

Matthew A. Lemay

Research Scientist
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EDUCATION

PhD, Department of Biology, University of British Columbia, Okanagan Campus (2010-2014)

Thesis title: Ecological genomics of kokanee salmon

MSc, Department of Integrative Biology, University of Guelph (2005-2007)

Thesis title: Reduced genetic diversity and high variance in reproductive success in captive-bred pinto abalone, *Haliotis kamtschatkana*

BSc, Department of Biology, University of Victoria (1998-2002)

RESEARCH APPOINTMENTS

- 2017 - present **Research Scientist**, Hakai Institute, Victoria, British Columbia
- 2019 - 2022 **Adjunct Assistant Professor**, Faculty of Environment, University of Waterloo, Ontario
- 2014 - 2017 **Postdoctoral Fellow**, Biodiversity Research Centre, University of British Columbia, Vancouver, British Columbia
- 2008 - 2010 **Research Assistant**, Natural Resources Canada, Fredericton, New Brunswick
- 2008 **Research Assistant**, Agriculture and Agri-Food Canada, Fredericton, New Brunswick

PUBLICATIONS

29. Reidy RD, Gauthier S, Doniol-Valcroze T, **Lemay MA**, Clemente-Carvalho RBG, Cowen LLE, Juanes F (2023) Humpback whale (*Megaptera novaeangliae*) feeding on walleye pollock (*Gadus chalcogrammus*) aggregations in Juan de Fuca Strait, Canada. **PLoS One**, 18 (3): e0282651.
28. Reidy RD, **Lemay MA**, Innes KG, Clemente-Carvalho RBG, Janusson C, Dower JF, Cowen LLE, Juanes F (2022) Fine-scale diversity of prey detected in humpback whale feces. **Ecology and Evolution**, 12 (12): e9680.
27. Xue JY, Hind KR, **Lemay MA**, Mcminigal A, Jourdain E, Chan CX, Martone PT (2022) Transcriptome of the coralline alga *Calliarthron tuberculosum* (Corallinales, Rhodophyta) reveals convergent evolution of a partial lignin biosynthesis pathway. **PLoS One**, 17 (7): e0266892.
26. Hirai J, Chen F, Itoh H, Tadokoro K, **Lemay MA**, Hunt BPV, Tsuda A (2022) Molecular and morphological analyses to improve taxonomic classification of the *Metridia lucens/pacifica* species complex in the North Pacific. **Journal of Plankton Research**, 44: 454-463.

25. Foster EU, Watson JC, **Lemay MA**, Tinker MT, Estes JA, Piercey RS, Henson L, Ritland C, Miscampbell A, Nichol LM, Hessing-Lewis M, Salomon, AK, Darimont CT (2021) Physical disturbance by recovering sea otter populations increases eelgrass genetic diversity. **Science**, 374: 333-336.
24. Lindstrom SC, **Lemay MA**, Starko S, Hind KR, Martone PT (2021) New and interesting seaweed records from the Hakai area of the central coast of British Columbia, Canada: Chlorophyta. **Botanica Marina**, 64: 343-361.
23. **Lemay MA**, Davis KM, Martone PT, Parfrey LW. (2021) Kelp-associated microbiota are structured by host anatomy. **Journal of Phycology**, 57: 1119-1130.
22. **Lemay MA**, Chen MY, Mazel F, Hind KR, Starko S, Keeling PJ, Martone PT, Parfrey, LW (2021) Host morphology affects the diversity of marine microbiomes. **The ISME Journal**, 15: 1372-1386.
21. Sanders RS, Segovia BT, Forbes C, Hessing-Lewis M, Morien E, **Lemay MA**, O'Connor MI, Parfrey LW (2020) Host-specificity and core taxa of seagrass leaf microbiome identified across tissue age and geographical regions. **Frontiers in Ecology and Evolution**, 8: 605304.
20. Whalen MA, Millard-Martin BR, Cox KD, **Lemay MA**, Paulay G (2020) Poleward range expansion of invasive parasite, *Orthione griffenis*, confirmed by establishment in Central British Columbia, Canada. **BioInvasion Records**, 9: 538-548.
19. Mann AE, Mazel F, **Lemay MA**, *et al.* (2020) Biodiversity of protists and nematodes in the wild non-human primate gut. **The ISME Journal**, 14: 609-622.
18. Hind KR, Starko S, Salomon AK, Burt JM, **Lemay MA**, Martone PT (2019) Trophic control of cryptic coralline algal diversity. **Proceedings of the National Academy of Sciences**, 116 (30): 15080-15085.
17. **Lemay MA**, Martone PT, Hind KR, Lindstrom SC, Parfrey LW (2018) Alternate life-history phases of a common seaweed have distinct microbial surface communities. **Molecular Ecology**, 27: 3555-3568.
16. **Lemay MA**, Martone PT, Keeling PJ, Burt JM, Krumhansl KA, Sanders RD, Parfrey LW (2018) Sympatric kelp species share a large portion of their surface bacterial communities. **Environmental Microbiology** 20: 658-670.
15. Lin JD, **Lemay MA**, Parfrey LW (2018) Diverse bacteria utilize alginate within the microbiome of the giant kelp *Macrocystis pyrifera*. **Frontiers in Microbiology** 9: 1914.
14. **Lemay MA**, Russello MA (2015) Genetic evidence for ecological divergence in kokanee salmon. **Molecular Ecology** 24: 798-811.
13. **Lemay MA**, Russello MA (2014) Latitudinal cline in allele length provides evidence for selection in a circadian rhythm gene. **Biological Journal of the Linnean Society** 111: 869-877.
12. **Lemay MA**, Russello MA (2014) Diversity and relative abundance of the bacterial pathogen, *Flavobacterium sp.* infecting kokanee salmon. **BMC Research Notes** 7: 778.

11. **Lemay MA**, Henry P, Lamb CT, Robson KM, Russello MA (2013) Novel genomic resources for a climate change sensitive mammal: Characterization of the American pika transcriptome. **BMC Genomics** 14: 311.
10. **Lemay MA**, Donnelly DJ, Russello MA (2013) Transcriptome-wide comparison of sequence variation in divergent ecotypes of kokanee salmon. **BMC Genomics** 14: 308.
9. **Lemay MA**, Russello MA (2012) Neutral loci reveal population structure by geography, not ecotype, in Kootenay Lake kokanee. **North American Journal of Fisheries Management** 32: 282-291.
8. Read KD, **Lemay MA**, Acheson S, Boulding EG (2012) Using molecular pedigree reconstruction to evaluate the long-term survival of outplanted hatchery-raised larval and juvenile Northern abalone (*Haliotis kamtschatkana*). **Conservation Genetics** 13: 801-810.
7. Silk PJ, Ryall K, Mayo P, **Lemay MA**, Grant G, Crook D, Cossé A, Fraser I, Sweeney JD, Lyons DB, Pitt D, Scarr T, MaGee D (2011) Evidence for a volatile sex pheromone in *Agilus planipennis* Fairmaire (Coleoptera: Buprestidae) that synergizes attraction to a host foliar volatile. **Environmental Entomology** 40: 904-916.
6. Silk PJ, **Lemay MA**, LeClair G, Sweeney J, MaGee D (2010) Behavioral and electrophysiological responses of *Tetropium fuscum* (Coleoptera: Cerambycidae) to pheromone and spruce volatiles. **Environmental Entomology** 39: 1997-2005.
5. Sweeney J, Silk PJ, Gutowski J, Wu J, **Lemay MA**, Mayo P, MaGee D (2010) Effect of chirality, release rate, and host volatiles on response of *Tetropium fuscum* (F.), *Tetropium cinnamopterum* Kirby, and *Tetropium castaneum* (L.) to the aggregation pheromone, fuscumol. **Journal of Chemical Ecology** 36: 1309-1321.
4. Ryall K, Silk PJ, Wu J, Mayo P, **Lemay MA**, MaGee D (2010) Sex pheromone chemistry of the elm spanworm *Ennomos subsignaria* (Hübner) (Lepidoptera: Geometridae). **Naturwissenschaften** 97: 717-724.
3. **Lemay MA**, Silk PJ, Sweeney J (2010) Calling behaviour of *Tetropium fuscum* (Coleoptera: Cerambycidae: Spondylidinae). **The Canadian Entomologist** 142: 256-260.
2. **Lemay MA**, Boulding EG (2009) Microsatellite pedigree analysis reveals high variance in reproductive success and reduced genetic diversity in captive-bred northern abalone. **Aquaculture** 295: 22-29.
1. Zahradnik TD, **Lemay MA**, Boulding EG (2008) Choosy males in a Littorinid gastropod: Male *Littorina subrotundata* compete for large and virgin females. **Journal of Molluscan Studies** 74: 245-251.

MANUSCRIPTS IN REVIEW

Meagher Robinson K, Prentice C, Clemente-Carvalho R, Hall K, Monteith ZL, Morien E, Olson AM, Pontier O, Hessing-Lewis M, Kellogg CTE, **Lemay MA**. Paired environmental DNA and dive surveys provide distinct but complimentary snapshots of marine biodiversity in a coastal inlet. Submitted to *Environmental DNA*, January 2023.

Benoit NP, Meagher Robinson K, Kellogg CTE, **Lemay MA**, Hunt BPV. Using qPCR of environmental DNA (eDNA) to estimate the biomass of juvenile Pacific salmon (*Oncorhynchus* spp.). Submitted to *Environmental DNA*, December 2022.

Davis KM, Mazel F, **Lemay MA**, Piercey RS, Martone PT, Parfrey, LW. Drivers of temporal and inter-individual variation in the macroalgal microbiome. Submitted to *Microbiome*, January 2022.

RESEARCH FUNDING

- 2022 *Putting fjord biodiversity on the map for British Columbia conservation planning*
Fisheries and Oceans Canada – Ecosystems and Oceans Science Contribution Framework, \$298,425
I am a co-lead on this grant with Dr. Brian Hunt (UBC) and Dr. Colleen Kellogg (Hakai)
- 2020 *Optimizing the eDNA approach to monitor biodiversity in Canada's Marine Protected Areas.*
Genome Canada: Genomic Applications Partnership Program, \$242,100
Principal investigator: Dr. Jennifer Sunday (McGill University)
My official role on this grant is Project Collaborator, and I will oversee all the genomic work described in this grant.
- 2016 *Microbial ecology of seaweed (renewal)*
Tula Foundation Research Grant, \$55,000
Principal investigator: Dr. Laura Parfrey (University of British Columbia)
My role on this grant was co-lead and postdoctoral fellow.
- 2015 *Microbial ecology of seaweed*
Tula Foundation Research Grant, \$50,000
Principal investigator: Dr. Laura Parfrey (University of British Columbia)
My role on this grant was co-lead and postdoctoral fellow.

UNITED NATIONS: DECADE OF OCEAN SCIENCE FOR SUSTAINABLE DEVELOPMENT

The following research projects have been endorsed as UN Decade actions:

[1] *Pacific eDNA Coastal Observatory (PECO)*

I am a co-lead with Dr. Jennifer Sunday (McGill) and Dr. Margot Hessing-Lewis (Hakai)

[2] *Hakai Institute Biological Observing Network (HI-BON)*

I am a co-lead with Dr. Colleen Kellogg (Hakai)

TECHNICAL REPORTS

- 2023 Performance criteria for the analysis of environmental DNA by targeted quantitative polymerase chain reaction. National Standard of Canada, *in review*.

PEER REVIEWING

[1] I have reviewed manuscripts for:

Aquatic Microbial Ecology, Biochemical Systematics and Ecology, BMC Evolutionary Biology, Canadian Journal of Fisheries and Aquatic Science, Ecology, Environmental Microbiology, Heredity, Journal of Molluscan Studies, Microbiology Open, Molecular Ecology, Molecular Ecology Resources, Molecular Genetics and Genomics, PLoS One, Transactions of the American Fisheries Society

[2] I have reviewed grants for:

The National Science Foundation (NSF)

MENTORING AND SUPERVISION

[1] POSTDOCTORAL FELLOWS (co-advised)

2022-present Andreas Novotny (UBC)

2022-present Loic Jacquemot (UBC)

[2] GRADUATE STUDENT COMMITTEE MEMBER

2021-present Lauran Liggan, PhD student (University of Wisconsin)

2019-present Sara Wickham, PhD student (University of Waterloo)

[3] LAB AND FIELD TECHNICIANS

2022 Brittany Cummings, NSF-funded intern (Florida State University)

2021-present Rosie Savage, lab technician (Hakai Institute)

2020-present Kristin Meagher, lab technician (Hakai Institute)

2020-present Rute Clemente-Carvalho, lab manager (Hakai Institute)

2019-present Sue Valasquez, lab technician (Hakai Institute)

2019-present Evan Morien, bioinformatics specialist (Hakai Institute)

2019-2022 Deidra Ferguson, lab manager (Hakai Institute)

2019-present Carly Janusson, lab technician (Hakai Institute)

2018-present Kyle Hall, field technician (Hakai Institute)

2017-present Gillian Sadlier-Brown, lab technician (Hakai Institute)

2019 Neha Acharya-Patel, lab technician (Hakai Institute)

2018 Sara Wickham, lab technician (Hakai Institute)

2016 Cassandra Jensen, lab technician (UBC)

[4] HONORS, DIRECTED STUDIES STUDENTS

2015-2016 Cole Larson, B.Sc. directed studies project (UBC)

2015-2016 Jordan Lin, B.Sc. honors research project (UBC)

2015 Bobby Chan, B.Sc. directed studies project (UBC)

2014-2015 Karina Grigore, B.Sc. directed studies project (UBC)

2013-2014 Tal Shalev, B.Sc. honors research project (UBC)

2012 Tal Shalev, B.Sc. directed studies (UBC)

2011-2012 David Donnelly, B.Sc. honors research project (UBC)

2011 David Donnelly, B.Sc. directed studies (UBC)

TEACHING

[1] COURSE INSTRUCTOR

2009 **Genetics** (Biol 2053), University of New Brunswick, Fredericton NB

[2] TEACHING ASSISTANT

- 2011 **Biology for Science Majors II** (Biol 116), UBC Okanagan
- 2010 **Biology for Science Majors I** (Biol 125), UBC Okanagan
- 2006 **Humans in the Natural World** (Biol 1500), University of Guelph
- 2005 **Marine Biology and Oceanography**, Field Course (ZOO 4300), University of Guelph and Huntsman Marine Station

[3] GUEST LECTURES

- 2021 **Biology of Algae** (Biol 336), University of Victoria
- 2016 **Survey of the Algae** (Biol 321), UBC Vancouver
- 2012 **Evolutionary Principles and Methods** (Biol 301), UBC Okanagan

[4] PUBLIC EDUCATION & OUTREACH

- 2013 **Outreach activity coordinator**, Canadian Society for Ecology and Evolution, Annual meeting, Kelowna BC
- 2007 **Science Outreach Instructor**, University of Guelph
- 2003-2004 **Marine Science Educator**, Bamfield Marine Sciences Centre, Bamfield, BC

SERVICE

- 2023-present **Member**, Steering Committee for the Biodiversity Action Network
- 2022-present **Member**, Canadian Standards Association working group on eDNA assay design
- 2021-present **Member**, End-user advisory board, iTrack-DNA
- 2019-present **Member**, Hakai Institute Joint Health and Safety Committee
- 2012-2013 **Chair**, Biology Graduate Student Society, UBC Okanagan
- 2012-2013 **Coordinator**, Species at Risk and Habitat Studies seminar series, Kelowna BC
- 2012-2013 **Organizing committee member**, Canadian Society for Ecology and Evolution annual meeting, Kelowna BC
- 2011-2012 **Executive member**, Biology Graduate Student Society, UBC Okanagan
- 2011-2012 **Student representative**, Department of Biology faculty meetings, UBC Okanagan

AWARDS AND SCHOLARSHIPS

- 2014 Graduate Student Researcher of the Year, UBC Okanagan campus (\$1500)
- 2014 University Graduate Fellowship, UBC Okanagan campus (\$6000)
- 2013 Graduate Student Award, UBC Okanagan campus (\$1500)
- 2013 University Graduate Fellowship, UBC Okanagan campus (\$6000)
- 2012 University Graduate Fellowship, UBC Okanagan campus (\$3000)
- 2012 Graduate Student Travel Grant, UBC Okanagan campus (\$1000)
- 2012 NSERC Travel Grant (\$875)
- 2011 NSERC Post Graduate Scholarship (PGS-D3; \$63000 over three years)
- 2011 University Graduate Fellowship, UBC Okanagan campus (\$1000)
- 2010 Tuition Award, UBC Okanagan campus (covered graduate school tuition for four years)
- 2010 Entrance Scholarship, UBC Okanagan campus (\$7000)
- 2007 Graduate Student Scholarship, University of Guelph (\$2000)
- 2006 Graduate Student Scholarship, University of Guelph (\$2000)
- 2005 Best poster, 5th Annual AquaNet Conference, Victoria BC (\$500)

INVITED TALKS

- 2022 *Monitoring coastal marine biodiversity using environmental DNA*. BC Fish Habitat Modeling Team Meeting
- 2021 *A census of coastal biodiversity through DNA barcodes*. Marine Biodiversity Observation Network (MBON) eDNA working group
- 2021 *Biodiversity research at the Hakai Institute*. McGill University, Biology Department, Non-Academic Career Panel
- 2013 *Ecological genomics of kokanee salmon*. Species at Risk and Habitat Studies seminar series, Kelowna, British Columbia.

SELECT PRESENTATIONS

- 2023 *Long-term biodiversity monitoring using citizen science and eDNA*. Canadian Meteorological and Oceanographic Society (CMOS) 57th Congress. Saint John, Newfoundland.
- 2023 *Paired environmental DNA and dive surveys provide distinct but complementary snapshots of marine biodiversity in a coastal fjord*. Pathway to Increase Standards and Competency in eDNA Surveys (PISCeS) meeting, Guelph Ontario.
- 2021 *Long-term biodiversity monitoring using citizen science and eDNA*. Canadian Society for Ecology and Evolution, virtual meeting.
- 2021 *Kelp-associated microbiota are structured by host anatomy*. Phycological Society of America, virtual meeting.
- 2020 *Coastal marine biodiversity is underrepresented in genetic databases*. Canadian Society for Ecology and Evolution, Edmonton, Alberta. [canceled due to COVID 19]
- 2019 *A census of coastal biodiversity through DNA barcodes*. PICES Annual Meeting, Victoria British Columbia.
- 2019 *Subtidal biodiversity on the central coast of British Columbia*. PICES Annual Meeting, Victoria British Columbia. (poster)
- 2017 *Microbial ecology of seaweed*. Canadian Society for Ecology and Evolution, Victoria, British Columbia.
- 2016 *Microbial ecology of kelp forests*. EVO-WIBO, Port Townsend, WA. (Poster)
- 2014 *How DNA can inform biodiversity conservation: Case studies in the Okanagan*. Okanagan Water and Biodiversity Forum, Kelowna, British Columbia.
- 2014 *Ecological genomics of kokanee salmon*. 2nd International Conference on Integrative Salmonid Biology, Vancouver, BC. (Poster)
- 2013 *Latitudinal cline in variation associated with circadian rhythm in kokanee salmon*. Species at Risk and Habitat Studies seminar series, Kelowna, British Columbia.
- 2013 *Transcriptome-wide comparison of sequence variation in ecotypes of kokanee salmon*. Canadian Society for Ecology and Evolution, Kelowna, British Columbia.
- 2012 *Detecting signatures of selection in divergent ecotypes of kokanee and sockeye salmon*. 1st Joint Congress on Evolutionary Biology, Ottawa, Ontario.
- 2011 *Population genomics of kokanee salmon*. Canadian Society for Ecology and Evolution, Banff, Alberta. (Poster)
- 2011 *Genome-wide signatures of selection in divergent populations of kokanee salmon*. Species at Risk and Habitat Studies seminar series, Kelowna, British Columbia.
- 2007 *Reduced genetic diversity in captive-bred strains of the threatened pinto abalone*. Canadian Society for Ecology and Evolution, Toronto, Ontario. (Poster)
- 2006 *Development of a selective breeding program for pinto abalone, *Haliotis kamtschatkana**. 6th International Abalone Symposium, Puerto Varas, Chile.
- 2005 *Microsatellite markers elucidate pedigree in a hatchery population of pinto abalone*. 5th annual Aqua Net Conference, Victoria, British Columbia. (Poster)