov or 509-538-2299, ext. 246.

Department Chair, Biological Sciences, Towson University

The Fisher College of Science and Mathematics is seeking candidates to fill the position of Chair for the Department of Biological Sciences, starting August 2011. The Department Chair is responsible for the management and leadership of the Department's teaching, research, and service functions. The Chair is expected to provide effective academic leadership and to remain active in teaching and research, including the ability to attract extramural support. The Chair reports to the Dean of the Fisher College of Science and Mathematics.

The successful candidate should be a broadly-trained biologist and must have demonstrated abilities in teaching and scholarship and the potential for successful academic leadership, as demonstrated by his or her record of service to the Department, University, or profession. Candidates are expected to develop an exciting, dynamic, and strategic vision of the Department's future, compatible with existing strengths and opportunities. Experience with a Master's-level institution is desirable. Candidates should be eligible for appointment as a tenured full professor and salary will be commensurate with qualifications. Start-up funds will be available. A detailed position description is available on the Department's web site (http://bit.ly/hUYZ75)

Send letter of interest, CV, copies of recent publications, and the names and contact information of three references to the address below. The letter of interest should address the applicant's vision for leadership of a large, rapidly growing department (40 faculty, 750 majors), with broad areas of research interest in cell and molecular biology, ecology and conservation biology, and physiology, and a strong and growing Master's program (70 graduate students). At least one of the letters of reference should come from an individual who can speak to the applicant's leadership and administrative skills.

Review of applications will begin on January 17, 2011 and continue until a suitable candidate is found. Send all application materials electronically to:

Dr. David Schaefer
Chair, Dept. of Physics Astronomy and Geosciences
Towson University
8000 York Rd.
Towson, MD 21252-0001
dschaefer@towson.edu

10*th* International Congress
on the Biology of Fish

University of Wisconsin ~ Madison
Madison, Wisconsin

July 15-19, 2012

Call for Symposia

We are currently seeking proposals for symposia for the 2012 meeting here in Madison. Interested parties should send a title, a 200 (max) word abstract outlining the purpose and target audience of the symposium and a number of potential speakers to Mark Hartl (m.hartl@hw.ac.uk). We would also like to urge veteran symposium organizers to encourage younger colleagues to come forward and co-organize symposia. In fact, we would prefer to see at least 2 named organizers per proposed symposium. The initial deadline is 31st January, 2011.

For more information about the Madison and the conference venue, accommodation and travel arrangements, please visit the
conference website http://bit.ly/gJYyM5

Terry Barry, Don MacKinlay, Mark Hartl