



THE Open Reading Frame

Newsletter of the Genetics Section of the American Fisheries Society

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President’s Message

secretary-treasurer. We are all looking forward to the next year and the opportunities it presents for the genetics section.

This year the national meeting was held in Spokane Washington. I enjoyed finally attending a conference in person again and it was great to see so many talks focusing on using genetics to improve fisheries management. During this conference we held our annual meeting, one of the highlights of which is announcing awards for excellence and achievement in fisheries genetics. These included awards for graduate student achievement (James E. Wright award), excellence in a paper contributed to AFS journals (Stevan Phelps Memorial award), excellence in early career contributions (Early Career award), and for career achievements (Hall of Excellence award). On behalf of the executive committee, I’d like to congratulate all our awardees for their excellent work.

Next year the annual meeting will be held in Grand Rapids, Michigan. We hope to have a strong showing from the genetics section and welcome any ideas for genetics-themed symposia or workshops. Symposia proposals are typically due near the end of January (submitted through the national meeting website) but it’s never too early to start thinking of ideas and contacting potential co-chairs and presenters. As always, the executive committee is available if you need help planning a symposium.

I’m also excited for the return of the Coastwide Salmonid Genetics Conference next June 27th-29th in Boise, Idaho. The last meeting was unfortunately cancelled due to COVID so it is great to see this conference happening again. The genetics section website has a page for meeting details and it will be updated as more information becomes available.

Garrett J. McKinney
President, AFS Genetics Section

Welcome to the Fall 2022 edition of the Genetics Section newsletter. I’m excited to step into the role as president of the Genetics section. Our new executive committee consists of Marlis Douglas as past-president, Jared Homola as president-elect, and Mary Peacock as



Dr. Garrett McKinney
AFSGS President

2022 Stevan Phelps Memorial Award

The Stevan Phelps Memorial Award was created in 2000 as a perpetual memorial to Steve who died prematurely from cancer in 1999. The award, honoring Steve's strong commitment to publication of applied genetic research in fisheries, is given annually for the best genetics paper published in an AFS journal the preceding year. This year's awardees are led by Dr. Gregory Neils Puncher, who provides the following contribution.



Figure 1: Dr. Gregory Neils Puncher posing with an Atlantic cod aboard the CCGS John Cabot.

On behalf of my co-authors (Yanjun Wang, Ryan Martin, Steven Cadrin, Douglas Zemeckis, Sherrylynn Rowe, Nathalie M. Leblanc, Genevieve J. Parent, and Scott A. Pavey) and I (Gregory Neils Puncher), I wish to communicate our gratitude to the American Fisheries Society Genetics Section for the honour of having been awarded the 2022 Stevan R Phelps Award. In our 2021 Transactions of the American Fisheries Society article "Transborder Gene Flow between Canada and the USA and Fine-Scale Population Structure of Atlantic Cod in the Broader Gulf of Maine Region", we detailed our genomic analysis of 248 adult and 215 juvenile Atlantic Cod collected from areas saddling our shared border in 2017–2018. Our team consisted of researchers from universities and federal departments/agencies in Canada and the USA. The welfare of Atlantic cod stocks in the western Atlantic and the broader Gulf of Maine Region in particular, remains precarious, despite over twenty years of conservation research. This project was an opportunity to explore the spatial dynamics of cod from the Eastern Georges Bank and their connection with adjacent Canada and U.S. cod stocks, which fall under a shared Canada/U.S. transboundary cod management strategy. Our study represents the best sampling effort to date in this region and is the first study to compare juveniles from the northern Gulf of Maine to populations in adjacent Canadian waters.

We focused on the allele frequencies of neutral and outlier single nucleotide polymorphisms as well as four super genes. Our results provided evidence of local adaptations among samples from the Bay of Fundy and the western Gulf of Maine and suggested that spawning groups in the northern Gulf of Maine, which were previously considered extirpated, likely persist given the genetic differentiation of juveniles captured in the area. Moreover, allele frequencies of one super gene complex suggested that gene flow between the Gulf of Maine Region and areas north of 45°N, in Canadian waters, is ongoing. Finally, we found that nursery and spawning areas appear to overlap in some locations, suggesting that dispersal during early life stages may be limited and heavily influenced by local hydrodynamics.

We concluded from these results that the biological units in the Gulf of Maine Region are different from current management units, that transboundary gene flow persists, and that adaptive selection on supergenes defines the majority of genetic variation in the Bay of Fundy and western Gulf of Maine. Failure to account for this stock complexity is likely to lead to overestimation of productivity and Maximum Sustainable Yield, thereby increasing the likelihood of stock depletion. The results of our study will help guide stock assessments and fisheries management in the U.S. and Canada and could significantly improve models of population dynamics, ultimately benefitting cod stock management.

Through this work, Yanjun Wang and I were given the opportunity to join the Atlantic Cod Stock Structure Working Group, a joint venture of both nations. We travelled from Nova Scotia and New Brunswick to the University of New Hampshire for a working group meeting where we were able to meet some of our co-authors in person. It is fortunate that we as researchers are able to move just as freely across our border as our shared marine resources, for it is through joint collaboration, cooperation and open communication that we can most effectively conserve our common natural heritage.



Figure 2: Dr. Gregory Neils Puncher (centre) and Dr. Scott A. Pavey (2nd from left) with research team of the Canadian Rivers Institute at the University of New Brunswick, Canada.

James E. Wright Award Winners

The James E. Wright Graduate Award is given in the memory of Jim Wright, one of the founders of fish genetics research and education in North America. This award is presented annually to recognize excellence in graduate-level work in fisheries genetics, as well as assist graduate students with travel to the national meeting. For 2022, our student winners were Sam Rosenbaum, Dominic Swift, and Zach Zbinden, while the postdoc winner was Melanie LaCava. Sam and Dominic introduce themselves and their research below.

Sam Rosenbaum, University of Alaska, Fairbanks

I would like to thank the AFS Genetics Section for supporting my attendance at the AFS Annual Meeting in Spokane through the James E. Wright Award. As a master's student at the University of Alaska Fairbanks, I am validating trans-generational genetic mark-recapture (tGMR) for improved enumeration of a salmon stock of management concern. Leveraging non-lethal tissue sampling, high-throughput genotyping, and parentage analysis, I have produced precise and accurate estimates of adult salmon spawning abundance (escapement). This research focuses on a population complex of Chinook salmon in Southeast Alaska that is listed as a stock of management concern and has historically supported a robust subsistence fishery. Our tGMR models provide escapement estimates that are concordant with those derived using traditional mark-recapture methods, while yielding greatly increased precision. I am currently developing simulations to evaluate potential biases in tGMR estimates that may occur under a range of demographic and sampling scenarios. Providing a framework to assess and correct violations of the core tGMR assumptions will expand the feasibility of this emerging method.

I am honored to have received the James E. Wright Award and benefited greatly from the opportunity to present my research at the national meeting. I am excited to be associated with the AFS Genetics Section and look forward to increasing my involvement as my career progresses!

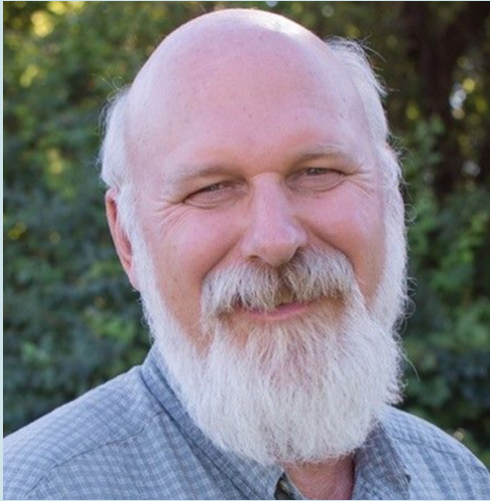


Dominic Swift, Texas A&M-Corpus Christi

I graduated from the Marine Biology program at Texas A&M University-Corpus Christi in August 2022. I'm interested in understanding elasmobranch reproductive biology to inform conservation and management using genetic and genomic techniques. My dissertation focused on the blacktip shark (*Carcharhinus limbatus*) in the western North Atlantic Ocean. Blacktip sharks give birth in coastal nurseries where young-of-the-year may remain for extended periods of time. Regional philopatry by males and females has contributed to the formation of three genetic stocks in the U.S. Atlantic and northern Gulf of Mexico. In addition, female philopatry to environmentally heterogeneous nurseries appears to have generated fine-scale adaptive structure within stocks, highlighting the importance of conserving essential habitats throughout a species' range. I expanded upon this research to examine how gene flow and movement influence blacktip shark stock structure across national boundaries. Working with international colleagues, I demonstrated the presence of two highly distinct stocks in Cuba and The Bahamas and a shared stock in the western Gulf of Mexico that straddles U.S. and Mexican waters. Further, by assigning larger individuals to genetic stocks of origin, I uncovered evidence of blacktip sharks moving between the Gulf of Mexico and Cuba, as well as between the Gulf and U.S. Atlantic. This research has implications for shark fisheries and suggests management would benefit from internationally coordinated policies. I am very proud and grateful to receive a James E. Wright Award which enabled me to virtually present at this year's AFS meeting. I would like to thank the AFS Genetics Section and award committee for their work and support of my research.



2022 Genetic Section Hall of Excellence Inductee - Dr. Kim Scribner



Dr. Kim Scribner

Dr. Scribner has produced an impressively wide-ranging scope of research activity, with clear practical application to fishery and wildlife management. His work in applied population genetics is rigorous and includes studies of lake sturgeon, lake trout, salmonids, and non-game species; going beyond fishes, it also includes many herps, mammals and birds. He has published papers advancing our understanding of the natural history of North American species. Such work has addressed the life history and invasion ecology of sea lamprey, the dynamics of hybrid zones, as well as resolution of apparent conundrums regarding lekking and nest defense behaviors in birds. His work in landscape genetics leads its application to riverscapes and development of new analytic tools. His contributions include use of computer simulation as a tool in landscape genetics, exploration of the applicability of resistance surfaces, relation of landscape genetics to adaptive variation, and application of the landscape genetics approach to model the spread of chronic wasting disease of cervids. His work has been documented in over 290 peer-reviewed publications. This work is widely respected and

built upon by colleagues, who have cited his work over 11,000 times. His larger legacy, though, is likely the young minds that he has mentored, including 15 M.S. and 22 Ph.D. students and six post-docs.

2022 Early Career Award Winner - Dr. Elizabeth Mandeville



Dr. Elizabeth Mandeville

I am an Assistant Professor in the Department of Integrative Biology at the University of Guelph in Ontario, Canada. I am interested broadly in fish evolution, and how ecological conditions, including anthropogenic disturbance, affect the evolution and maintenance of fish biodiversity. I work in a variety of freshwater fish systems across Canada and the United States.

Much of the current work in my lab focuses on understanding and mitigating the effects of anthropogenic disturbance on fish populations, using high resolution genomic data. We have two ongoing projects quantifying the effects of agricultural land use and urbanization on hybridization dynamics of cyprinid fishes, as well as the demographic trends in these species over the period of European settlement of Ontario. These projects are part of the Food From Thought program at the University of Guelph. Another study in my lab, in collaboration with Colorado Parks and Wildlife, will examine whether a conservation intervention using a resistance board weir can prevent hybridization between native and introduced *Catostomus suckers*.

More broadly, we are also interested in differences in genome structure and sex determination systems in groups of fish that can hybridize. Major differences in genome structure or genetics of sex determination

are thought to be a major contributors to diversification of some fish clades, and could constrain hybridization outcomes and be a source of reproductive isolation. We're currently working on these topics in *Catostomus suckers* and *Chrosomus dace*.

In the past, I've also worked on quantifying variation in hybridization outcomes across replicate hybrid zones in *Catostomus suckers*, trout, and sauger/walleye in the US mountain west. This work was done in close collaboration with Colorado Parks and Wildlife, the Wyoming Game and Fish Department, and other state and federal agencies. I'm deeply appreciative of the longstanding partnerships with conservation and management agencies that have enabled this work, as well as the contributions of academic mentors.

I have benefitted enormously from involvement with the American Fisheries Society as I've progressed in my career in fisheries genetics, from my first local chapter meeting as a graduate student all the way through my current faculty position. The Genetics Section in particular has been a wonderful hub of like-minded researchers, and I very much appreciate the feedback, collaborations, and opportunities that have come through this group. I am honored to be this year's recipient of the Early Career Award, and look forward to continued involvement with the American Fisheries Society Genetics Section for years to come.

Sights from the 2022 AFS Annual Meeting in Spokane, Washington



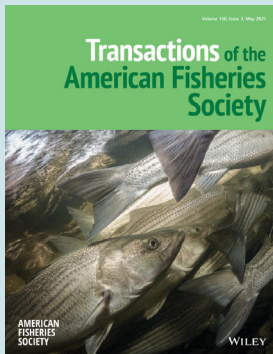
152nd ANNUAL MEETING
Spokane
AUGUST 21-25, 2022



In case you missed it...

Recent genetics papers from AFS journals and beyond

Click citations for link to papers



Wojtusik et al. River-of-origin assignment of migratory striped bass with implications for mixed stock analysis. *Transactions of the American Fisheries Society*.

Askin et al. Population genetic structure in channeled whelk *Busycotypus canaliculatus* along the U.S. Atlantic Coast. *Transactions of the American Fisheries Society*.

Su, et al. Population genomic analysis of the speckled dace species complex (*Rhinichthys osculus*) identifies three distinct lineages in California. *Transactions of the American Fishery Society*.

Farrell et al. Cytological and molecular approaches for ploidy determination: results from a wild walleye population. *North American Journal of Fisheries Management*.

McKinney et al. A new genotyping-in-thousands-by-sequencing single nucleotide polymorphism panel for mixed-stock analysis of chum salmon from coastal western Alaska. *North American Journal of Fisheries Management*.

Kinziger et al. Pedigree analysis of an integrated hatchery steelhead program from the Mad River, California provides insight into life history patterns and informs management. *North American Journal of Fisheries Management*.

Biagi et al. Timing of postfertilization pressure shock treatment for the production my mitotic gynogens in six salmonid species. *North American Journal of Aquaculture*.



LeBlanc and Pavey. Comparing mixed models and random forest association tests using natural gas and a striped bass SNP data set. *Molecular Ecology Resources*.

Laine et al. An ecologist's guide for studying DNA methylation variation in wild vertebrates. *Molecular Ecology Resources*.

Formenti et al. The era of reference genomes in conservation genomics. *Trends in Ecology and Evolution*.

Semeniuk et al. Innovating transcriptomics for practitioners in freshwater fish management and conservation: best practices across diverse resource-sector uses. *Reviews in Fish Biology and Fisheries*.



Pont et al. Quantitative monitoring of diverse fish communities on a large scale combining eDNA metabarcoding and qPCR. *Molecular Ecology Resources*.

Kronenberger et al. eDNAAssay: A machine learning tool that accurately predicts qPCR cross-amplification. *Molecular Ecology Resources*.

Littlefair et al. Environmental nucleic acids: A field-based comparison for monitoring freshwater habitats using eDNA and eRNA. *Molecular Ecology Resources*

Shi et al. High-density genomic data reveal fine-scale population structure and pronounced islands of adaptive divergence in lake whitefish (*Coregonus clupeaformis*) from Lake Michigan. *Evolutionary Applications*.

Bradbury et al. Genomic evidence of recent European introgression into North American farmed and wild Atlantic salmon. *Evolutionary Applications*.

Tigano and Russello. The genomic basis of reproductive and migratory behaviour in a polymorphic salmonid. *Molecular Ecology*.

Calendar

Click listings for more info

November 2022

7th-10th: North American Invasive Species Management Association 30th Annual Conference. Ft. Myers, Florida.

14th-17th: North American Lake Management Society 2022 Symposium. Minneapolis, Minnesota.

December 2022

4th-8th: Restore America's Estuaries 2022 Coastal and Estuarine Summit. New Orleans, Louisiana.

February 2023

1st-5th: AFS Southern Division Annual Meeting. Charleston, South Carolina.

3rd-9th: IMPAC 5 - 5th International Marine Protected Areas Congress. Vancouver, British Columbia.

12th-15th: 83rd Midwest Fish & Wildlife Conference. Overland Park, Kansas.

18th-23rd: 10th World Recreational Fishing Conference. Melbourne, Australia.

March 2023

16th-19th: North American Native Fishes Association 2023 Convention. Columbia, South Carolina.

27th-30th: ICES International Symposium on Fisheries and Zooplankton Acoustics. Portland, Maine.

April 2023

17th-23rd: 5th Effects of Climate Change on the World's Ocean Symposium. Bergen, Norway.

May 2023

7th-12th: IAGLR 66th Annual Conference. Toronto, Ontario.

8th-12th: Advances in the Population Ecology of Stream-Dwelling Salmonids VI. Mallorca, Spain.

To find dates and information for AFS chapter meetings, visit fisheries.org/about/units/chapters/

Job Postings

Click ads for more info

Two Assistant Professorships - University of Kansas.

The Department of Molecular Biosciences at the University of Kansas invites applications for two faculty positions in Genomics at the tenure-track Assistant Professor level to begin August 2023.

Conservation Genetics Lab Assistant - West Virginia University.

The Wild Genomics Laboratory at West Virginia University is seeking a laboratory technician to conduct laboratory work on a variety of fish and wildlife species using a wide range of genetic and genomic techniques. Primary responsibilities include: genotyping brook trout, walleye, and candy darter; using genetic markers for sex identification of lake sturgeon; extracting DNA from a variety of fish and wildlife species; development of genomic tools; conducting preliminary analyses on resulting data; managing and overseeing daily laboratory functions. The position is funded for 1 year, with the possibility of extension. Candidates can apply at the provided link in this announcement. Contact Dr. Amy Welsh (amy.welsh@mail.wvu.edu) with any questions.

Two postdocs in genomics, Michigan State University.

We seek two postdoctoral research associates to join our research efforts on evolutionary and functional genomics in zebrafish and sea lamprey. The successful applicants will work as part of an interdisciplinary group and leverage a newly renovated laboratory designed for rearing and genetically modifying sea lamprey and zebrafish to 1) study the genomic regulation of reproduction, development, or life history strategies in sea lamprey and zebrafish and 2) develop and evaluate the efficacy of approaches to generate genetically modified sea lamprey.

Three Assistant Professorships - Louisiana State University.

Louisiana State University (LSU) is hiring 3 Assistant Professors in the Department of Biological Sciences (Evolution, ecology or any field of biology) as part of a DEI cluster hire. As part of a college-wide effort to hire leading research faculty with a strong commitment to research, teaching, and service that will promote the success of underrepresented minority students and address the needs of our diverse state, the Department of Biological Sciences at Louisiana State University announces a search for three assistant professors across all areas of Biology. All three will be supported as a cohort and individually to develop first-class research, teaching, and mentorship programs. We will also consider applicants above the Assistant level to be hired as Associate or Full Professors, based on experience.

Postdoc in Sea Lamprey Control Genomics, University of Wisconsin-Stevens Point.

Substantial resources are expended annually throughout the Great Lakes to control invasive sea lamprey. While application of lampricides is the most common control strategy, alternative methods (i.e., supplemental controls) may increase the effectiveness of efforts to suppress sea lamprey recruitment. We seek a researcher to lead a project that uses genomic tools to evaluate supplemental control strategies for sea lamprey in the Great Lakes. The successful applicant will construct RAD capture (RAPTURE) genomic libraries and perform analyses to determine efficacy of sea lamprey control efforts based on pedigree analysis and measures such as effective number of breeders (N_b) and number of successfully breeding adults (N_s). Additional duties include involvement in mentoring and training undergraduate and graduate students, opportunities to write grant proposals, and to author research publications.



Fall Color near Rangely, Maine. Jared Homola.

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