Jens C. Hegg

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Reprints, lesson plans, and additional information available at www.jenshegg.com
- *Underlined text is hyperlinked to more information*

EDUCATION

UNIVERSITY OF IDAHO

Ph.D. – 2017 Water Resources Science & Management
with Graduate Certificate in Statistical Science

M.S. – 2011 Water Resources Science & Management

MACALESTER COLLEGE

B.A. – 2000 *Major:* Biology
Minor: Anthropology

PUBLICATIONS

** indicates student mentee co-author*

2022 - Chittaro, P., **Jens C. Hegg**, Abby Fuhrman, Devin Robichaux, Rothboury Doung, Brian Beckman, Chris Fisher, Jeff Vervoort, and Brian Kennedy. 2022. "The incorporation of environmentally derived 87Sr/86Sr and Sr/Ca in early otolith formation of Chinook salmon" *Ecology of Freshwater Fish*
DOI: 10.1111/eff.12673

2021 - **Hegg, Jens C.**, Brian P. Kennedy. "Let's Do the Time Warp Again: Non-linear time-series matching as a tool for mining temporally structured data in ecology" *Ecosphere*
DOI: 10.1002/ecs2.3742

Hegg, Jens C., *Breanna Graves, Chris M. Fisher. "Sawfish, Read in Tooth and Saw: rostral teeth as endogenous chemical records of movement and life-history in a critically endangered species" *Aquatic Conservation: Marine and Freshwater Ecosystems*
DOI: 10.1002/aqc.3635

*Carine G. Moraes, **Jens C. Hegg**, Tommaso Giarrizzo, Marcelo C. Andrade. "Feeding behavior and trophic niche partitioning between co-existing river otter species" *Hydrobiologia*
DOI: 10.1007/s10750-021-04614-w

2019 - Chittaro, P. M., **Jens C. Hegg**, Brian P. Kennedy, Laurie A. Weitkamp, Lyndal L. Johnson, Cynthia Bucher, Richard W. Zabel. "Juvenile river residence and performance of Snake River fall Chinook salmon" *Ecology of Freshwater Fish* DOI: 10.1111/eff.12462

2018 - **Hegg, Jens C.**, Brian P. Kennedy, Paul Chittaro. "What did you say about my mother? The complexities of maternally derived chemical signatures in otoliths" *Canadian Journal of Fisheries and Aquatic Sciences* DOI: 10.1139/cjfas-2017-0341

Hegg, Jens C., Jonathan Middleton, Ben Luca Robertson. "The Sound of Migration: Exploring data sonification as a means of interpreting multivariate salmon movement datasets" *Heliyon* DOI: 10.1016/j.heliyon.2018.e00532

2015 - **Hegg, Jens C**., Tommaso Giarrizzo, Brian P. Kennedy. "Diverse Early Life-History Strategies in Migratory Amazonian Catfish: Implications for Conservation and Management". *PLOS One* DOI: 10.1371/journal.pone.0129697

2013 - **Hegg, Jens C**., Brian P. Kennedy, Alex K. Fremier. "Predicting fish location using otoliths and bedrock geology: Understanding the effects of geologic heterogeneity". *Chemical Geology* DOI: 10.1016/j.chemgeo.2013.10.010

Hegg, Jens C., Brian P. Kennedy, Paul M. Chittaro, and Richard W. Zabel. "Spatial structuring of an evolving life-history strategy under altered environmental conditions." *Oecologia* DOI: 10.1007/s00442-012-2564-9

Upcoming Publications

Hegg, Jens C., Chris M. Fisher, Jeffery D. Vervoort. "Simultaneous determination of $^{87}Sr/^{86}Sr$ and trace-element data in otoliths and other sclerochronological hard structures" ***(In review, Methods in Ecology and Evolution)***

BiorXive Preprint DOI: 10.1101/2020.04.24.060640

*Kat Gillies-Rector, **Jens C. Hegg**, Brian P. Kennedy. "Spatial Variation in Natal River Rearing and Downstream Movement in Snake River Fall Chinook Salmon" ***(In-review – Environmental Biology of Fishes)***

Hegg, Jens C., *Kat Gillies-Rector, Brian P. Kennedy, Paul Chittaro, Richard W. Zabel, William P. Connor. "Abiotic and biotic effects on successful life history strategies under variable environmental conditions" ***(In prep for Can. J. Fish & Aq. Sc.)***

Proceedings, Dissertations and Theses

2017 - **Hegg, Jens C.** "Movement, Migration, and Melody: An interdisciplinary study of juvenile salmon ecology through otolith chemistry." (2017) *Ph.D. Dissertation*, Water Resources – Science and Management, College of Graduate Studies, University of Idaho.

2015 - Ben Luca Robertson, Jonathan Middleton, **Jens C. Hegg.** "Multi-channel spatial sonification of Chinook salmon migration patterns in the Snake River watershed". *Proceedings of the 12th Annual Sound and Music Computing Conference* 1:497–502. Maynooth, Ireland.
(peer-reviewed abstract) DOI: 10.13140/RG.2.1.1523.1843

2011 - **Hegg, Jens C.** "Spatial and temporal variation in juvenile salmon life history: implications of habitat alteration." (2011) *Masters Thesis*, Water Resources – Science and Management, University of Idaho.

2000 - Hove, MC, Hornbach DJ, Cunningham LA, Esse KG, **Hegg JC**, Hermanson, TW, Mann JC. 2000. "Long term changes in mussel populations of the St Croix River" *Proceedings of the Mississippi River Research Consortium* (2000) April 13-14;
La Crosse (WI): Volume 32 p 43.

Patents and Applications

Hegg, Jens, Michael P. Meyer. "Bifurcation stent and balloon assemblies." *U.S. Patent #8,118,861, issued Feb. 21, 2012.*

Hegg, Jens. "Displaceable stent side branch structure." *U.S. Patent #7,744,643, June 29, 2010.*

Hegg, Jens, Michael P. Meyer. "Bifurcated stent." *U.S. Patent #7,833,264 Nov. 16, 2010.*

Eidenschink, Tracee, Todd Bethel, Thomas E. Broome, Gordon J. Kocur, **Jens Hegg**, Michael P. Meyer. "Ratcheting Bio Cell Designs." *U.S. Patent Application #20080281395-A1, filed May 7, 2007.*

Meyer, Michael P., Thomas E. Broome, Amnon Yadin, Daniel Gregorich, Kevin Grotheim, **Jens Hegg**. "Bifurcation Stent Design with Over Expansion Capability." *U.S. Patent Application #20080177377-A1, filed Oct. 16, 2007.*

FUNDING

Grants

2019 *Mussel shells as a long-term record of environmental and ecological change*
Idaho Department of Fish and Game, End of Year Grant Funding
PI's: **Jens C. Hegg**, Brian P. Kennedy
$15,200

Fellowships

2019 *Fulbright Post-Doctoral Award: Use of Low-Salinity Environments in Two Iconic Brazilian Species*
J. William Fulbright Foreign Scholarship Board & Fulbright Commission Brazil
- Award funded 4-month in-country study of migration in endangered largetooth sawfish and Atlantic tarpon on the Brazilian Amazon coast

2010 *National Science Foundation GK12 Fellowship*
National Science Foundation

- Award funded one year of salary during intensive training in pedogogy and classroom teaching as a high school visiting scientist and co-teacher.

Contracts

As manager of the Kennedy LIFE Lab I am directly responsible for recruiting external contracts with state and federal agencies, tribal resource managers, consulting agencies and academic research groups. The following is a summary of the yearly receipts and sources of funding for projects I oversee.

2021 **$ 114,600** ($89,000 in future work secured for 2022)

Sources of Funding:
National Oceanic and Atmospheric Administration (NOAA)
South Puget Sound Salmon Enhancement Group
4 Peaks Environmental Science & Data Solutions
South Dakota Department of Game, Fish & Parks
University of Nebraska – Kearney
IZOR Institute for Oceanography and Fisheries – Croatia
Federal University of the Semi-Arid Region – Brazil

2020 **$ 6,100** (*Affected by my absence during 2019 Fulbright and the COVID-19 pandemic shutdown of labs)*

Sources of Funding:
NOAA
University of Nebraska - Kearney

2019 **$ 55,500**

Sources of Funding:
Idaho Department of Fish and Game
Shoshone-Bannock Tribes
National Oceanic and Atmospheric Administration (NOAA)
University of Nebraska - Kearney

2018 **$ 28,300**

Sources of Funding:
Bonneville Power Administration
NOAA
Idaho Cooperative Fish and Wildlife Research Unit
University of Idaho Geology Department

Donations

2021 *Spirit Lake rainbow trout life-history, growth and energetics*
Private Donation
PI's: **Jens C. Hegg**, Tara Blackman
$7,000

2019 *Could teeth and scale chemistry reveal threatened Amazonian mega-fish movements?*
Crowdfunding outreach effort through Experiment.com
PI's: **Jens C. Hegg**, Tommaso Giarrizzo, Jorge Nunes, Patricia Charvet
Partner NGO: Ecologists Without Borders
$5,171 (additional information: www.doi.org/10.18258/14000)

2016 *Big Fish a Long Way from Home: Using ear bones and teeth to unravel migration in Amazonian fish*
Crowdfunding outreach effort through Experiment.com
PI's: Jens C. Hegg, Tommasso Giarrizzo
$5,664 (additional information: www.doi.org/10.18258/6836)

PROFESSIONAL EXPERIENCE

Assistant Professor of Biology
Gonzaga University, Dept. of Biology
Beginning August 16, 2022

Lab Manager of Kennedy LIFE Lab/Post-Doctoral Researcher
University of Idaho, Dept. of Fish & Wildlife Sciences
2018-Current
- Manage collaboration, contracts, and analysis of fish hard-part and water samples
- Secured contracts greater than $50,000/year since 2018
- Supervise clean lab, otolith lab, and TIMS lab operations
- Created web presence for the Kennedy LIFE Lab (www.kennedyecology.com)

Fulbright Post-Doctoral Researcher
Federal University of Pará – Belém, Pará, Brazil
July 2019-December 2019
- Movements of both species into fresh water are important ecologically and important for conservation, but poorly understood
- Used chemical signatures in scales and rostral teeth to determine species movements
- Results will inform conservation actions of IUCN critically endangered sawfish
- Collaborating with Dr. Tommaso Giarrizzo, Dr. Patricia Charvet, and Dr. Jorge Nunes

Post-Doctoral Data Analyst – Willamette River Chinook Life History
University of Idaho, Dept. of Fish & Wildlife Sciences
2017-2019
- Analysis of Willamette otolith chemistry and scale data to determine reservoir life-history in Chinook salmon outplanted above dams in tributaries to the Willamette system
- Confirmation of a reservoir chemical signature in juvenile salmon otoliths
- Investigation of adult returns and the prevalence of reservoir life-history in the spawning population

Graduate Assistant

University of Idaho, Dept. of Fish & Wildlife Sciences

2008- 2017

- Built otolith preparation lab, equipment and record keeping into to a full-service lab
- Investigated recent life-history changes in Snake River fall Chinook salmon population
- Developed new techniques for $^{87}Sr/^{86}Sr$ and elemental analysis of otoliths for LA-ICPMS
- Mentored team of 13 graduate and undergraduates in otolith prep and analysis projects

R&D Senior Technician III

Boston Scientific Inc., Stent R&D Dept.

2005-2008

- Investigated 3D/4D coronary artery variation using cadaver and in-vivo imaging
- 3 US patents issued as primary inventor, 2 US patent applications as supporting inventor

Bio-catalysis and Biomass Technician

Natureworks, LLC, Biocatalyst R&D Lab

2002-2005

- Researched bioreactor catalysis of lactic acid for bio-plastics in engineered yeast strains
- Investigated methods of corn biomass treatment for bio-catalysis of lactic acid

Analytical Chemistry Technician

General Mills, Inc., R&D Lab

2001

- Developed pre-clinical SOP to quantify phytosterol levels in cereal using GC and HPLC

Mississippi River Warm Water Fish Survey

Minnesota Pollution Control Agency

Summer 2000

- Surveyed non-game fish for biological water quality monitoring efforts
- Electrofishing fish sampling and identification, habitat and stream quality assessment

St. Croix River Unionid Mussel Survey

Macalester College, Hornbach Lab

Summer 1999

- Study investigating threatened and endangered freshwater mussel population trends

Mosquito Biological Control Research

Roraima State Secretary of Health, Roraima, Brazil

Fall 1999

- Investigated bio-control efficacy of three bacterial and nematode larvicides in field and laboratory studies as an independent, study-abroad research project

PUBLIC OUTREACH

Crowdfunding outreach effort, "Could teeth and scale chemistry reveal threatened Amazonian mega-fish movements?" - Experiment*.com*
Dec. 2019

- Successful outreach and funding campaign to study migration in Amazonian sawfish and Atlantic tarpon (www.experiment.com/amazonmegafish)
- Secured $5,171 to cover import and analysis of 130+ sawfish rostral tooth samples and Atlantic tarpon scale samples
- Official partner project of Ecologists Without Borders (https://www.ecowb.org/amazon-megafish-migration)

Crowdfunding outreach effort, "Big Fish a Long Way from Home: Using ear bones and teeth to unravel migration in Amazonian fish." - *Experiment.com*
May 2016

- Led successful outreach and funding campaign (www.experiment.com/amazonianfish)
- Reached 214% of funding goal (163 backers, $35 average pledge, raised $5,664)
- Wrote four-part blog series on successful scientific crowdfunding

Editor, PLOS Ecology Community Blog - *Public Library of Science*
August 2015-May 2017

- Editor and blogger for PLOS Ecology Community blog
- Interviews with leading ecologists, coverage of conferences and publications

Salmon Ecology and Biology Advisor - *Virtual Technology Lab, University of Idaho*
2014-2015

- Salmon Sim Project, an immersive, first-person, salmon-simulation video game
- Advised game developers on salmon ecology for video game
- Game promoted active learning and testing of observations in Alaskan K-12 schools

Press Coverage of my Research

"Sawfish Teeth as GPS: Chemical Makeup of Teeth Could Lead to Better Protection for Critically Endangered Fish" About Us, College of Natural Resources, University of Idaho. April 2020

"Finding fish scales: UI alumnus chosen for a Fulbright award to Brazil"
The Argonaut, Moscow, ID. May 1, 2019

"College of Natural Resources Alum Receives Fulbright to Brazil"
University of Idaho News, March 27, 2019

*"**Symphony of the salmon: How scientists are learning by putting fish migration to music**"*
Idaho Statesman, Boise, Idaho. July 9, 2018.

"Researchers give salmon their songs"
Northern Kittitas Country Tribune, Cle Elum, Washington. March 15, 2018.

"Study: Listening to data – sonification – could be best way to track salmon migration"
Columbia Basin Bulletin, Bend Oregon. February 23, 2018.

"Tracking salmon migration through music"
Oregon Public Broadcasting, Portland, Oregon. Feb 21, 2018.

"Em busca do espadarte amazônico: Pequisadores vão reveler mistério do gigante fantasma da Amazônia"
Amazônia Viva, Belém, Brazil. July 11, 2017, ed.71, pp. 44-46.

"Researchers hope to use ear bones, other data to study Amazon catfish"
Lewiston Morning Tribune, Lewiston Idaho. Oct. 7, 2016.

"Catfish research relies on inter-continental partnerships"
Here We Have Idaho. Moscow, Idaho. Fall Issue 2015.

"UI graduate student researches migration of Amazonian catfish"
The Argonaut. Moscow, Idaho. July 21, 2015.

Public Presentations

"'S' Is for Salmon (*and Sawfish*)" – Summer Reading Program presentation
Palouse Branch, Whitman County Library, Palouse, WA. July 5, 2022

"Fish Migration" – Summer Reading Program presentation
Garfield Branch, Whitman County Library, Garfield, WA. June 13, 2022

"Skype a Scientist: What I do as a fish ecologist"
Public School 113 Anthony J Pranzo, Grade 4, Queens, New York. April 6, 2022
Ecolé Belmont, Grades 1&2, Winnipeg, Manitoba. April 27, 2021
Thunder Bay Catholic, Kindergarten, Thunder Bay, Ontario. February 19, 2021
Booth Free School, Grade 5, Roxbury, CT. February 20, 2020

"Goliath Catfish: What the history of Snake River salmon tells us about conservation of the Amazon's largest predators and the longest freshwater migration on earth"
Presentation. Clearwater Flycasters Club, Moscow, ID. November 9, 2016

"What's the deal with salmon?"
Presentation about salmon and other migratory fish to 4th and 5th Grade Classes, Garfield-Palouse Elementary School, Palouse, WA, April 14, 2016

"What I do as a scientist"
Presentation to 9th grade Physical Science class, Garfield-Palouse High School, Palouse, WA. May 12th, 2011

"Migration, ear stones, and isotopes: Reconstructing migration strategies in juvenile salmon"
Presentation to Junior Biology Class, Garfield-Palouse High School. May 18, 2010

"Resolving life history strategies & out-migration timing"
Presentation. Clearwater Flycasters Club, Moscow, ID. November 2009

AWARDS

- **Outstanding Graduate Student**, Dept. of Fish & Wildlife, University of Idaho, 2018
- **Student of the Year**, Water Resources Department, University of Idaho, 2018
- **Outstanding Student Presentation**, Western Division of the American Fisheries Society, Boise, Idaho. April, 2013
- **Alspach-Engerbretson Scholarship**, Clearwater Flycasters. 2009
- **Outstanding Achievement Award**, Boston Scientific R&D Department, April 2006
- **W.R. Angel Scholarship in Biology**, Macalester College. 1999
- **Eagle Scout Rank**, Boy Scouts of America. 1996

PROFESSIONAL SERVICE

Co-organizer – Symposium (With Dr. Sammy Matsaw)

"Advances in Endogenous Records with Connections to Indigenous Knowledge, Lands, and Waterways", American Fisheries Society National Meeting, August 21-25, 2022, Spokane, WA

Organizer – Special Session

"Freshwater Fisheries of the Northwest: Past Practices, Current Issues, and the Future of Fisheries", Annual Meeting of the Northwest Scientific Association, March 26 – 29, 2019, Lewis-Clark State College, Lewiston, ID

TEACHING AND PEDAGOGY

Fish Ecology (FISH 315) - ***University of Idaho***
Instructor of Record
Fall Semester 2020 & co-instructor 2021

- Instructor of record for 3-credit, upper-level lecture
- Present ecological concepts through the lens of current Inland Northwest and Columbia River watershed management and conservation issues
- Perspectives from tribal, agency, and international lecturers from:
    - Nez Perce & Coeur d'Alene Tribes, Columbia Inter-tribal Fish Commission
    - Idaho Fish & Game, NOAA
    - University of Paraíba & University of Pará, Brazil
- Includes significant synthesis of primary literature and writing intensive final project
- Developed curriculum for a flexible, in-person course with significant online/hybrid access following university COVID protocols
- Positive evaluations of course expectations, content, and delivery (2.8-3.2 on 4-point scale)
- Students reported confidence in achieving learning goals (85% very confident, 15% moderately confident) and met department level learning goal metrics.

Fish Ecology Field Techniques and Methods (FISH 314) - *University of Idaho*

Instructor of Record

Fall Semester 2020 & co-instructor 2021

- 2-credit, upper-level field methods lab taught concurrently with FISH 315 lecture
- Intensive backcountry field experience near the Frank Church River of No Return Wilderness, incorporating training in common aquatic techniques:
    - Electrofishing (fish identification, mark-recapture population estimation)
    - Snorkel surveys (fish identification, abundance, competitive behavior)
    - Hook-and-line population sampling (population demographic data collection)
    - Salmon redd surveys (GPS, collection of carcass otoliths and genetics)
    - Large-scale abundance surveys (picket weir, screw trap, PIT tag antenna)
    - Habitat assessment
- Field trip data used as the basis for labs using R software for data analysis throughout the remainder of the semester
- Developed innovative lesson using R software to introduce otolith microchemistry as a tool for understanding the ecology of fish migration and life-history
- Established innovative curriculum to teach all required field techniques entirely on-campus in a flexible, in-person course following COVID protocols during Fall 2020
- Course evaluations combined with Fish 315 (above)

Exploring Natural Resources (NR101) – *University of Idaho*

Co-Instructor

Fall Semester 2020

- 3-week field aquatic lab for three sections of a large introductory class
- Taught exercises in mapping, riparian assessment, benthic invertebrate identification, and electro-fishing population surveys

Preparing Future Faculty Training Series - *University of Idaho*

Participant

September 2018

- Semester-long training seminar taught by University of Idaho Center for Excellence in Teaching and Learning
- Dedicated teaching mentorship and instruction
- Training in diversity and inclusion policies and best-practices
- Course design and teaching strategies

National Science Foundation GK12 Fellowship - *University of Idaho*

Visiting Teacher

May 2010 – June 2011

- Prestigious national teaching fellowship bringing scientists into K-12 classrooms
- Partnered with high school science teacher for 1 year as a visiting teacher
- Intensive training in inquiry-based teaching and curriculum development
- Developed all-new curriculum for field-based Wildlife Management class (grade 11-12)
- Lead teacher and lab curriculum development for Physical Science class (grade 9)

Fish Ecology Field Techniques and Methods (FISH 315) - *University of Idaho*

Teaching Assistant
2008, 2010, 2014

- Over three years designed, taught and refined a multiple day exercise based on Charnov's marginal value theorem of optimal foraging, designed to teach application of theory, experimental design, and scientific writing
- Included long-form scientific analysis/writing assignment as part of 3-part lab lesson-plan
- Assisted in teaching mark-recapture, otolith analysis and scale analysis lessons
- Lectured on the evolution of migration and life-history diversity

Mentoring

As a PhD student and lab manager I have independently mentored a diverse team of student researchers listed below, a group which includes numerous members of underrepresented groups in academia.

(*** indicates student mentee co-author, * indicates student mentee conference presenter*)

Undergraduate Mentees

Drake Van Buskirk – *University of Idaho undergraduate student researcher, 2021-2022*

- Ecology and Conservation Biology thesis student studying high-elevation brook trout
- Prepared otolith samples for major daily growth study (1,500+ samples)

Curtis Youngren – *University of Idaho undergraduate student researcher, 2021-2022*

- Prepared otolith samples for major daily growth study (1,500+ samples)

Conrad Robbins – *University of Idaho undergraduate student researcher, 2021-2022*

- Prepared otolith samples for major daily growth study (1,500+ samples)

Brianna Frazee – *University of Idaho undergraduate student researcher, 2018

- Completed a study of river mussel biogeochemistry, stable isotope chemistry and growth
- Best Student Poster at Idaho Chapter of the American Fisheries Society annual meeting, 2019
- Prior employment at Idaho Department of Fish and Game
- Current graduate student at University of Idaho

****Breanna Graves – *University of Idaho undergraduate student researcher, 2018***

- Co-authored a manuscript showing sawfish rostral teeth can be used to infer life-history
- Presented results at the annual American Fisheries Society national meeting, 2019
- Employed with Idaho Department of Fish and Game

Anna Miera – *University of Idaho undergraduate student researcher, 2013-2016*

- Doris Duke Conservation Scholar 2015-2016
- Expanded and improved large database of juvenile and adult otolith samples
- Currently employed with the United States Forest Service

Katelyn Wilcox – *University of Idaho undergraduate student researcher, 2015-2016*

- Trained in polishing and analysis of otolith samples for isotopic and elemental analysis
- Field collection of water samples for background isotopic comparison
- Peace Corps Volunteer, Nepal, 2017-2018
- Current graduate student in Geology, Fresno State University

Avery King – *University of Idaho undergraduate student researcher, 2015-2016*

- University of Idaho Semester in the Wild student.
- Data analysis and database support of sonification and virtual reality salmon projects

Josie Greenwood – ***University of Idaho undergraduate student researcher, 2015***

- Collected water isotope samples from throughout the Snake River Basin

Brandon Carman – ***University of Idaho undergraduate student researcher, 2014-2015***

- Completed archiving, preparation, and data reduction of 150+ Chinook salmon otoliths
- Currently employed with the Quinault Tribe.

Scott Bumpus – ***High school student worker, Summer 2014-2015***

- Mounted and prepared 100+ Chinook salmon otoliths as high school student
- Trained in the use of SEM and LA-ICP-MS for otolith growth and isotope analysis

Earl Beasley – ***University of Idaho undergraduate student researcher, Summer 2013***

- Created database to store Chinook salmon otolith data and sample tracking
- Student Affairs Council Rep of the Palouse Unit of the American Fisheries Society.

Joshua Stedman – ***Honors Project student in Fish & Wildlife Sciences, 2013***

- Completed a unique independent project analyzing steelhead anadromy above water diversion dams using otolith microchemistry
- Currently employed by Confederated Tribes of the Umatilla

Alifia Merchant –** ***NSF REU Summer Exchange Student from Ohio State University, 2011

- Presented results at Harvard University, National Collegiate Research Conference, 2012
- Completed an independent study of maternal origins and degree of anadromy of juvenile steelhead in Lapwai Creek, ID using otolith microchemistry
- M.S. in Ag. & Env. Chemistry, UC Davis. Currently working as R&D Flavor Chemist

Graduate Mentees

Sierra Stokes – ***Masters of Natural Resources Student, University of Idaho, 2021-2022***

- Mentored in preparation and LA-ICPMS analysis and R analysis of population structure for Croatian bream.

****Carine Moraes –** ***Masters Student, Federal University of Pará, Brazil, 2019***

- Mentored in writing and analysis of masters project, resulting in co-authorship on a publication in *Hydrobiologia* examining giant otter niche partitioning.

****Kat Gillies-Rector –** ***Masters student, University of Idaho, 2016***

- Trained in otolith preparation and microscopy, water sampling, LA-ICP-MS analysis, data storage and statistical analysis for research on salmon life history

Austin Anderson – ***Masters student, University of Idaho, 2016***

- Trained in otolith preparation and microscopy

Jeff Caisman – ***Masters Student, University of Idaho, Fish & Wildlife Sciences***

- Mentored in otolith preparation and analysis of microchemical signatures

Sam Bourret – ***Masters Student, University of Idaho, Fish & Wildlife Sciences 2011-2013***

- Mentored in otolith preparation and analysis of microchemical signatures

Additional Related Training and Skills

- **Strategies for Incorporating Diversity, Equity, Inclusion, and Social Justice into Ecology Curriculum**
  August 6, 2021, Dr. Mallory Rice, Dr. Aramati Cooper, Dr Allison Salisbury, Ecological Society of America

- **Backward Design and Inclusive Pedagogy for Teaching Ecology Courses**
  *August 5, 2021***,** Dr. Nathan Emery, Ecological Society of America
- **RaceTalk: Skills for Cross-Racial Communication**
  *August 4, 2021***,** Dr. Badelia Richards, Ecological Society of America
- **Telling Stories, Sharing Knowledge, and Seeing the Nature of Things: Teaching Scientific Communication in Ecology Courses**
  August 3, 2021, Dr. Bethann Garramon Merkle, Ecological Society of America
- **Cultural Literacy & Equity Symposium**
  October 30-31, 2018, Dr. JuanCarlos Arauz, University of Idaho
- **Backpacking Electrofishing Theory and Techniques Certification**
  April 24-26, 2017, Dr. Jim Reynolds, Idaho Chapter of the American Fisheries Society
- **Languages: English** *(native)***, Portuguese** *(conversant)* **Spanish** *(intermediate/technical)*

Guest Lectures

"Introduction to Sawfish and the EcoWB Amazon Megafish Project"
Advanced Topics in GIS and Remote Sensing, Juniata College, Huntington, PA, Feb 1, 2021

"Financiamento Coletivo – Crowdfunding: Métodos para usar as mídias sociais para financiar a ciência e devulgar sua pesquisa"
Class in Scientific Communication, Department of Biodiversity and Conservation, Federal University of Maranhão, São Luís, Maranhão, Brazil, July 23, 2020 (remote instruction)

"Landscape & Life History: Speciation and life-history diversity in Pacific salmonids"
Fish 314 – Fish Ecology, University of Idaho, Oct. 16, 2018

"Evolution – It's here! It's in your backyard! It's…"
Geology 210 – Earth's History and Evolution, Washington State University, Sept. 21, 2018

"The Business of Coronary Stent Design"
Biol. Eng. 404 - Introduction to BioEngineering, University of Idaho, Sept. 15, 2014.
"Introduction to Coronary Stents and Medical Device Engineering"
Biol. Eng. 404 - Introduction to BioEngineering, University of Idaho, Sept. 15, 2010

"Migration, Ear Stones, and Isotopes: Reconstructing migration strategies in juvenile salmon"
Macalester College Environmental Studies Seminar. St. Paul, MN, April 7, 2010

PRESENTATIONS AND POSTERS

Invited and Keynote

"That Fish is Going Places: ***New stories of migration from chemical tracers in salmon, sawfish, and Amazonian catfish*****"**
Invited Lecture. NOAA - Northwest Fisheries Science Center Weekly Seminar Series. Seattle, WA. Jan 16th, 2019

"Cálcio e Quimica: *Uma visão geral das técnicas microquímicas em estruturas rígidas, com applicação para espadarte e outras espécies amazônicas*"
Invited Lecture. Federal University of Paraná – Department of Biology. Curitiba, Paraná, Brazil. October 26, 2019

"**Financiamento Coletivo – Crowdfunding: *Métodos para usar as mídias sociais para financiar a ciência e devulgar sua pesquisa*"**
Invited Lecture. Federal University of Pará – Nucleo Aquatica e Pesca (NEAP) Lecture Series. Belém, Pará, Brazil. November 21, 2019

"Calcium and Chemistry: *An overview of microchemical techniques in hard parts with application to sawfish and other Amazonian Species*"
Keynote Lecture. International Meeting on Amazonian Sharks and Batoids. São Luis, Maranhão, Brazil, September 11, 2019.

"The Geology of Migrations: How isotopes and ear bones reveal fish ecology and movement."
Invited Lecture. Washington State University Geology Department Lecture Series. Pullman, WA, March 2019.

"The Geology of Migrations: How isotopes and ear bones reveal fish ecology and movement."
Invited Lecture. Washington State University Geology Department Lecture Series. Pullman, WA, March 2019.

"Annual Variability in Fall Chinook Life History: *Using otolith chemistry to uncover movement and timing of outmigration*."
Invited Presentation. Meeting of the NOAA Adaptive Management Implementation Plan – Life Cycle Modelling group (AMIP-LCM), Moscow, Idaho. June 21, 2018.

"Determining natal origin from juvenile otolith chemistry*: Multiple chemical signatures in otoliths allow improvements in discriminating natal river and hatchery of origin for hatchery and wild fish*."
Invited Presentation. Snake River Fall Chinook Salmon Symposium. Inter-Agency review of Fall Chinook research under ESA Section 10, Clarkston, WA, May 16-17, 2017

"The Limits of Prediction: *Applying strontium isoscape predictions to otolith studies across spatial scale and geologic heterogeneity"*
Invited Presentation. Frontiers in Otolith Chemistry: Insights, Advances and Future Directions Symposium. National Meeting of the American Fisheries Society, Portland, OR, August 2015.

"Modeling Movement of Fall Chinook Salmon: *Understanding movement decisions through optimizing fitness*"
Invited Presentation. Frontiers in Otolith Chemistry: Insights, Advances and Future Directions Symposium. National Meeting of the American Fisheries Society, Portland, OR, August 2015. *(Co-author, Presented in place of lead author Brian P. Kennedy)*

"Otolith Microchemistry: *Early Rearing locations and juvenile life history in Snake River Fall Chinook salmon.*"
Invited Presentation. BPA Snake River Fall Chinook Program Review; Lower Snake River Compensation Plan, Clarkston, WA. August 2013.

"Migration, Ear stones, and Isotopes: *Reconstructing migration strategies in juvenile salmon*"
Invited Lecture. Macalester College Environmental Studies Seminar. St. Paul, MN, April 7, 2010

Accepted Presentations and Posters

"Let's Do the Time Warp Again: Dynamic time warping as a tool for temporally structured ecological data"
Poster. Ecological Society of America Annual Meeting. Virtual Meeting. August 5, 2021

"**Dentes, Química, e Migração: *Dentes rostrais de peixe-serra como registros químicos endógenos de movimento e história de vida em espécies criticamente ameaçadas"***
Presentation. International Meeting on Amazonian Sharks and Batoids. São Luis, Maranhão, Brazil, September 10, 2019.

"Assessing the potential of sawfish rostral teeth as records of growth and habitat using micro-structure, trace-elements, and isotopes"
Poster. (co-author, first author *Breanna Graves) National meeting of the American Fisheries Society. Reno, NV, Sept 29- Oct 3, 2019

"Advances in Hard-Part Chemistry In The Context Of Idaho Fish Populations." *Presentation*. Annual Meeting of the Idaho Chapter of the American Fisheries Society, Boise, ID, March 2019.

"Juvenile Fall Chinook Life History: *Using otolith chemistry to assess outmigration*."
Invited Presentation. Fall Chinook Research Meeting, Cooperative agency research team, Lewiston, Idaho. Sept 24, 2018.

"Movement, Migration, and Melody: *An interdisciplinary study of juvenile salmon ecology through otolith chemistry.*"
Presentation. Ph.D. Dissertation Public Defense, University of Idaho, Moscow, ID, Nov. 29, 2017.

"Quantifying individual-based migration strategies to understand selection on juvenile life-history for a salmon population in an altered landscape"
Presentation. Annual meeting of the Western Division of the American Fisheries Society, Missoula, MT, May 22-25, 2017.

"Use of isotope tracers to determine yearly variation in juvenile movement and maternal origin of Snake River fall Chinook salmon."
Presentation. Joint Meeting of the Idaho Chapters of the American Fisheries Society and Wildlife Society, Boise, ID, March 1-3, 2017.

"Ótolitos e Migração: *O que a história do salmão do rio Snake nos diz sobre a conservação dos maiores predadores da Amazônia e a maior migração de água doce na terra*."
Presentation. Laboratory of Fisheries Biology and Management of Aquatic Resources, Federal University of Pará, Belém, Pará, Brazil. February 10, 2017.

"Modeling Migratory Decisions Using Endogenous Chemical Tags"
Poster. Institute for Bioinformatics and Evolutionary Studies. IBEST Science Expo. University of Idaho, Moscow, ID, October 9, 2015.

"Modeling Spatially Explicit Life History Strategies in Chinook Salmon Using Location-Specific Data from Otoliths"
Presentation. Advances in Population Ecology of Stream Salmonids – IV, Girona, Spain, May 2015.

"Modeling Spatially Explicit Life History Strategies in Juvenile Snake River Fall Chinook Salmon"
Presentation. Annual Meeting of the Idaho Chapter of the American Fisheries Society, Boise, ID, March 2015.

"Diverse Life History Strategies in a Migratory Amazonian Catfish: *Implications for Conservation and Management"*
Presentation. Annual meeting of the Western Division of the American Fisheries Society, Mazatlán, Mexico, April 2014.

"Predicting Fish Location Using Otoliths and Bedrock Geology: *Understanding the Effects of Geologic Heterogeneity"*
Poster. Annual meeting of the Western Division of the American Fisheries Society, Mazatlán, Mexico, April 2014.

"Predicting Fish Location Using Otoliths and Bedrock Geology: *Understanding the Effects of Geologic Heterogeneity*"
Poster. Annual meeting of the Western Division of the American Fisheries Society, Boise, ID, April 2013.

"Modeling Spatially Explicit Life History Strategies In Juvenile Fall Chinook Salmon: *Using Multiple Chemical Signatures to Improve Determination of Source Location*"
Presentation. Annual meeting of the Western Division of the American Fisheries Society, Boise, ID, April 2013.

Predicting Fish Location Using Otoliths and Bedrock Geology: *Understanding the Effects of Geologic Heterogeneity*"
Poster. Annual Meeting of the American Geophysical Union. San Francisco, CA, December 2012

"Predicting Fish Location using Otoliths and Bedrock Geology: *Understanding the Effects of Geologic Heterogeneity*"
Presentation. Fish and Wildlife Sciences Departmental Seminar, University of Idaho, Moscow, ID, November 28, 2012

"A Life Cycle Modeling Approach to Life History Evolution in a Spatially Structured Population of Fall Chinook Salmon"
Presentation. Annual Meeting of the Idaho Chapter of the American Fisheries Society, Coeur d'Alene, ID, March 2012

"Using Predictions from Bedrock Lithology to Improve Geochemical Reconstruction of Migratory Movements in Salmon"
Presentation. Annual Meeting of the American Geophysical Union. San Francisco, CA, December, 2011

"Extending Spatial Resolution of Migration Studies with Isotopes and GIS Prediction: *Reconstructing Juvenile Salmon Outmigration at Three Life Stages"*
Presentation. National Meeting of the American Fisheries Society. Seattle, WA, September 5, 2011

"Spatial and Temporal Variation in Juvenile Salmon Life History: *Implications of habitat alteration*"
Presentation. Masters Defense Presentation. University of Idaho, April 28, 2011

"Determining spatially distinct differences in juvenile migration strategies in wild Fall Chinook salmon (*Oncorhynchus tshawytscha*) in the Snake River, Idaho"
Presentation. Annual Meeting of the Idaho Chapter of the American Fisheries Society, Boise, ID, March 2, 2011

"Resolving natal origins and spatial distribution of juvenile migration strategies in wild Fall Chinook salmon (*Oncorhynchus tshawytscha*) using otolith microchemistry and geospatial analysis"
Presentation. Annual Meeting of the Idaho Chapter of the American Fisheries Society, Pocatello, ID, March 9, 2010

"Resolving Life History Strategies and Migration Timing in Juvenile Fall Chinook Salmon"
Presentation. 4th International Otolith Symposium. Monterey, CA, August 2009

"Resolving Life History Strategies & Out-Migration Timing: *Juvenile Fall Chinook Salmon in the Snake River, Idaho*"
Presentation. Annual Meeting of the Idaho Chapter of the American Fisheries Society. Boise, ID, March 2009

"Evaluating the Risks of Mosquito Resistance to Biological Larval Control in Tropical and Temperate Climates"
Presentation. Major Capstone Paper and Presentation. Macalester College, May 2000.

"Laboratory and Field Tests of the Effectiveness of Bacterial and Parasitic Nematode Biolarvacides in Controlling Larvae of Anopheline and Culex Mosquitoes in the State of Roraima, Brazil"
Presentation. Independent Study Project, School for International Training, Belém, Brazil 1999