

Danielle M. Blumstein

Molecular ecology & genomics

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EDUCATION

PhD Student, Molecular and Evolutionary Systems Biology. University of New Hampshire. 2019-Present

M.S., Natural Resources. Wisconsin Cooperative Fishery Research Unit, University of Wisconsin - Stevens Point. 2017-present

GPA: 3.88/4.00

B.S., Zoology. Michigan State University. 2013 – 2017. Concentration: Ecology, Evolution, and Organismal Biology Minor: Environmental Studies and Sustainability

GPA: 3.3931/4.00

PUBLICATIONS

Blumstein, D. M., Campbell, M. A., Hale, M. C., Sutherland, B. J., McKinney, G. J., Stott, W., & Larson, W. A. (2019). Comparative genomic analyses and a novel linkage map for cisco (*Coregonus artedii*) provides insight into chromosomal evolution and rediploidization across salmonids. *bioRxiv*, 834937.

Blumstein DM. (2019). The first haploid linkage map in a coregonid (*Coregonus artedii*) improves knowledge of chromosomal evolution and rediploidization across Salmonids. Master's thesis. University of Wisconsin Stevens Point.

Blumstein DM, Mays D, Scribner KT. (2017). Spatial genetic structure and recruitment dynamics of burbot (*Lota lota*) in Eastern Lake Michigan and Michigan tributaries. *Journal of Great Lakes Research*, 44(1):149-156.

Waraniak JM, **Blumstein DM**, Scribner KT. (2017). Barcoding PCR primers detect larval lake sturgeon (*Acipenser fulvescens*) in diets of piscine predators. *Conservation Genetics Resources*, 10(2):259-268.

RESEARCH EXPERIENCE

2019 – Present Graduate Research Assistant. Department of Molecular, Cellular, and Biomedical Sciences, University of New Hampshire. Advisor: Dr. Matthew MacManes.

“Physiological genomics of desert adaptation in *Peromyscus*”

- Investigate the genomic basis of desert adaptations in desert mice (*Peromyscus*).
- Measure metabolic rates using flow-through respirometry.
- Examine gene expression patterns (RNAseq) in multiple tissues and electrolyte changes.
- Maintain a *Peromyscus eremicus* colony in a desert chamber.
- Extracted DNA and used a SNP based RADseq approach to genotype individuals

RESEARCH EXPERIENCE CONT.

2017-2019 Graduate Research Assistant. *Wisconsin Cooperative Fisheries Unit, University of Wisconsin – Stevens Point.*

“The first haploid linkage map in a coregonid (*Coregonus artedii*) improves knowledge of chromosomal evolution and rediploidization across Salmonids” Advisor: Dr. Wesley Larson.

Constructed a linkage map to facilitate research on the genetic basis of phenotypic diversity in coregonines in the Great Lakes.

- Collected *C. artedii* from known spawning locations in Lake Huron
- Use dry artificial spawning methods paired with UV-irradiation of sperm to produce newly generated haploid families
- Collected morphometric measurements from previously generated diploid families
- Extracted DNA and used a SNP based RADseq approach to genotype individuals
- Constructed a high-density integrated linkage map using haploid and diploid data annotated with QTL mapping
- Aligned the linkage map to various other genomic resources
- Conducted a cross-species comparison of homeologous regions was conducted to identify regions that still exhibit residual tetraploidy, that rediploidized and diverged prior to speciation, and that diverged since diversification

Jan-Apr 2017 International Research Experience. *Victoria University of Wellington, New Zealand.*

Developed an interdisciplinary perspective of interactions between animal health, environmental health, and human health as they apply to culture.

- Completed course work that consisted of extensive field, laboratory, and statistical courses in the studies of ecology, microbiology, molecular biology, genetics, histopathology, and bioinformatics.
- Completed field work that consisted of
- Surveys for critically endangered giant land snail (*Powelliphanta*)
- Soil sample collection
- Biodiversity assays
- Macroinvertebrate community assemblage
- Point counts
- Transect surveys
- Species identification (birds, plants, macroinvertebrates)
- Interacted with the local public and stakeholders, explained our scientific and conservation work

2014-2017 Undergraduate Laboratory Technician. *Department of Fisheries and Wildlife Molecular Ecology Laboratory, Michigan State University.*

Conducted molecular genetics lab work and data analysis on various projects.

- Independent research on the spatial genetic structure and recruitment dynamics of Burbot (*Lota lota*)
- Developed a molecular assay to quantify the predation of larval Lake Sturgeon (*Acipenser fulvescens*) • Genetic assessment of male lake sturgeon (*Acipenser fulvescens*) reproductive success
- Assisted in lab work related to Steelhead and invasive species projects.
- Extracted DNA
- Optimized primers
- PCR
- Gel electrophoresis
- Microsatellite genotyping
- Database management
- Pedigree analysis
- Assignment to population of origin

RESEARCH EXPERIENCE CONT.

May-Aug 2016/ Field Technician. *MSU/MDNR Black River Sturgeon Hatchery and*

May-Aug 2017 *Research Facility, Onaway, Michigan.*

Conducted hatchery and field work for research and conservation aquaculture of lake sturgeon

- Captured adult sturgeon with large dip nets during snorkel surveys
- Extracted gametes from spawning adult sturgeon
- Implanted RFID, PIT, and floy tags
- Artificial fertilization of fish eggs
- Maintained fish health during early life stages (removal of dead individuals, prophylactic treatments)
- Fed larval fishes (brine shrimp cultures, bloodworms)
- General hatchery maintenance (disinfection, pipes and filtration systems)

July-Aug 2016 Aquatic Invasive Species Technician. *Department of Fisheries and Wildlife Molecular Ecology Laboratory, Michigan State University*

Assisted in field sampling and lab work to develop eDNA assays to detect presence of aquatic invasive species

- Traveled to ~50 rivers, inland lakes, and Great Lake sites throughout the Michigan's lower peninsula to collect rusty crayfish (*Orconectes rusticus*), zebra mussels (*Dreissena polymorpha*), and round goby (*Neogobius melanostomus*).
- Collected 30 individuals from each species from locations chosen prior to sampling. Samples were collected using dip nets, snorkeling, beach seining, hand line fishing, and electroshocking.
- Sample cataloging
- DNA extractions and DNA quantification • RADseq.
- Map creation using ArcGIS.

May-Dec 2015 Field Technician. *Michigan State University Department of Plant Biology Schenck Laboratory, Mammoth Cave National Park, Kentucky.*

Field sampling and greenhouse rearing of plants for research on the latitudinal biodiversity gradient

- Independently collected and analyzed field data
- Population location
- Species identification (*Ruellia*, *Cuphea*, *Desmodium*, and *Phytolacca*)
- Pollinator observations, pollinator/herbivore collection, herbivory rate measurements, insect pinning and identification, and caterpillar rearing
- Autogamy treatments, seed collections, leaf and flower marking, floral and leaf trait measurements • Sowing seeds
- Transplanting large populations of plants
- Seed counting
- Leaf drying
- Plant care (watering, fertilization, etc.)

2013-2016 Student Intern. *RISE Bailey Greenhouse and Urban Farm, Michigan State University.*

Work in an urban greenhouse to grow organic produce and crop plan for urban farming research

- Daily greenhouse duties consisted of harvest, bed preparation, watering, soil testing, composting, and maintenance work to produce certified USDA organic vegetables and herbs.
- Participated in Urban Farming Research including "green roof" gardening, vermicomposting, hot composting, urban beekeeping, season extension, and passive solar greenhouse technology.
- Provided informational seminars and tours of Bailey Greenhouse and Urban Farm and Student Organic Farm to public and private groups

PRESENTATIONS

Blumstein DM. (2019). The first haploid linkage map in a coregonid (*Coregonus artedi*) improves knowledge of chromosomal evolution and rediploidization across Salmonids. International Association for Great Lakes Research 62nd Annual Conference on Great Lakes Research. The College at Brockport, State University of New York

Blumstein DM. (2019). The first haploid linkage map in a coregonid (*Coregonus artedi*) improves knowledge of chromosomal evolution and rediploidization across Salmonids. Master's thesis. University of Wisconsin Stevens Point.

Blumstein DM, Stott W, Larson WA (2019) Development of a genetic linkage map for cisco (*Coregonus artedi*) to facilitate integrated studies of adaptive diversity (poster). 47th Annual Meeting of the Wisconsin Chapter of the American Fisheries Society. Green Bay, Wisconsin.

Blumstein DM, Stott W, Larson WA (2019) Development of a genetic linkage map for cisco (*Coregonus artedi*) to facilitate integrated studies of adaptive diversity (poster). 47th Annual Meeting of the Wisconsin Chapter of the American Fisheries Society. Green Bay, Wisconsin.

Blumstein DM, Stott W, Larson WA (2018) Development of a genetic linkage map for cisco (*Coregonus artedi*) to facilitate integrated studies of adaptive diversity. Coastwide Salmonid Genetics Meeting, Mukilteo, Washington.

Blumstein DM, Stott W, Larson WA (2018) Development of a genetic linkage map for cisco (*Coregonus artedi*) to facilitate integrated studies of adaptive diversity. USGS Great Lakes Science Center, Ann Arbor, Michigan. *Invited Seminar.*

Blumstein DM, Stott W, Larson WA (2018) Development of a genetic linkage map for cisco (*Coregonus artedi*) to facilitate integrated studies of adaptive diversity (poster). Midwest Fish and Wildlife Conference. Milwaukee, Wisconsin.

Blumstein DM, Mays D, Scribner KT (2017) Spatial genetic structure and recruitment dynamics of burbot (*Lota lota*) in Eastern Lake Michigan and Michigan tributaries. USGS Great Lakes Science Center, Ann Arbor, Michigan. *Invited Seminar.*

Blumstein DB, Waraniak JM, Scribner KT (2016) Barcoding PCR primers detect larval lake sturgeon (*Acipenser fulvescens*) in diets of piscine predators (poster). University Undergraduate Research and Arts Forum, Michigan State University.

Blumstein DB, Scribner KT (2015) Genetic assessment of the male reproductive success of lake sturgeon (*Acipenser fulvescens*) as a function of duration of river occupancy during the spawning season (poster). University Undergraduate Research and Arts Forum, Michigan State University.

AWARDS

2020 Molecular, Cellular, and Biomedical Sciences Department Graduate Student Travel Grant, University of New Hampshire

2020 Graduate Student Travel Grant, University of New Hampshire

2019 Graduate Student Travel Grant, University of New Hampshire

2018 Muskie Clubs Alliance of Wisconsin Inc. Scholarship, University of Wisconsin – Stevens Point.

2018 OSCAR Travel Grant, University of Wisconsin – Stevens Point.

AWARDS CONT.

2017 Undergraduate Long-Term Study Abroad Program Scholarship, College of Natural Science, Michigan State University.

2016 Undergraduate Research Support Program Scholarship, College of Natural Science, Michigan State University.

2015 The Rajendra Essay Award, Department of Fisheries and Wildlife, Michigan State University.

2014 RISE Emerging Leaders Scholarship, College of Natural Resources, Michigan State University.

2014 Donald F. Koch and Barbara J. Sawyer-Koch Environmental Studies Scholarship, College of Natural Resources, Michigan State University.

WORKSHOPS AND SPECIAL COURSES

2018 NFS-funded expert workshop for the development of a global experiment to understand Coregonid adaptive response to changing thermal regimes. Thonon – les – Bains, France.

2017 RAD Sequencing Workshop. Molecular Conservation Genetics Laboratory, University of Wisconsin – Stevens Point.

2016 Microsatellite Genotyping Workshop. Molecular Ecology Laboratory, Michigan State University.

2015 Ecology and Plant Systematics Field Courses. Kellogg Biological Station, Michigan. 2014. MDNR Fish Sampling Techniques Course. Gaylord, Michigan.

PROFESSIONAL SERVICE

Ad hoc reviewer: Transactions of the American Fisheries Society

2019 Skype a Scientist (middle school). Three classes: Actual Living Scientist.

2019 Presenter, Science Sleuths (Preschool). Two class periods: What are fish? University of New Hampshire

2019 Judge Jim and Katie Krause College of Natural Resources Student Research Symposium, University of Wisconsin – Stevens Point.

2019 Presenter, STEAM Point Day for Girls (16 middle school students per class). Two class periods: Evolution Board Game. University of Wisconsin – Stevens Point

2018 Guest lecture, Principles of Genetics (Biology 210), University of Wisconsin – Stevens Point

2018 Judge Jim and Katie Krause College of Natural Resources Student Research Symposium, University of Wisconsin – Stevens Point.

2018 Presenter, STEAM Point Day for Boys (16 middle school students per class). Two class periods: Evolution Board Game. University of Wisconsin – Stevens Point

2018 Presenter, STEM Exploration Day at Treehaven (16 middle school students per class). Three class periods: Evolution Board Game. University of Wisconsin – Stevens Point

SKILLS

Genetics Lab Work:

- 96 well Qiagen/Promega DNA extraction (tissue)
- Qiagen single tube DNA extraction (tissue, diet samples, eDNA, insects)
- Agarose and polyacrylamide gel electrophoresis
- qPCR
- PCR optimization & clean up
- Microsatellite genotyping
- DNA quantification (nanodrop and PicoGreen)
- Plate prep for ABI 3730
- RAD library preparation and data management TOPO cloning with Blue-White Selection

Computer Skills:

- Programs: STACKS, Rqtl, ArcMap, LepMap
- R statistical software
- High performance computing with slurm scheduling
- Microsoft Office (Word, Excel, Powerpoint)
- Image J
- Colony Parentage Analysis Program
- Adobe Photoshop
- Coding languages: Java, Python

Fisheries Field Work:

- Morphometric measurements
- Barge and backpack electrofishing
- Kick net, seine net, drift net, fyke net, trap net, and gill net sampling
- Implantation of RFID, PIT, and floy tags
- Tissue sample collection for genetic analyses
- Fish care and fish feeding, fish disease prevention, identification, and treatment

Other Skills:

- Extensive backcountry camping experience
- Snorkeling
- Graphic design
- Knot tying
- Driving 4WD vehicles, including manual transmission

COURSEWORK

Graduate (University of New Hampshire)

GEN 812: Programming for Bioinformatics
MCBS 913: Applied Bioinformatics
NR 995: Landscape Genetics

Graduate (University of Wisconsin – Stevens Point)

CNMT 110: Object-Oriented Programming
DS 700: Data Science
GEOG 641: GIS Programming and Customization
NRES 605: R Programming
NRES 775: Topics in Conservation Genetics
NRES 796: Conservation Biology and Modeling
NRES 797: Research Methods Design & Analysis
WATR 584: Life History of Fishes
WLDL 742: Ecological Data Analysis

Undergraduate (Michigan State University)

FW 101/101L: Fundamentals of Fish and Wildlife
FW 419: Application of GIS in Natural Resources
IBIO 341: Fundamental Genetics
IBIO 445: Evolution
IBIO 492: Interdisciplinary Study Conservation Medicine
IBIO 492L: Advance Research Applied Conservation Medicine
IBIO 493: International Communication Conservation Medicine
MC 391: Selected Topics in Public Affairs Environmental Policy
NSC 192: Environmental Issues Seminar
NSC 292: Application of Environmental Studies
PLB 418: Plant Systematics
ZOL 355/355L: Ecology
ZOL 489: Seminar in Zoo and Aquarium Science

PROFESSIONAL MEMBERSHIPS

American Society of Mammologists

Society for the Study of Evolution

MENTORING AND ADVISING

2016 Undergraduate Advisor. Michigan State University.

2016 Undergraduate Tutor (math, biology, genetics, writing). Michigan State University.

2014-2017 Residential community recruitment and selection committee. Michigan State University.

2014-2017 Residential community student mentor. Michigan State University.

REFERENCES

Dr. Matthew MacManes

matthew.macmanes@unh.edu

Professor, University of New Hampshire

Dr. Wesley Larson

wes.larson@uwsp.edu

Professor, University of Wisconsin- Stevens Point

Dr. Wendylee Stott

wstott@usgs.gov

Research Fisheries Biologist, USGS Great Lakes Science Center

Dr. Garrett McKinney

garrett.mckinney@noaa.gov

NOAA, National Marine Fisheries Service