



**21st Biennial Conference on the Biology of Marine Mammals:
Bridging the Past Toward the Future**

10th Student Affairs Workshop

Wednesday, December 16, 2015

6 - 8 pm

Hilton Continental Ballroom

San Francisco, USA

Organisation: Student Affairs Committee

Carolina Loch (SMM SMaL)

Sarah Kienle (SMM SMaL)

Caroline Casey

Cara Gallagher

Keith Hernandez

Nistara Randhawa

Sarah McKay Strobel



EVENT SCHEDULE

- | | |
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| I. Sign in, socialize and forage | 6-6:30pm |
| II. Welcome and Introduction | 6:30-6:35pm |
| Carolina Loch and Sarah Kienle - SMM Student Members at Large | |
| III. Student chapter presentations | 6:35-7pm |
| IV. Group discussions | 7-7:50pm |
| Choice of 5 X 10min roundtable sessions | |
| V. Raffle off prizes | 7:50-8pm |

GROUP DISCUSSION PARTICIPANTS

Anatomy and Physiology

Jeremy Goldbogenm , Ph.D.

Jeremy Goldbogenm is a comparative physiologist who studies the biomechanics, functional morphology, and energetics of locomotion and feeding. Current research integrates data from multi-sensor tags, remote sensing, and advanced bio-imaging to understand the mechanisms of foraging and predator-prey interactions. Recommendations for graduate work and beyond in marine mammals: 1) Be driven by questions that focus on testing specific hypotheses, mechanisms, and processes; 2) learn a programming language; 3) major in one of the following disciplines: math, physics, engineering, statistics; 4) learn to work as a team and learn from people that come from different backgrounds.

D. Ann Pabst , Ph.D.

I am a Professor of Biology and Marine Biology at the University of North Carolina Wilmington. Our lab investigates how the mammalian body is functionally adapted to the marine environment. My students, colleagues and I have focused much of our work on musculoskeletal design and thermoregulatory function in cetaceans (whales, dolphins and porpoises). I can only advise that students follow their genuine interest in the discipline. While on that path, get as much quantitative and computational training as you can. Think integratively, work collaboratively, and search constantly for how your questions fit into a broader context. And regularly ask yourself where you want to be in five years – it will help ensure that you get there.

Behavior and Ecology

Ari Friedlaender, Ph.D.

Ari Friedlaender is an Associate Professor at Oregon State University's Marine Mammal Institute. Ari's research focuses on the foraging ecology and behavior of marine predators. Ari and his lab use and develop a variety of telemetry tools to quantify the underwater behaviors of animals to test ecological principles across a range of spatial and temporal scales. Ari studies a number of baleen whale species around the world and is particularly interested in understanding how their foraging behavior and predator-prey dynamics are affected by human effects (e.g. climate change, navy sonar). Ari has long-term research programs in Cape Cod, California, Alaska, and Antarctica. Ari advises graduate students (Master's and PhD) and post-doctoral researchers and is drawn to students with interests in a broad range of disciplines including behavior, ecology, biomechanics, and physiology. Ari is drawn to students with research questions that test hypotheses regarding how marine animals are adapted for their environment and the means in which they are successful predators, and have/can learn the quantitative skills to answer these. Ari believes in creating a working and learning environment that fosters collaboration between and among students and therefore seeks graduate students with diverse backgrounds in science and mathematics. As advice for perspective graduate students, Ari suggests not only finding an advisor who's interests are compatible with yours, but also who's students are doing interesting and cutting-edge work.

Conservation, Climate Change, and Human Dimensions

Helene Marsh, Ph.D.

Helene Marsh is a professor and graduate dean at James Cook University in Australia where she has supervised 55 PhDs and 20 Masters students to successful completion with a few more on the way. Helene is a conservation biologist with some 30 years' experience in research into species conservation, management and policy with particular reference to dugongs and coastal dolphins. The policy outcomes of her research include significant contributions to the science base of dugong conservation in Australia and internationally. Helene is committed to informing interdisciplinary solutions to conservation problems and has collaborated widely with colleagues in other disciplines. Helene has received national and international awards for her research and conservation. She is a past president of the Society of Marine Mammalogy and Co-chair of the IUCN Sirenia Specialist Group. She is on the editorial boards of *Conservation Biology*, *Endangered Species Research* and *Oecologia*.

Helene's biggest piece of advice is to choose a research topic that really interests you and a major professor who really cares about graduate students and who will mentor you. Graduate school is a huge investment and you really need to love what you, value your time, plan carefully and treat it like a job. Most of today's grad students will not have academic careers, so it is important to use your time in graduate school to develop the generic and interpersonal skills that employers outside academia hire on. These skills include empathy, resilience and drive, capacity to work in a cross-disciplinary team and oral and written communication skills. Having a mentor who works in a non-university job that interests you is a good idea as is doing internships in a range of careers. If you want to be a professor, publishing your work must be a high priority.

Michael Moore, Ph.D.

Michael Moore is a veterinarian (trained at U. of Cambridge, U.K.) and a Senior Research Specialist at the Biology Department of the Woods Hole Oceanographic Institution (WHOI), in Woods Hole, Mass, USA. His PhD thesis within the Massachusetts Institute of Technology/WHOI Joint Program in Biological Oceanography focused on sewage derived contaminant induced neoplasia in bottom fish. Since then his rather peripatetic 'focus' has been on the broad interface between human activities and marine mammals. Toxicology, vessel strike trauma, peracute and chronic fishing gear entanglement, acoustic stress and resultant impacts on gas management during diving, body condition, tracking and behavioral tags, and their related drag and tissue impacts, and other factors that affect overall health, as seen through the lens of stranding response (as a veterinarian with the International Fund for Animal Welfare). Aerial photogrammetry and blow sampling of live animals. Most recently he has worked with colleagues to use small remote multicopters for these latter perspectives. For undergraduates considering graduate school he urges them to do their homework about potential advisors. Ask them not what they are doing or what they can do for you. That is all readily available on line. Approach with a plan as to what your presence in their group would mean to you and them. Look at possible fellowships and scholarships that might be available to you. For graduate students looking for the next step, consider what that next focus might be, who you would pursue that with, and where, and discuss potential funding options to achieve same. Never feel trapped by what you are doing now, in terms of what you might do next. But above all, publish as you proceed to the extent that your program allows. Don't see the thesis as an end in itself. Post Doc

positions are far more attainable with a growing list of publications. Consider potential other avenues and careers at each step. Most important of all is believe in yourself, have confidence in your worth, and build trust in your judgement by diligent, thorough work.

Distribution, Abundance, and Population Biology

Dr Rochelle Constantine, Ph.D.

Dr Rochelle Constantine is the Director of the Joint Graduate School in Coastal and Marine Science and the University of Auckland, New Zealand. She takes a collaborative, multi-disciplinary approach to her research as cetaceans are tricky things to study and she finds working with others is the best way to get answers to conservation questions. She runs a number of research projects on whales anywhere between the Antarctic and the South Pacific Islands through to coastal dolphins and whales in New Zealand waters with an emphasis on conservation biology. She advises all students to think about what scientific questions inspire them and where they see themselves once they have finished graduate school. Knowing this will help immensely when choosing what to study and where. Also develop do your homework on where you go to study, form networks, make sure you learn transferable skills and think outside your comfort zone. Most importantly, enjoy what you're doing – that really helps.

Robin W. Baird, Ph.D.

Robin W. Baird is a research biologist with Cascadia Research Collective, based in Olympia, Washington. Robin has been studying whales and dolphins since 1986, and received his PhD from Simon Fraser University in 1994. Most of his research for the last 17 years has focused on Hawaiian odontocetes, assessing population structure, estimating abundance, examining habitat use and behavior, and assessing human interactions including fisheries impacts and impacts from Navy sonar. Much of his work is focused on conservation and management, and he both provides information to government management agencies and groups potentially impacting the environment, and to environmental groups suing the government. In terms of his advice for people interested in a career studying marine mammals, a list is available at <http://www.cascadiaresearch.org/robin/advice.htm> - some specifics: Volunteer to gain experience, but choose the volunteer opportunity not based on an exotic field site or charismatic study species, but on the type and quality of the science being undertaken. If you are interested in observational studies of behavior, become a birder. Why is this relevant? Birders are good observers, and learning to spot and identify birds will help hone your observational skills. Plus it may help you get a job someday. Do your homework. Read everything published (yes, everything) on the species you are interested in, and on the questions you are interested in. Too many prospective students (and current students) are not familiar with the work that has been undertaken on the same topic/species, and spend a lot of time thinking they are answering questions that have already been answered, or end up taking credit for "discoveries" that have already been discovered. If you've wanted to study killer whales your entire life, don't volunteer that information to everyone you ask to work with. There are thousands of people out there who "have always wanted to study killer whales". This desire by itself does not set you apart from the crowd. Learn how to drive and launch

boats. Learn how to trouble-shoot engine problems. Learn advanced quantitative methods. These things will make you stand out much more.

Philip Hammond, Ph.D.

Philip Hammond is Professor of Marine Ecology at the University of St Andrews, UK. He is interested in population dynamics and ecology, and applied aspects of how seals and cetaceans interact with humans. His research activities focus on three main areas: (a) studies of the habitat usage, foraging ecology and diet of marine mammals; (b) estimation of abundance, survival and reproductive rates, and the modelling of marine mammal populations; and (c) studies of the management of human impacts (e.g. bycatch) and the conservation of vulnerable species. In the latter area, he has been a long-serving member of IWC Scientific Committee and is a member of IUCN Cetacean Specialist Group and Red List Authority. In terms of advice, having a passion for what you want to do is crucial but not sufficient for pursuing a career in marine mammal science; there are many more passionate candidates than PhD places or jobs. Employers/advisors are (much) more likely to take on people who can demonstrate they can actually do things and do them well or have the clear potential to do so. More specifically, (1) focus on a discipline - the need is for people who are experts in their field not general "marine mammal biologists"; (2) become competent in specialist practical skills that relate to your interests; (3) for environmental research, become analytically competent by learning how to program (in R); (4) volunteer or take short term positions that give you a skill and add something concrete to your CV; (5) find the right balance between being focused on your specific interests and being sufficiently flexible to take advantage of all relevant opportunities; (6) develop additional inter-personal skills such as communication, organisation, independent and team working.

Medicine and Toxicology

Claire Simeone, Ph.D.

Claire Simeone is a Conservation Medicine Veterinarian with NOAA-National Marine Fisheries Service and The Marine Mammal Center in Sausalito, California, USA. In addition to providing clinical veterinary care for rehabilitated marine mammals, she investigates Unusual Mortality Events, provides veterinary support for biological field projects across the country, and has a focus in international stranding response. A main interest is in marine mammal health and emerging diseases. For undergraduate students considering veterinary school, or veterinary students or veterinary technicians with an interest in marine mammal and conservation medicine, her biggest piece of advice is to get hands-on experience in the widest variety of fields as possible. Many people think of veterinarians in a clinical role, providing care for animals at a rehab center, for instance. However, veterinarians have roles in public policy, wildlife disease research, pathologic investigation - there may be jobs out there that you haven't considered yet. Another piece of advice is to find someone who is doing what you want to do, and ask them about how they got to where they are today. Networking (like these workshops) are incredibly valuable as you advance in your career.

Michelle Barbieri, Ph.D.

Michelle Barbieri is a veterinarian leading the Health & Disease Program for the NOAA Hawaiian Monk Seal Research Program. She oversees health monitoring research for the population, conducts rescue and rehabilitation of sick or injured monk seals, and provides veterinary support to the field research projects of the Program. The program is also preparing to implement a vaccination plan to protect wild monk seals from morbillivirus infections. For students, veterinary or not, she encourages them to seek out extra-curricular opportunities for hands-on and real-life experience in and out of the field. She stresses the importance of remaining open and wants students to know that there is more than one way to pursue any given career path. Mid-way through her M.S. degree, Michelle shifted her plans from looking into PhD programs to pursuing veterinary medicine and it was largely through being involved in multiple different types of marine mammal science that she found her niche.

Acoustics and Sensory Biology

Colleen Reichmuth, Ph.D.

Trained primarily as an animal behaviorist, Dr. Colleen Reichmuth has spent the past 20+ years conducting research in the areas of comparative cognition, bioacoustics, and behavioral ecology. Dr. Reichmuth currently heads the Cognition and Sensory Systems Laboratory, based at UC Santa Cruz's Long Marine Lab, where resident seals, sea lions, and sea otters are trained for participation in studies examining how these amphibious marine mammals acquire and process information. She has extensive experience with laboratory and field methods addressing how animals produce, perceive, and are affected by sound, and expertise in operant studies of discrimination learning and emergent behavior. Dr. Reichmuth currently directs the research program and is responsible for managing all research, personnel, animal care, funding, and administrative activities. She mentors graduate and undergraduate students conducting research in the areas of animal learning and sensory biology. She has a B.Sc. in Biology, a M.Sc. in Marine Science, and a Ph.D. in Ocean Sciences, all from the University of California Santa Cruz. Dr. Reichmuth worked closely with the project's founder, Dr. Ronald Schusterman, for many years before taking over the leadership of the project. She strives to sustain the positive, cooperative, and team-based program that has supported so much great science and fostered so many good scientists over the past four decades.

Laela Sayigh, Ph.D.

Laela Sayigh is a researcher specializing in cetacean acoustic communication at the Woods Hole Oceanographic Institution. Her work is both applied and basic, and includes topics such as effects of anthropogenic noise on communication in a variety of cetacean species, and structure and function of calls in the natural communication systems of various odontocete species. Her advice to prospective and current students interested in bioacoustics is to get as strong a quantitative background as possible, including math, physics, and computer science. Additional advice is to get research experience as an undergraduate, even if it is not related to marine mammals or bioacoustics.

Careers in Marine Mammal Science

Bob Pitman

Bob Pitman is a marine ecologist with US NOAA Fisheries, Southwest Fisheries Science Center, La Jolla, California, and has worked for over 40 years with that agency. He took a leave of absence from college during his freshman year in 1974 to participate in a seabird survey from California to Tierra del Fuego and never really got off the boat. Since then he has participated in over 150 marine bird and mammal research cruises in the Pacific, Atlantic, and Indian oceans, tropics to poles, and all around Antarctica, spending between 4 and 8 months in the field every year. He has authored over 100 publications on various aspects of marine vertebrate biology. Most recently, he co-authored a field guide to marine mammals (*Marine Mammals of the World*, 2nd edition. Academic Press). His passions include beaked whales, tropical seabirds (he described a new species of booby), and conservation biology. For the past decade, his focus has been killer whales, and he spends 2-3 months/year working on them in Western Australia and Antarctica.

Words of advice from a field biologist:

- * Think hard about your priorities: families and extended field work often do not mix well, and you may need to choose between the two.
- * Take the time and learn to write: communication skills will serve you well no matter where you find yourself.
- * If you are lucky enough to work with animals for a living, consider sharing your experiences with those who don't: give talks to the public, write popular articles, etc. You owe it to these animals to raise public awareness and concern about them and the natural world.

Dr Ailsa J. Hall, Ph.D

As Director of the Sea Mammal Research Unit I am responsible for the overall management of the Unit and it's 60+ staff which now leaves much less time for research. However, my research interests are all aimed at determining the effect that contaminant and pathogen exposure has on the risk of mortality and morbidity in marine mammals, both seals and cetaceans. I am particularly interested in the role of these factors in determining an animals' early survival and reproductive capability and in how they interact with the species immune and endocrine systems. This interest has also led to more fundamental questions about how the immune system may be shaped by the life history strategy of marine mammals. I am also very interested in the physiological adaptations of mammals to a marine existence, particularly at the molecular level; such as the respiratory and osmoregulatory adaptations and strategies that allow animals to forage at depth and their adaptations to cope with long periods of fasting.

Be tenacious, enthusiastic and inquisitive. Question everything you read in the literature! Don't be too dogmatic about what you want to do, a bit of flexibility may allow you to continue to work in a related field, whilst pursuing your main interest in marine mammals at the same time. We are an interdisciplinary team so rely on skills and expertise from physicists to molecular biologists, we need specific skill sets to answer marine mammal science questions. It's going to be hard work, especially early on in your career and some of the opportunities will be down to luck but make the most of any

that do arise, even if they may not be quite what you had planned, you never know where things will lead and what you may discover!

Genetics and Genomics

Andrew Foote, MSc

I am an evolutionary ecologist with a particular interest in adaptation and speciation. Using a multi-disciplinary approach that combines ancient DNA, genomics and behavioural studies I have investigated these process in the killer whale, which has radiated into different forms and ecotypes. I am currently applying these approaches to more model systems for understanding the processes and underlying mechanisms of adaptation and speciation.

My career path has been a bit different from most, as I came back into academia several years after my bachelor's degree. After an internship as a research assistant on a project studying killer whales, I developed my own research project. This led to me doing a part-time research MSc over three years, studying the evolution of vocal dialects of killer whales. An advantage of this route over working on a supervisor's project was that I was able to work very independently, but the cost was that I had to fund the project, my salary and tuition fees myself. Since then I have always worked on projects I have developed and I can't imagine working any other way. With experience, I've been getting better at getting grants and funding to cover the project costs and my salary. I hope this highlights that there are different options and routes into a career in science, all of which have different costs and benefits, and you just need to figure out which one suits you best.

My advice to students looking for a PhD position, is to try and develop a research question and approach a prospective supervisor with that. It may not be feasible, or the prospective supervisor may not have the funding, but it will make you stand out and you are more likely to get some positive feedback.

My advice to students already enrolled in PhD programs is to read more broadly, to see what the big unresolved questions are in biology that your research on your study organism is ideally suited to address.

Aimée R. Lang, Ph.D.

Aimée's marine mammal career began as an intern at Texas A&M Galveston's Marine Mammal Research Program, which led to acceptance into a master's program at San Diego State University's Cetacean Behavior Lab. While completing her thesis work studying the movements of California coastal bottlenose dolphins, she became interested in population genetics and (on her third try!) was admitted into the Scripps Institution of Oceanography Ph.D. program, where her research focused on the population genetics of gray whales. After completing her Ph.D. in 2010, she went on to do a postdoc with the Marine Mammal and Turtle Division at Southwest Fisheries Science Center, where she currently is on contract as a PI with the Marine Mammal Genetics Group. The primary focus of her research is the use of genetic and genomic tools to identify units-to-serve in marine

mammals. Her current projects include investigating stock structure in gray whales, bottlenose dolphins, and Arctic ice seals and evaluating the subspecies taxonomy of blue whales.

Advice for students:

* Publish as you go.... Having a strong publication record now will help you get grants, postdocs, and jobs in the future.

* Science on marine mammals can rarely happen without collaboration, and word of mouth is often a big part of finding a postdoc or job. Cultivate professional relationships and be careful not to unnecessarily step on anyone's toes.

* Identify a mentor in the field that you respect and can rely on to give you positive but realistic feedback. Ideally (but not necessarily) this person will be your advisor or a committee member.

* For those interested in genetics/genomics...get bioinformatics skills. More and more these days, the challenge facing geneticists is having very large datasets without the skills to efficiently process and analyze them. Plus there are lots of jobs out there looking for bioinformaticians!

Alana Alexander, Ph.D.

Alana is a postdoctoral researcher specializing in genomics at the University of Kansas Biodiversity Institute. She is interested in looking at evolutionary patterns in non-model organisms from the perspective of ecological processes, such as the effects of behavior, social structure, selection, and molecular evolution on patterns of genetic diversity and differentiation. Her research has included population genetics and phylogenomics on a wide range of taxa, including cetaceans, mice, kingfishers, lizards and frogs. She completed her BSc. and BSc. (Hons) in Biology at the University of Auckland, before coming to the USA on an International Fulbright Science and Technology Award in 2008. She completed her Ph.D. in 2014, working with Prof. Scott Baker at Oregon State, on the influence of social structure and molecular evolution on genetic diversity in the sperm whale. For undergraduate students considering graduate school, and MSc. students considering moving on to a Ph.D., her biggest piece of advice is to monitor job postings to make sure there is adequate demand to justify investing time and money in grad school, as employment opportunities can be fairly limited in life sciences (particularly within cetacean biology). In addition, it is a good idea to get hands-on experience in your area of interest so you can decide whether you like it enough to do a graduate degree in it. If you do decide to go to grad school, try to pick up skills that increase your employability (e.g. for genetics: next-gen sequencing, programming in R/python/linux), and gain experience in writing grants: even the small ones you might write during your Ph.D. give you experience that you can scale up. For current Ph.D. students: make sure you start looking for jobs/fellowships at least a year out from finishing – it can take a while to line up opportunities in the current job market.

Tips for Writing Papers

Kathleen M. Dudzinski, Ph.D.

Kathleen Dudzinski, Ph.D. had her first experience studying marine mammals as an intern with the Atlantic Cetacean Research Center (Summer, 1987), and began graduate studies with Dr. Bernd Würsig at Texas A&M University in 1990. With guidance from Dr.'s Bernd Würsig and Christopher Clark, Dudzinski designed and built a new system for simultaneously recording the behavior and vocalizations of dolphins under water, for which she received the Fairfield Memorial Award for Innovative Research at the Tenth Biennial Conference on the Biology of Marine Mammals, Galveston, Texas, in December, 1993. Dudzinski earned her doctorate degree in Wildlife & Fisheries Sciences from Texas A&M University in 1996. Since then, her research has focused on tactile, behavioral and acoustic signals used by dolphins to share information with each other and across groups. After spending her post-doc in Japan studying Indo-Pacific dolphins around Mikura Island, Dudzinski participated with seven colleagues in the large-format film DOLPHINS from MacGillivray Freeman Films (2000) for IMAX theaters. In 2000, her first book for children, "Meeting Dolphins My Adventures in the Sea", was published by National Geographic Books. Dudzinski's second book, co-authored with Toni Frohoff, was published by Yale University Press in fall 2008: "Dolphin Mysteries: Unlocking the Secrets of Communication." Dudzinski is Founder and Director of the Dolphin Communication Project (DCP), with a current research focus on three groups of dolphins in managed case and wild spotted dolphins around Bimini, The Bahamas. Her main focus relates to understanding how dolphins in varied habitats (including captive and wild) share information with the goal of conducting comparative research into signal exchange. Through DCP, Dudzinski is able to funnel research results and methods into educational programs for secondary students, college-level students and members of the general public.

Advice: Find a way to intern or volunteer in an area that interests you. In this way, you gain experience and also connections. Do not let someone else tell you what you can or cannot do.

Frank Fish, Ph.D.

Dr. Frank Fish is a Professor of Biology at West Chester University of Pennsylvania, where he has been on the faculty since 1980. He received a B.A. in Biology from SUNY Oswego in 1975. He completed a Ph.D. in 1980 in Zoology at Michigan State University, where he studied the energetics and biomechanics of swimming in the muskrat. He is an associate editor for *Marine Mammal Science*, and he served on the editorial board of *Bioinspiration and Biomimetics*. Dr. Fish has published over 130 journal articles, book chapters, and technical reports. The journals included *The Anatomical Record*, *Integrative and Comparative Biology*, *Journal of Biomechanical Engineering*, *Journal of Experimental Biology*, *Marine Mammal Science*, and *Marine Technology Society Journal*. Dr. Fish's research is focused on the energetics and hydrodynamics of aquatic locomotion by vertebrates with biomimetic applications. While specializing on swimming by aquatic mammals, He has been funded by the Defense Advanced Research Projects Agency, National Science Foundation, and the Office of Naval Research. Recent projects have included examinations of the evolution of swimming modes in aquatic mammals, energetics and maneuverability of aquatic animals,

hydrodynamic design and flexibility of biological control surfaces, and analysis of animal swimming for biomimetic AUV design.

Some words of advice for writing:

1. Don't be afraid. Just write. Attack the page.
2. Set up an outline. The order and emphasis of things may change, but you have a starting point.
3. Subject, verb. Keep them close to each other.
4. Keep sentences short.
5. Start writing with sections that are easy.
6. Whatever you write have someone else read it. What is clear to you may be confusing to someone else.
7. Justify your statements either with data or references.
8. Think broadly. More general ideas have greater impact than specific ideas

How to Get a Faculty Position

Birgitte McDonald, Ph.D.

Birgitte McDonald is an assistant professor of Vertebrate Ecology at Moss Landing Marine Laboratories. She is a physiological and behavioral ecologist, who seeks to study the whole organism, using techniques from physiological, evolutionary and behavioral biology to better understand the mechanisms that determine the ecological niche of an organism. Her research has provided opportunities to work with a broad range of species (seals, sea lions, porpoises, dolphins and penguins) in a diversity of habitats from the Antarctic to the Galapagos. She received an M.A. in Biology from Sonoma State University in 2003 and a Ph.D. in Ecology and Evolutionary Biology from the University of California, Santa Cruz in 2009. After completion of her Ph.D. she conducted 3 years of postdoctoral research at Scripps Institution of Oceanography studying the oxygen management strategies of wild California sea lion and the physiological ecology of emperor penguins. She then spent two years at Aarhus University in Denmark as a National Science Foundation International Fellow investigating the diving physiology and energetics of harbor porpoises before starting her position at Moss Landing in January 2015.

A few tips for students:

- One of the most important skills you can develop in graduate school is time management, you will only get busier
- Try to think about what type of job you want in the future and then plan your graduate career to help you develop those skills (Teaching, research techniques, analytical skills, writing, etc).
- Learn how to communicate your science to the general public

Sascha Hooker, PhD

Sascha Hooker is a Reader in Marine Ecology at the Sea Mammal Research Unit at the University of St Andrews, UK. Sascha has been involved in research on the ecology and conservation of marine mammals since 1993. She completed her undergraduate research in Zoology with Anthropology at the University of Oxford, then did her PhD research at Dalhousie University, Canada, where she studied the foraging ecology of northern bottlenose whales in eastern Canada, completing this in 1999. She held a post-doctoral fellowship at the British Antarctic Survey working on Antarctic fur seal foraging in South Georgia, and a UK Royal Society Dorothy Hodgkin Fellowship (2003-2010) at the University of St Andrews working more generally on marine mammal foraging strategies. In 2004, she obtained a lectureship at the University of St Andrews (to begin upon completion of her fellowship, although she delayed this slightly spending a year as a visiting researcher at the University of La Rochelle). She has reduced her hours to a half-time position since 2004 when she had the first of her three children. She was recently promoted from lecturer to reader, the equivalent of a US associate professor. She has three main areas of research: the interaction between marine mammal behaviour and the surrounding environment, the physiological mechanisms underpinning diving behavior, and the application of these to conservation planning in the ocean. She has had a long interest in biologging instrumentation, from the trials of trying to attach TDRs to northern bottlenose whales, to the tribulations of using prototype oceanographic and digital camera tags on Antarctic fur seals. Sascha has published over 40 scientific papers in journals including Proceedings of the Royal Society, Conservation Biology, BioScience and Ecography.

Words of advice:

- Your PhD is like a ploughed field. Your advisor has identified that the soil is fertile, but it is up to you to do the work, and fulfill the potential.
- Make the most of opportunities presented to you.
- Publish but...
- Don't take rejection personally. Try to develop a thick skin and make the most of the advice.
- Try to step back and see the bigger picture.
- Life may throw you a curve ball sometimes but the important thing is how you deal with it.

Leah Gerber, Ph.D.

Leah Gerber is a Professor of Ecology, Evolution and Environmental Sciences in the School of Life Sciences, Senior Sustainability Scientist in the School of Sustainability, and Founding Director of the Center for Biodiversity Outcomes (CBO) at Arizona State University. Gerber is a population ecologist and marine conservation biologist who is committed to a strong empirically-based marine research program and in connecting science to policies for sustaining the health of the world's oceans. As a population ecologist, she works at the interface between behavior, population ecology and demography of long-lived marine species. As a conservation biologist she works with government and non-governmental organizations to ensure that basic research is applied in relevant conservation settings. In both endeavors, Gerber employs empirical and modeling approaches to understand marine systems connect academic pursuits in marine biological sciences to tenable decision tools and policy. With a grounding in natural history and primary data collection, quantitative methods, and an appreciation for the interactions between humans and the environment, Gerber has pioneered new approaches in protected area design, population viability

analysis, and incorporating uncertainty into environmental decision-making. Gerber has published broadly on life history, dispersal, monitoring, adaptive management, animal behavior and ecosystem-based management. She is a National Science Foundation Career Awardee and an Aldo Leopold Leadership Fellow. As the Founding Director for CBO, Gerber aims to accelerate the success of biodiversity management and sustainable biodiversity outcomes by fostering relationships amongst academics and decision makers. Dr. Gerber can be followed on Twitter @Leahleopold.

Words of advice: Do what you love, develop a support network, be the best scientist you can be, embrace creativity in science, treat your time as a precious commodity, develop good work habits, share your science and your love of science, celebrate small and big successes, and have fun and maintain your sense of humor!

How to Get a Post-doc

Ann Allen, Ph.D.

Ann Allen is a postdoctoral investigator at Cascadia Research Collective in Olympia, WA. She has 10 years of experience in marine mammal research. In 2013, she received her Ph.D. in Biological Oceanography from the Massachusetts Institute of Technology and Woods Hole Oceanographic Institution Joint Program. Her primary thesis work used data from satellite tagged humpback whales to investigate the cues they use to navigate during their annual migrations. She is currently working on the Southern California Behavioral Response Study, an interdisciplinary collaboration that uses digital acoustic recording tags (DTAGs) and other methods to assess, and minimize, the effects of Navy Sonar exercises on marine mammals. Her primary research goals focus on using animal mounted tags to study the movements and behavior of marine mammals.

Words of advice:

-Know why you are getting a graduate degree. Will it help you obtain the job you are aiming for? Or would alternative jobs and/or experiences serve you better in acquiring the necessary skills for the career you want?

-Know what job you do want after you are finished with schooling. There are jobs in academia for only a small percentage of PhDs. However, this is the job market that PhDs are trained for. If that is the career path you want then work from the beginning of grad school towards it. If you think you would prefer an alternative career path then focus on gaining the outside experiences that will help you get a job in the area you want, e.g. teaching experience, science writing, policy internships.

-Don't get discouraged when your perfectly planned thesis doesn't work out like you expected. Especially when field work is involved there will be setbacks and you will have to redo things. There is always something that can be salvaged from the experience.

-After you overcome the setbacks in your thesis and are writing up the final manuscript, take a step back and look at what you DID do, not just what you intended to do. Craft a cohesive narrative from this perspective, rather than trying to exactly follow your proposed objectives. If you stick to your

proposal then it highlights the areas you had difficulties with, instead of emphasizing what you did well.

Frants Jensen, PhD

Frants Jensen received his PhD in biology from Aarhus University in 2011. He has since held postdoctoral fellowships at Woods Hole Oceanographic Institution and is now a postdoctoral fellow at Princeton University. His research spans a wide range of topics on the acoustic ecology of wild toothed whales, with published papers on biosonar signals, pneumatic sound production and acoustic communication of delphinids. He now works mainly on studying the social dynamics of wild delphinids, with a focus on investigating how group-living animals coordinate activities and foraging behavior, how they may benefit from direct or indirect information flow during foraging periods, and how decisions within groups are made. To do this, he primarily uses acoustic and movement logging suction cup tags deployed on multiple closely associated delphinids. These tools provide a unique and highly detailed perspective into the behavior of small groups of delphinids, but poses new challenges in processing and visualizing large amounts of data for both established and emergent researchers alike.

Words of advice:

- Look for the big questions in biology that interface with your research and work towards those – keeping a larger perspective will make your research more relevant, and will make it easier to frame research proposals for future funding.

- Acquire the necessary skills to excel in your field, even if some of these skills may seem daunting at first. Increasingly, these are technical or computational skills that require time and practice to become good at. In many cases, there are great online tools to facilitate self-learning for motivated students.

Jobs Outside of Academia

Josh London, Ph.D.

Josh London is a wildlife biologist with the NOAA Fisheries Alaska Fisheries Science Center (AFSC) in Seattle, Washington, USA. Josh's responsibilities at AFSC currently focus on abundance and trend of harbor seals in Alaska and the application of animal telemetry data to address ecological questions related to space use for harbor and ice-associated seals. Josh received his undergraduate degree in wildlife biology from the University of Washington, College of Forest Resources. He then went on to complete his Ph.D. at the University of Washington, School of Aquatic and Fishery Sciences where he studied predation impacts of harbor seals on endangered salmon and of Bigg's killer whales on harbor seals. In addition to his research efforts on seal ecology at AFSC, Josh is also responsible for data science and management within the program and has contributed significant time to improving the availability and accessibility of AFSC data. Along those lines, Josh's advice for students is for them to become experts in at least one programming language, learn fundamentals of data management, and to embrace open data, open science, and reproducibility early in their careers.

Carey Kuhn, Ph.D.

Dr. Carey Kuhn is a Research Ecologist at the National Marine Mammal Laboratory of the Alaska Fisheries Science Center, U.S. National Marine Fisheries Service. Dr. Kuhn's research interests include pinniped foraging ecology, at-sea behavior, and predator-prey interactions. She acquired her B.S in Zoology at Arizona State University and a Ph.D. in Ecology and Evolutionary Biology from the University of California, Santa Cruz. After graduate school Dr. Kuhn received a Postdoctoral Research Fellowship from the National Research Council of the National Academies to study northern fur seal foraging ecology, work she continues in her current position. Dr. Kuhn recommends that students: "1) Find ways to collaborate within and outside of your research focus. Working with a diverse group of scientists will broaden the scope of your research, which is incredibly beneficial when applying for jobs. 2) Learn a programming language. 3) Schedule time for writing (e.g., grants, publications, reports). This is a critical part of scientific research yet field work/data collection often take priority. 4) Keep an eye on developing technology and an open mind on how to apply it. Technological advances continue to provide new methods to collect and analyze data in nearly all realms of marine mammal research. You never know how the next technological breakthrough will change the way you do science but sometimes you need to be creative to make it work."

Tips for Writing Grants, Fellowships, and Job Applications

Heather E.M. Liwanag, Ph.D.

Heather Liwanag earned her Ph.D. at the University of California, Santa Cruz, studying the comparative physiology of pinnipeds. For her dissertation, she compared fur and blubber as insulators and examined the metabolic and behavioral consequences of the two different types of insulation in otariids. She conducted postdoctoral work at UC San Diego and Cal State Northridge; she then worked as an Assistant Professor at Adelphi University in New York before beginning her current position as an Assistant Professor at Cal Poly San Luis Obispo. Current research projects with marine mammals include: ontogenetic development of physiological capabilities in polar seals, the effects of electronic instrumentation on fur seal pelts, the incidence of fungal infection in stranded pinnipeds, and the functional morphology of sea otter pelts through ontogeny.

Words of advice:

- Your path to success may not be linear. Pay attention to opportunities that may not be exactly what you think you want. Often it is these opportunities that serve as stepping-stones to where you really want to be.
- Collaborative science lets us answer bigger questions and look at things in a more integrated way. Be a good colleague so you can collaborate with other great scientists.
- Keep lots of copies of your data – in digital and hard copy.
- Learn how to write well. This will help you get grant money and publish your work.

- Accept constructive criticism. Peer review and rejection are part of the process. Use these things to improve your writing and your science.
- Pursue your passions. You need to be excited about your science to get through the tough times. Science is hard work, but you should also be having fun!

Mithriel MacKay, Ph.D.

Mithriel received her Ph.D. from Texas A&M University @ Galveston in Marine Biology studying humpback whales (*Megaptera novaeangliae*) wintering off Puerto Rico, USA. She received her Master's degree in Marine Resources Management from Texas A&M at Galveston, and her bachelor's degree in clinical laboratory medicine/medical technology from Simmons College in Boston, Massachusetts. Her background includes over 30 years developing curriculum and adult education in science.

Mithriel is the Director of Research and Education for the Marine and Coastal Ecology Research Center (MCERC). MCERC is a non-profit organization conducting research while providing opportunities for developing skills important for marine and coastal ecology based careers. Current projects include the Puerto Rico Humpback Research Project; a mark-recapture study of Axis deer (*Axis axis*) an invasive/introduced species in the Texas Hill Country; instruction on personal marketing packages, including CV preparation; and teaching wide variety of marine and terrestrial ecology/biology/ resources management programs to undergraduates, graduate students, and anyone desiring field experience.

There are several important items that need to be communicated to a future employer, supervisor, or advisor. The first is that the applicant is aware they are needed to support the project rather than the project being created to support the applicant. The second is the applicant is willing to learn new skills and methods of accomplishing the project goals and that these are likely to be different from any previous experience. The third is the applicant is willing to put forth the effort to prepare and perform a spectrum of tasks to make the project successful. In the end, if these things are among the assets that are offered to a team, the rewards will be experience and growth.