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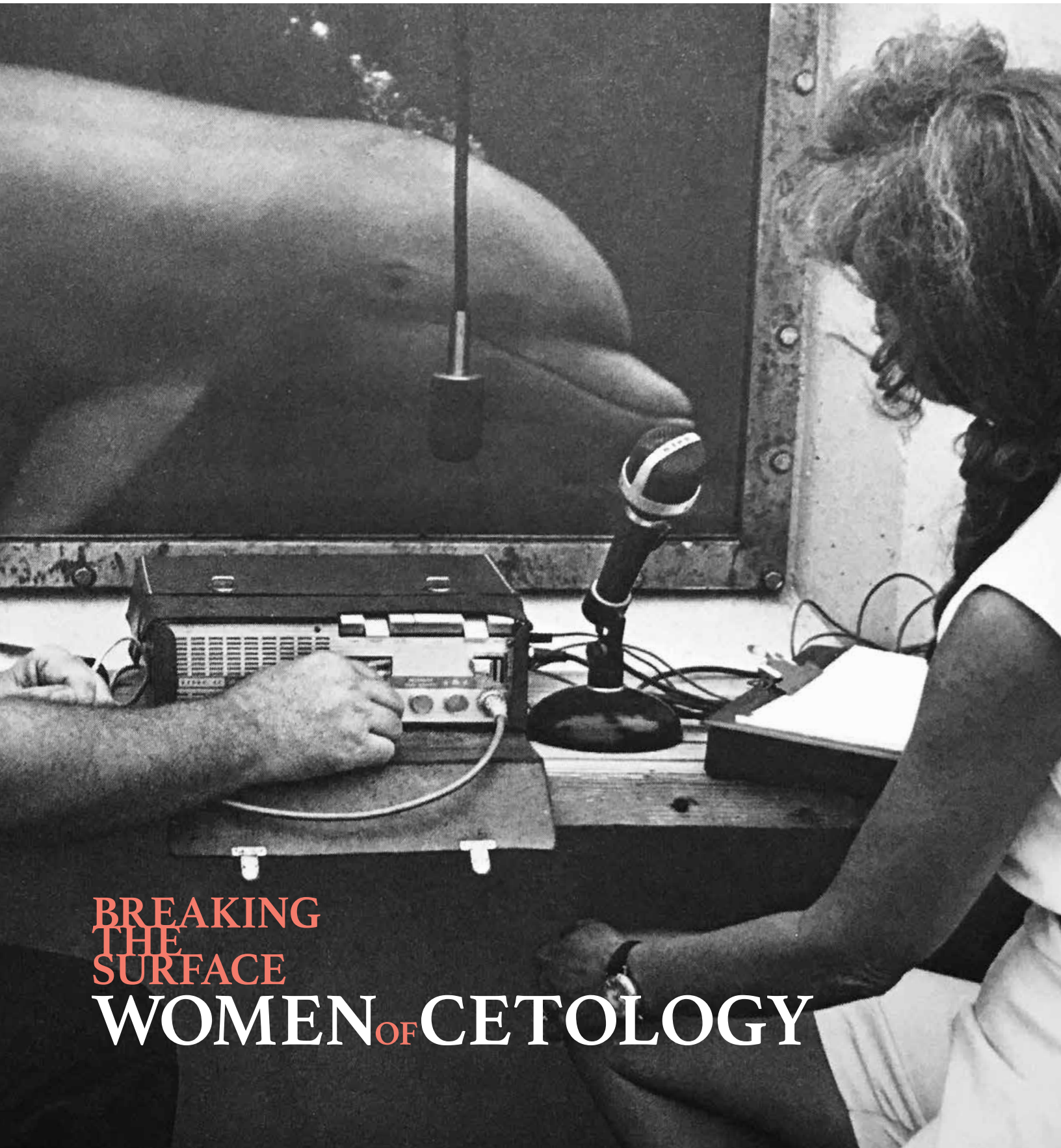

BREAKING THE SURFACE
WOMEN OF CETOLOGY

Humpback calf. *Photo by Jo Marie Acebes.*

ON THE COVER

The Caldwells recording vocalizations of a bottlenose dolphin at Marineland of Florida.
Photo by: Marineland of Florida

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LETTER FROM THE PRESIDENT

UKO GORTER

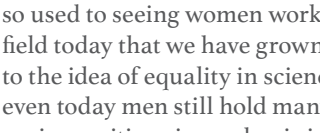
You may have noticed that this special issue of our *Whalewatcher* journal is not really about whales. Instead, it is about humans. Women, to be more precise.

For anyone who has attended a marine mammal science conference recently, you would have immediately noticed the multitude of women in attendance. They far outnumber their male counterparts. Of course, this wasn't always so.

For centuries, the scientific discipline of the study of whales—like so many others—was dominated by men. Nowadays we're so used to seeing women working in this field today that we have grown accustomed to the idea of equality in science. However, even today men still hold many of the most senior positions in academic institutions.

We thought it was high time to look back and see how far women have come in the field of cetology, or the study of whales. We also wanted to hear from women scientists who are working in the field today, or recently retired. The results are essays from a wonderful mix of women from different generations, backgrounds, and career stages. You will read about their struggles and achievements in their academic and career paths. They also impart some valuable wisdom and a unique perspective for young women (and men!) entering the field of cetology today. Their stories are fun, insightful, and immensely inspiring. Above all, we hope this issue honors the pioneering women who paved the way, and celebrates all women who have, and continue to study cetaceans for many decades to come.

I want to express my gratitude to our ACS National Board Member, Sabena Siddiqui, who served as our lead Editor for this wonderful issue. Sabena has deftly guided the process with immense patience and sensitivity. It is because of her efforts, while still navigating her own academic work, that this unique special issue has been made possible. We are indebted to all the incredible women scientists who have contributed to this issue. None of them were used to writing so openly about themselves and their careers. They have done so with grace and from the heart.



Uko Gorter, president

Three members of the LA Pod travel along Palos Verdes, headed toward our Gray Whale Census, February 1988. Female CA2 - "The "Whale That Ate Jaws" - is in the middle of this trio; in October 1997, she killed a great white shark off of the Farallon Islands, and ate its liver. *Photo by Alisa Schulman-Janiger.*

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Left: Christina Lockyer in Glacier Bay on a humpback whale survey. Middle: On his fourth attempt. male Bigg's transient killer whale T069C smacks a harbor seal with his flukes and sends it sailing about 80 feet into the air just off Victoria, BC in October 2015. *Photo by Alisa Schulman-Janiger.* Right: Dusky Dolphin in Kaikoura, NZ. *Photo by Mridula Srinivasan.*

Left: Atlantic spotted dolphins. *Photo by Denise Herzing.*
Top: Gray whale fluke taken in 2015 during a small boat photo-identification survey off the west coast of Vancouver Island. NOAA Permit 14097. *Photo by Alisa Schulman-Janiger.*
Bottom: Alisa using Big-Eye binoculars to scan for cetaceans and other marine mammals off of the west coast of Vancouver Island, on the RV Reuben Lasker, during the NOAA Fisheries 2015 Collaborative Large Whale Survey (CLaWS) in November. *Photo courtesy of Alisa Schulman-Janiger.*

challenges faced by

Women in STEM

Science, Technology, Engineering, and Mathematics

While women make up 44% of full-time employees

they represent 66% of part-time workers

and 74% of people who are unemployed and not seeking work

This is driven primarily by women being

4.6x more likely to not seek work due to family responsibilities [1]

Additionally, women may be ranked as being less hireable and competent than men based on CVs alone[2]

Women continue to get paid less for equal work...

The gender wage gap still exists

ONLY 82¢

Women employed in science and engineering are paid 82¢ to the dollar[1]

11%

wage gap reported for tenure track academics[3]

Awards received by women are of lower value (and are less prestigious)[4]

...and experience high rates of sexual harassment and gender bias

Women in working environments where they are outnumbered by men or where leadership is male-dominated experience higher rates of sexual harassment[5]

61% of students reported having experienced gender bias in biology undergraduate classes,

78% reported incidents of sexual harassment at least once in the past year[6]

Gender bias from peers and sexual harassment from instructors negatively affected STEM motivation and career aspirations[6]

While the percentage of women is increasing in some fields...

gender bias isn't unique to male-dominated disciplines

Even in balanced fields women...

face descrimination, are **underestimated by peers,** and **work harder for less credit**

29% of students identified experiences of discrimination throughout their degree[7]

Men are more likely than women to be named by their peers as being knowledgeable about course content[8]

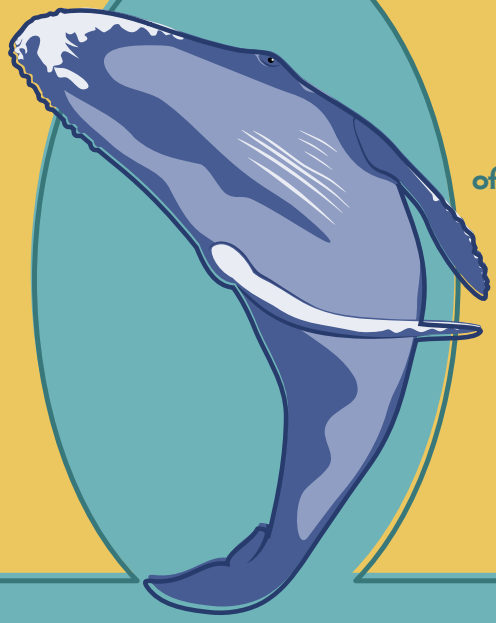
Though male PhD students spent less time engaged in research, they were 15% more likely to be listed as an author on publications[9]

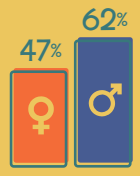
Infographic by Cara Gallagher @CaraAGallagher

From the Women in Marine Mammal Science Initiatives' 2017 Survey![10]

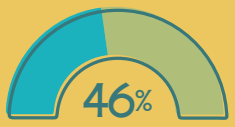
-barriers to success in-

MARINE MAMMAL SCIENCE





Women were underrepresented in supervisory and leadership positions



of women experienced negative assumptions of their competence or commitment to work after having children

of women reported having to provide more evidence of competence than their male colleagues

of women experienced instances of gender bias throughout their career

Women experience more bullying, harassment, and discrimination

51.5% report bullying or harassment

45.4% report discrimination

Many of the surveyed women reported being sexually harassed by superiors during their career

Though many reported harassment, few perpetrators, many of whom were in leadership or supervisory positions, faced any consequences. Women who have reported these incidents have lost productive communication, lost control or authorship of their research, had to change research groups, and even lost their jobs. These incidents often occured in remote locations during fieldwork.

[1] NSF 2019 Report "Women, Minorities, and Persons with Disabilities in Science and Engineering" - https://ncses.nsf.gov/pubs/nsf19304/digest
[2] Eaton, A.A., Saunders, J.F., Jacobson, R.K. and West, K., 2020. How gender and race stereotypes impact the advancement of scholars in STEM: Professors' biased evaluations of physics and biology post-doctoral candidates. Sex Roles, 82(3-4), pp.127-141.
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[5] National Academies of Sciences, Engineering, and Medicine, 2018. Sexual harassment of women: climate, culture, and consequences in academic sciences, engineering, and medicine. National Academies Press.
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[7] Fisher, C.R., Thompson, C.D. and Brookes, R.H., 2020. '95% of the time things have been okay': the experience of undergraduate students in science disciplines with higher female representation. International Journal of Science Education, pp.1-17.
[8] Grunspan, D.Z., Eddy, S.L., Brownell, S.E., Wiggins, B.L., Crowe, A.J. and Goodreau, S.M., 2016. Males under-estimate academic performance of their female peers in undergraduate biology classrooms. PloS one, 11(2).
[9] Feldon, D.F., Peugh, J., Maher, M.A., Roksa, J. and Tofel-Grehl, C., 2017. Time-to-credit gender inequities of first-year PhD students in the biological sciences. CBE—Life Sciences Education, 16(1).
[10] Women in Marine Mammal Science. "Women in marine mammal science:breaking down barriers to success Workshop Report" - https://wimms.weebly.com/

EDITOR'S INTRODUCTION

MAPPING OUR PATH: CHARTING THE WAY FORWARD

SABENA SIDDIQUI

Competing male humpback whales off Maui, Hawaii.
Photo by Adam Pack under NMFS Permit #14585-01.

Page 8: Sabena Siddiqui conducting fish surveys at an offshore reef in The Red Sea off Egypt.
Photo courtesy of Sabena Siddiqui.

In these pages you will find articles written by phenomenal cetacean scientists detailing incredible adventures throughout their careers studying the lives of whales, dolphins, and porpoises. Together these stories shine a light on some of the triumphs and tribulations faced by the league of women in cetology. When I took on this task as editor, I expected a degree of hesitation from authors about getting too personal, but I did not as much anticipate the challenge of getting authors to detail their achievements. These are, after all, incredibly accomplished scientists! There's often a hesitancy to acknowledge our own accomplishments, but this is exactly why it is beneficial to take a moment to celebrate the successes of these innovative scientists. The main goals of this issue are to highlight contemporary scientists who have defined and continue to redefine the field of cetology, while also taking a dive into the history of early women scientists whose work was foundational for our current understanding of cetaceans. Taking a step back to reflect on how history has led up to this current moment shows how far we have come. Celebrating how far women in Science, Technology, Engineering, and Mathematics (STEM) have come is just as important as mapping our path onward.

I would like to address potential misconceptions some readers may have prior to starting this edition. Celebrating the accomplishments of women scientists does not intend to overshadow the accomplishments of others. The goal is not to create a gender divide, but to celebrate the tenacity of these scientists and their journeys. Many authors express their gratitude for their supportive male mentors who helped guide them, showing the crucial role that allies can play in enriching academia. For those readers who want to become allies, ask yourself and your colleagues, "How can we help?". Continue educating yourself, continue listening, and keep working towards the mutual goals of advancing cetology for the betterment of the planet and its inhabitants. The push for equality is not an attempt to flip the switch by placing one gender over the other, rather the goal is to level the playing field so that everyone has more access to the same opportunities. As you read each story you will note that there is no uniform method in which each author advanced in their careers. The journeys of each of these trailblazing scientists help to shatter preconceived notions about how a woman is supposed to think, act, or react. Women cannot be reduced or simplified. Their stories show us that women can succeed and flourish in spaces which originally may have been wary of their presence.

Many authors have shared their hard-earned lessons and their advice for students throughout this publication. As the Student Chair of ACS, I will provide examples from my own perspective as a student for others pursuing a career in this field. It is my hope that reading this helps to inspire the next generation of scientists, naturalists, and conservationists. While there is no blanket strategy that suits everyone, there are specific barriers that pop up for women pursuing STEM. These challenges begin to lose power once they are identified, only then can a strategy be deployed to address these barriers. Fortunately, there are entire fields of science equipped with the methodology and tools to identify what these obstacles are and how they impact women in STEM. Powerful stories lay ahead, but first let's take a look at some of the most common obstacles encountered by women pursuing careers in science, as shown by those I have faced in my career.

Fueling the Imagination

In recent years, cetology has generated fascinating and illuminating discoveries about culture, social learning and the existence of cetacean societies. As a species heavily reliant upon our capacity for culture ourselves, humans are profoundly influenced by cultural practices and social learning in our development. As such, we are continually shaped through the images and concepts we are exposed to over the course of our lifetime. Representation matters and it can influence how far our imagination extends and how the next generation moves the world of cetacean science forward. While cultural expectations put upon us can be limiting, they can also supply fuel for the imaginations of future generations.

Born in India, my family moved to Indiana when I was young, so I had never seen the ocean. My parents did not even know how to swim themselves and Indiana is not exactly a center of maritime culture. Nevertheless, I was infatuated from a young age simply by reading about animals and watching them in nature films. I spent my childhood pouring over marine mammal books at the local library and binge-watching nature documentaries. The enthusiastic men who starred in

Sabena with fellow ACS Student Coalition leaders after their presentation at the 2018 ACS conference in Newport Beach, CA. From left to right: Becca Katz, Jazmin Helzer, Kaitlyn Kush, Sabena Siddiqui, Michaela Setzer, Shelby Kasberger, and Kara Henderlight.
Photo courtesy of Sabena Siddiqui.

Page 11: Sabena using a receiver to determine the location of an acoustic tag placed on a humpback whale the day before off Maui, Hawaii.
Photo courtesy of Sabena Siddiqui.

nature shows inhabited my imagination, but female figures like Sylvia Earle, Jane Goodall, and even animated ones like Eliza Thornberry, extended that possibility that perhaps that could be me one day. My parents believed there were a select few career paths for me as a Muslim Indian woman. In their eyes, marine biology should be pursued only as a hobby, not a career. Thankfully, I chose to carve my own path with the support of my sister and friends. When I got in touch with ACS and founded the ACS Student Coalition, I discovered a new network of support. What I started as a marine conservation club at Indiana University grew and became a network of campus groups around the country. When I transitioned from an undergraduate student to a graduate student, I shifted my efforts from helping lead my campus group to mentoring and guiding students who are now leading their own groups. Each group focuses on educating their members and the public about cetaceans and marine conservation, while also undertaking projects to directly affect the environments around them. ACS student groups have performed water quality testing and cleanups in their own communities, lobbied for conservation legislation, led local anti-plastics campaigns and much more. Over the course of the last nine years as Student Chair of ACS, I have had the opportunity and pleasure of working with many rising scientists, naturalists and conservationists through career workshops I have organized at ACS conferences and through the ACS student coalition activities. The other ACS student leaders have been the greatest source of support I have cherished as I have pursued my own career. Together we have not only created a network for conservation that helps each of us better reach our communities, but also a supportive culture within our network. They have been an ongoing source of inspiration for me and for each other, helping to guide and support one another as many have gone on to careers in marine conservation and STEM fields. The ACS Student Leaders have managed to combine their enthusiasm for science with their commitment to applying their knowledge to real world issues. Their determination to solve problems and further science symbolize hope for future generations. My experience working with other students has provided a detailed and varied insight for the current climate that students in marine mammal science and conservation in general face.

The Little Things

Although I have had many rewarding experiences thus far, I have encountered hurdles. These stumbling blocks come in many shapes and sizes. While society has come a long way on denouncing some overt and obvious barriers, there are barriers that are more subversive. Scientific research in the fields of sociology and psychology have explored the impact of blatant aggressions as well as microaggressions (Nadal et al., 2011). For example, I remember how excited I was to tell my undergraduate biology professor that I had been accepted to the ACS and Society for Marine Mammalogy (SMM) conferences (finally I'd be among others who share the same interests!) to present my first research poster. I also remember that feeling dissolving into confusion and fear when he said, "Be careful, there's a lot of 'skirt chasing' that happens at these conferences". This resulted in me spending more of my energy concerned about his caution, rather than networking. Other little things continued to happen as I pursued my career. During an overseas field research experience, I was in my early 20s and preparing to explore the local town with my fellow interns. The field researcher's husband was also heading out for the night life when he turned to us (all young women) and told us he was "sorry if he acts weird while drunk" and for us to tell him he's "being a jerk". My second undergraduate research poster presentation was on manatee communication at an animal behavior conference in Indiana where I was the only person of color. I rehearsed my poster under my breath as I patiently watched the poster judge listen to each of the presenters near me with a smile and with questions. When the judge arrived at my poster, he didn't say a word. The judge, an older white man, cut me off before I finished my presentation and moved on without asking any questions. I watched as he brought back his smile and asked the other presenters questions. Maybe this academic had a grave dislike of manatees (unlikely, they're awesome!), or maybe he felt that I did not belong there. Either way, this experience is not uncommon for many women who have careers in historically male professions. Later in my career, a fellow intern stated their belief that affirmative action was favoring me. Years later, I was told by a peer in private they believed I was selected for an opportunity because I was the 'diverse pick', implying that my experience and abilities are either nonexistent or overshadowed by my outside appearance. Among colleagues I showed a picture of the groomsmen outfit

I had picked for my wedding and was told "he looks like he's from ISIS". On a few occasions I've been asked, "What are you?" or "Where are you from?" rather than being asked about my presentation topics. Many students have had similar experiences to mine. Young women who are now stepping into exciting opportunities and roles have also experienced a man interjecting to ask if there is perhaps someone more qualified to fill the role. As isolated incidents, these may seem like little things, but over time, they accumulate. The combined impact of microaggressions over time is often described as a death by a thousand cuts (Nadal et al., 2011). Microaggressions can exasperate mental and physical health issues, imposter syndrome, and contribute to a culture of alienation for new and experienced scientists.

You may have noticed that my personal examples brought in issues of gender and race. Each one impacts me equally but differently. Sexism and racism do not manifest in the same way, experiencing one does not necessarily translate into understanding the other. This applies to other aspects such as sexual orientation or gender identity, for example. Many women in science identify under multiple social categorizations. Intersectionality is defined as the interconnected nature of social categorizations such as race, class, and gender as they apply to a given individual or group, regarded as creating overlapping and interdependent systems of discrimination (McCall 2005). Intersectionality is why it is important to consider other factors (such as sexual orientation, ability, race, economic class, etc.) when discussing gender. These factors can compound the impacts felt by those who exist in multiple facets. This is another great reason to highlight the stories of scientists from a variety of backgrounds, so we can better support each other.

While microaggressions and blatant discrimination have their consequences, the positive experiences working with incredible scientists and teams can also be impactful! During my undergraduate, I was selected to live aboard a research vessel for 40 days assisting with the first cetacean abundance project in the Red Sea. I learned how to help with transect line surveys, acoustic monitoring, genetic sample collection, and monitoring of tourism impacts upon spinner dolphins at offshore reefs. Travelling to Egypt alone as a young woman was exhilarating, and an important milestone, providing me with confidence. The Red Sea Dolphin Project was led by three graduate students, all women, who I learned so many lessons from. Their training of research assistants and volunteers was meticulous and fun, their demeanor was inclusive and respectful towards the local community, and their work ethic was unrelenting. This fieldwork experience is one of several that provided me with supportive teachers and role models I continue to benefit from. My time on the project gave me a glimpse into the lives of the Egyptian marine biology student volunteers. We spent long nights having fascinating conversations about conservation, tourism, and the Arab Spring demonstrations that they were all involved in. My experience in Egypt opened my eyes to some of the challenges and conditions that students in other countries struggle with. This research trip was life changing for me. I then had the great fortune of interning with the Passive Acoustics Research Group with the NOAA-Northeast Fisheries Science Center located in Woods Hole, MA. When I entered the research space, there was an inviting atmosphere led by a brilliant science team composed of women who supported me as I learned acoustics. This marked the start of my

fascination with the topic of humpback whale acoustics which is now the focus of my graduate research at the University of Hawaii with Dr. Adam Pack. Having opportunities to work alongside other ambitious students, learn from scientists, and observe cetaceans in their habitats, have supported me through my challenges.

Some readers may wonder if there is any utility in examining barriers with a microscope at the risk of falling into victimization. Perhaps it would be more helpful to think of this as problem solving: first, the problem must be identified, then we can determine what the underlying mechanisms are. In addition to the biased structures of our culture at large, and within academia, women can become pitted against each other or become adversaries to one another. Rather than falling victim to the systems that inhibit us, it's more beneficial to create systems of support for each other. In my experience, it is empowering to be prepared, aware and ready with a set of tools.

Looking Forward

Throughout the history of science, major paradigm shifts in scientific thinking have occurred when concepts are approached with different perspectives and tools. Intelligence, ingenuity and curiosity can be found in people of every background. We can reach new heights by providing equal opportunities of advancement to people of different genders, backgrounds, and economic classes. Diversity fuels innovation and the progress of science, technology, and ultimately, the advancement of society.

While stratification is woven through every fiber of our society, there are actions we can take as individuals; the situation is not hopeless! The solution requires both top down and bottom up approaches. Senior scientists, supervisors, principal investigators, and professors are key holders with influence, and can be excellent mentors to future generations. Students and budding scientists have responsibility in the choices we make as well. There are many situations where we can either choose to run the well carved path of stepping over lab mates and classmates or instead, we can choose a more symbiotic approach. Many great scientific discoveries and breakthroughs were the product of elaborate teamwork, and not by single scientists. Our time is marked by great problems that can only be solved by great teams, working together. In my experience, choosing collaboration over competition has led to better science and most importantly, it's more fun! Why not enjoy the incredible work we get to do? That is why many of us chose this path, our passion for asking questions and seeking answers. It has benefited many students to seek mentorship from above, foster comradery from those beside you, and to help elevate others by sharing your advice in our collective mission to protect cetaceans.

The scope of this issue is a piece of what is possible for science outreach. It is my hope that this publication serves as a springboard for more content to arise. Across the world there are many inspiring stories of perseverance waiting to be heard. There is always room for improvement, even this publication is lacking representation from entire continents. Many cultures in parts of the world still do not allow women access to education, careers, civil representation, or basic rights. Additionally, the lack of research funds makes it challenging for projects to pay interns and volunteers which they rely on to accomplish their goals. Pursuing a career in conservation requires that students earn experience through multiple unpaid internships to succeed, immediately closing the doors to students from lower economic backgrounds. I hope those in a position of influence help to elevate these topics further.

Within the last century, our perception of cetaceans has changed greatly. By examining the many facets of cetaceans including culture, communication, and cognition, we've gone from fearing these monsters of the sea to being captivated by them. The scientists in this issue have been on the forefront, pushing boundaries of how we perceive these animals. These unwavering women have had the drive and intelligence to explore new frontiers, because to stop is simply not an option for them. They are pioneers whose work helps bring us all closer to understanding the ways in which we can protect and ensure the continued survival of these species. Of everything I have learned from my experiences, it is that persistence and passion create boundless possibilities for women in cetology. The challenges have only become landmarks of accomplishments, and a reminder of new accomplishments to come. The future is bright with growing contributions from scientists of different backgrounds and origins charting new territory. I am so excited for what new discoveries and revelations lay ahead for our understanding of whales, dolphins, and porpoises.

Top: Sabena recording data off Maui, Hawaii during humpback whale fieldwork. *Photo courtesy of Sabena Siddiqui.*
Bottom: A humpback whale displaying a head slap off Maui, Hawaii. *Photo by Adam Pack under NMFS Permit #14585-01.*

McCall, L. (2005). The complexity of intersectionality. Signs: Journal of women in culture and society, 30(3), 1771-1800.

Nadal, K. L., Issa, M. A., Leon, J., Meterko, V., Wideman, M., & Wong, Y. (2011). Sexual orientation microaggressions: "Death by a thousand cuts" for lesbian, gay, and bisexual youth. Journal of LGBT Youth, 8(3), 234-259.

Sally during winter fin and humpback whale studies in Kodiak Alaska, February 2007. *Photo courtesy of Sally Mizroch.*

FINDING THE PATH: NAVIGATING THROUGH TRICKY WATERS

SALLY MIZROCH

I've seen a lot of transitions since I started my career as a whale biologist for NOAA Fisheries in January 1979. I had started working for NOAA Fisheries in January 1977, as a Fisheries Biologist in the Resource Ecology and Fisheries Management division of the Northwest and Alaska Fisheries Center. I had been hired on various short-term contracts to help my fisheries boss, Loh-lee Low, write papers and do computer graphics for figures for our papers. Computer graphics in those days meant I would sit in my office and send

Sally Mizroch Cont.

plotting code using an acoustic-coupled modem (picture an old style telephone handset shoved into rubber cups) from a dumb terminal (like a little typewriter) to a mainframe computer at the University of Washington. To see the results, I'd walk from my office to campus (about a 15-minute walk) to pick up the output.

My first boss was very supportive and encouraged me to apply to grad school because he and I both wanted to strengthen my quantitative skills. I had graduated from college with a strong liberal arts biology background but I hadn't taken very many statistics classes. I applied to the UW's School of Fisheries, specifically in their Center for Quantitative Studies (CQS). The director of CQS at the time was Doug Chapman, a brilliant scientist (one of the International Whaling Commission's Committee of Three), a brilliant teacher and a warm and wonderful person. Doug agreed to be my major professor.

I was one of only two women in my incoming class and usually was the only woman in my stats classes. I used to joke with my fellow students (all guys, but all very supportive) that if I missed class, Doug would look around the class and say something like "Good. She's not here. Have you heard the one about…". But it was just a joke because Doug Chapman was such a decent guy. I always felt fully supported while in grad school.

My first marine mammal boss was Mike Tillman and I met him by lucky coincidence. In late 1978, my fisheries boss needed some life history data for a fish species known as hake. Mike Tillman's Master's Thesis was on hake and I went to the UW's Fisheries Oceanography Library to look up the von Bertalanffy growth parameters in Mike's thesis. His thesis was checked out so I called Mike (his office was a short drive away at the fisheries center's Marine Mammal Division at Sand Point) and arranged a visit to his office to get the parameters. While Mike and I were talking, he realized I was a grad student at CQS and asked if I'd be interested in working on a study of pregnancy rate data using historical whaling data. I couldn't believe my lucky fortune, because as much as I felt supported by Low working on fisheries status of stocks, my first biological loves in college were the study of large mammals and endangered species. Jackpot!

Some people (male and female alike) found Mike intimidating. But he and I were always on the same page about analyses, plus he was secure enough and smart enough to be willing to have really frank discussions about research approaches. I always felt supported when I worked for him and he gave me many opportunities (which I seized) to write as many papers as I could.

Mike encouraged me to submit my first paper to the International Whaling Commission's (IWC) Special Meeting on Sei and Bryde's Whales held in April 1979, just a few months after I started working for him. Starting in 1980, I was part of the US delegation to the IWC's Scientific Committee. I served as rapporteur for Mike while he chaired the Southern Hemisphere Minke Whale sub-committee. As rapporteur, I would write the first draft of the meeting minutes, every evening, right after we adjourned. The report was typed and distributed the next day and reviewed by the sub-committee as we went along. As a rapporteur, I developed stamina for extremely long meetings and I learned how to listen, to summarize and to write clearly. The issues in the minke

Left: Sally Mizroch and Jan Straley in front of the Taiji Whale Museum, February 2001. Right: Denny Zwiefelhofer, Jeff Lewis, Ygor Geyer, Sally Mizroch and Sophie Pierszalowki during a humpback whale tagging cruise in Kodiak, Alaska, July 2008.

Page 14: Sally Mizroch on the Japanese research vessel Yushin Maru No. 3 during the 2014 IWC-POWER cruise.
Photos courtesy of Sally Mizroch.

whale sub-committee were as contentious as could be because minke whales were still being hunted commercially.

I attended a number of IWC Special Meetings while Mike was my boss. At times I was a rapporteur, at times I was a contributing scientist. Some of the older generation of attendees seemed confused by my participation. During a coffee break, one older guy even asked me if I was a secretary. In general, especially in the early days, I realized that the best and most confident scientists, the ones who published a lot, the ones who wrote deep, comprehensive and well-researched papers, treated me like a colleague. The ones who saw me as someone's assistant were generally not the best and the brightest.

My first papers were controversial. Based on the existing literature, researchers had thought that whale reproductive rates had increased in sei and minke whales after the larger whales became depleted by whaling. In 1979, I was given access to the huge, newly computerized database of all the whaling records collected by the Bureau of International Whaling Statistics, which was by then managed by the IWC. This dataset had records for over 1 million dead whales.

The data were on huge magnetic tapes which were mounted for analysis on huge tape drives attached to a huge mainframe computer. I wrote Fortran programs to analyze the data. This was exciting, because the volume of data and the ease of analyzing hundreds of thousands of records at once allowed me to do a proper statistical analysis of the pregnancy data for blue, fin and sei whales. After careful analysis, there was no apparent increase of pregnancy rates of any of the large whales.

My first paper and a few subsequent ones attacked the "gospel" of density dependence in whale reproductive rates. This jolt to the system was significant in the early to mid-1980s when the US delegation was leading the way to initiate the moratorium on commercial whaling. The population models that people were using to develop catch limits always assumed density dependence in whale reproductive rates, i.e., when you've killed off enough blue whales, fin whales have more food and are able to reproduce at a higher rate. Then, when you've killed off enough fin whales, sei whales have more food and can increase their reproductive rate. If there is no density dependence in whale reproductive rates, it calls the population models into question. Whale researchers at the time had actually assumed that sei whales were at amazingly high population levels by the early 1960s because they had assumed that the population had been increasing reproduction steadily as the population of blue and fin whales declined.

I analyzed data dating from 1929-1972, from the start of modern pelagic whaling through the depletion of all the large whale species (blue, fin and sei whales) and there was no evidence at all of a trend in pregnancy rates. It turns out that sei whales were never at high levels and were hunted to commercial extinction between 1963 and 1968. Sei whale catches were banned in 1975, mostly because whaling fleets had trouble finding enough of them to hunt.

In 1982, the IWC voted for a Moratorium on Commercial Whaling to take effect in 1986. I remain proud that I was part of the US delegation that helped put the moratorium in place.

By the mid-1980s, my career focus began to shift. Because I was proficient in computer programming, in 1985 I was asked to develop a computer system for matching humpback whale tail flukes. In early 1986 I went to Hawaii to meet with each humpback whale researcher to see how they managed their data and to learn about their matching strategies. In April 1986 we held a workshop in Seattle to share ideas and test the prototype matching system I developed. We began soliciting photos from all the humpback whale researchers in the North Pacific at this time. In late 1986 I met with the researchers at the College of the Atlantic who managed the North Atlantic humpback whale catalog who helped refine some of the matching methods.

Believe it or not, in the mid-1980s, most researchers were skeptical about photo-ID. For those of us doing matching, it was obvious it worked. For everyone else, it seemed like magic, or maybe even voodoo science. We researchers collecting photos and developing catalogs knew it was a powerful technique to assess vital rates and distribution, but the rest of the research community was skeptical. Even those of us doing photo-ID sort of wondered how other researchers working on other species did it. For example, I'd seen a lot of fin whales at sea over the years, but I had no idea what cues people were using to catalog them.

In early 1987 I was invited by Mike Tillman to an IWC meeting in Iceland. Over drinks one night, Mike Tillman, another researcher and I decided to organize a workshop on photo-ID. We wanted to open up the world of photo-ID to the larger scientific community, so everyone

Top: Dale Rice, Sally Mizroch and Ewan Fordyce, August 2009
Bottom: David Mattila and Sally Mizroch doing humpback whale research in Hawaii, February 2003.

Page 17: Sally with a Bryde's whale mother and calf during the IWC-POWER cruise, August 2014.
Photos courtesy of Sally Mizroch.

could see matching cues for each species, and also so we could learn and share techniques. In 1988 I organized a large symposium for the public and we held a follow-up workshop by invitation for photo-ID researchers. The researchers attending the workshop were required to submit their research paper in advance of their attendance so we could all see their methods and results. Because we had the papers in hand when we held the workshop, we were able to review and edit the papers really quickly. We published our IWC Special Issue on Individual Recognition of Cetaceans: Use of Photo-Identification and Other Techniques to Estimation Population Parameters. However, in one of the first blows in my previously charmed career, I was not allowed by an administrator in my lab to be the senior author on the special issue. I had the support of many of the contributors and some other senior scientists who wanted me to be lead author (I organized and chaired the symposium and I solicited all the papers), but the administrator who made the decision would not be swayed. I decided it was more important to me to have the special issue be published in a timely fashion, so I stepped aside. Then and now, I don't think I would have won a protracted battle to try to change authorship. I'm very proud of the special issue and it did exactly as I'd hoped. It changed the perception of photo-ID in the larger scientific community and also served as a great resource for researchers everywhere developing new projects.

At around this time, the administrator at my lab removed me from the US delegation to the IWC. I was disappointed because some of the world's leading whale researchers attend the IWC meetings. Again, no recourse, so I focused on building the North Pacific humpback whale photo collection.

We planned to hold a series of workshops to estimate vital rates of North Pacific humpback whales using matches from the computer system. We held our first workshops on estimating calf mortality in North Pacific humpback whales in 1991 and 1996, but there was no funding for any subsequent workshops. In spite of this, we published a number of papers using matches from the database, including my own senior-authored paper estimating adult survival of the central North Pacific stock of humpback whales using data from 2,400 individual humpback whales photographed from 1979 and 1996.

In 2003, funding was pulled from my humpback whale photo-ID project and transferred to a new project managed by an outside research group. The decision was made above my pay grade and I had no recourse. Would this have happened to me if I were a tall white male?

What was next for me? During early research cruises I'd fallen in love with fin whales because they are so darn good at being whales. Not only are they elegant and extremely beautiful, but they prey on a wide range of fish and invertebrates, they are fast swimmers and can travel long distances. The population of fin whales pre-whaling was enormous and they sustained whaling in so many places for so many years before the population was depleted. I knew that existing whaling data was a historical treasure trove and recruited my good friend and colleague Dale Rice and other collaborators to work with me on a comprehensive paper on North Pacific fin whales. We analyzed whaling data, sightings data, and Discovery mark recovery data. Based on our analyses, we suggested that there were multiple stocks of fin whales in the North Pacific.

After we finished the paper on fin whales, Dale and I completed a comprehensive paper on sperm whales, using similar datasets. There had been some suggestion of stock structure in North Pacific sperm whales based on limited genetic samples, but we showed that most sperm whales ranged widely across the North Pacific as nomadic feeders likely as one stock. We also showed that female groups ranged further north historically than most people assumed. We also showed that the female population likely remains severely depleted years after extensive illegal whaling by the Soviets was halted.

Next, Dale and I began working on a comprehensive paper on North Pacific sei whales. In 2015 I submitted the paper to the IWC Scientific Committee meetings and was happy to be back at the IWC after my long break. Our paper suggested that there may have been 5 stocks of sei whales in the North Pacific, bounded by North Pacific current systems. Some (non-whaling) researchers found this to be exciting

and loved our oceanic approach. Other (pro-whaling) researchers found this to be controversial. We have been discussing the sei whale stocks issue at subsequent IWC meetings and have been gathering additional data to do modeling exercises to test my hypothesis.

After 39 years working for NOAA Fisheries, I retired from the government in 2016 so I could continue to work on the sei whale paper and other papers independently. I have always considered myself lucky in spite of the various twists and turns in my career. I had some good mentors and supporters at key times along the way, plus I love what I do. Would I have liked to continue with the IWC in the late 1980s? Of course. Would I have wanted to continue to manage humpback whale photo-ID in the North Pacific? Of course. Do I regret having the time to write comprehensive research papers? Of course not.

Over my career, I have been lucky enough to be friends with many amazing whale researchers, most of whom (male and female) have endured hardships in their careers. What we have in common is a love for our object of study and a desire to answer the big questions. Or as Stephen Jay Gould once told me, "To read the book of nature".

In our field, as well as every other, there will be wonderful, supportive colleagues as well as those who are less evolved. At times, I've had to stand my ground when faced with pressure to finish a paper before the data were analyzed thoroughly. My commitment has always been to the research, to try to produce a paper which contributes something new.

Over the years, I've found that I gravitate to researchers who will spend lots of time arguing about incorrect analytical techniques rather than arguing about annoying people. I've enjoyed many an intense dinner (usually with wine) with colleagues trying to figure out how to shift discussions at a meeting to make sure a sound analysis, not a hasty one, is accepted. Sometimes this process can take years but the battle is worthy. In the introduction to our special issue on photo-identification, we highlighted the pioneering work of Roger Payne, Mike Bigg and Charles Jurasz. In the early years of photo-ID studies, all three of these now iconic researchers faced extremely intense

Sally doing humpback whale biopsy research off the Washington coast, July 2001.
Photo courtesy of Sally Mizroch.

skepticism. They persisted because they knew they were on the right track. They and many other researchers who have persisted always inspire me.

And speaking of persistence: Almost everyone, male and female, who tries to work on the leading edge studies will face skepticism and hardship. However, in our society, even well into the 21st century, even more than 40 years after I started my career, even now when there are so many more women in our field, women are still much more vulnerable to losing ground in the face of skepticism. We saw this vulnerability in our election politics in 2016. This almost seems a little worse in 2020. When I was in college (1970-1975), we had a saying (it was even on T-shirts) that "women had to be twice as good to get half as far". This seems to be the case even to this day.

A last note about persistence (which includes some useful tactics). Jane Goodall started her PhD in 1965, a few years before I entered 9th grade taking an amazing biology class from a brilliant African-American teacher, Mrs. Ednae L. Rose. I grew up in the segregated south, Norfolk Virginia, and my junior high and high school were mostly segregated until my sophomore year in high school. We maybe had a couple of black kids in the whole school. The fact that Miss Rose was teaching in our school seemed normal to us (she was fabulous) but in retrospect, it's amazing we had her.

When I was in junior high and high school, I didn't imagine that I'd grow up to be a biologist, even though I loved my biology and chemistry classes. There just weren't very many women biologist role models. I also loved English, psychology, philosophy and pictured myself in one of those fields. Jane Goodall, as we know, also faced extreme skepticism as she developed her studies. But nevertheless, she persisted. I will leave you with the passage below, from a *New York Times* interview, which is a great example of her persistent tactics:

Excerpt from
Jane Goodall interview:
Jane Goodall Is Self-Isolating, Too
The New York Times By James Gorman
March 25, 2020

> Are there achievements of yours that stand out in terms of their future impact?
>
> I was the eighth person in the history of Cambridge to come in without an undergraduate degree. And I was really scared. You can imagine. And of course didn't help when the professors told me I'd done everything wrong. I shouldn't have named the chimps, they should have been numbered. And I couldn't talk about personality, mind or emotion because those were unique to us. But luckily my dog had taught me otherwise as a child. So I could stand up to them, not in an aggressive way. I just calmly, you know, went on talking about it that way. And I remember the first scientific paper I wrote was for Nature and it was about tool using I think. And so I described the chimpanzees, I gave them names and they left the names.
>
> But when I got the article back, they made corrections and they crossed out everywhere I put he or she. I mean, one thing is very clear, the difference between the sexes. But animals were "its." So I angrily crossed out the "its" and they left it. So that was the first breakthrough. And I think because the chimps had been found to be so biologically like us, along with the behavior shown in Hugo [van Lawick's] films and photographs, that really pushed science into thinking in a less reductionist way.
>
> We are not separated from the rest of the animal kingdom, we're part of it. Gradually that's gone more and more mainstream. So that's one thing, helping people understand that animals have personalities, minds and emotions, and now you can study those things.

Kate on the perch during the 2011 bowhead whale census, Barrow Alaska. *Photo by Dave Rugh.*

AN ACCIDENTAL ACOUSTICIAN

KATE STAFFORD

The first time I went to sea, I was just over a year old, and my parents and I were returning from living in Japan (where I was born). Of course, I don't remember the voyage but my mother tells me I was one of the few people who didn't throw up and who could stay upright during a typhoon through which we sailed. Fortunately, those sea legs have (mostly) followed me throughout my career.

Left: Kate Stafford in the arms of her mother Mary (Murphy) Stafford on her first ever ocean cruise Tokyo-San Francisco. *Photo by Roy Stafford.*
Right: Kate during gray whale field work in San Ignacio Lagoon, Baja, California, Mexico . *Photo by Bruce Mate.*

Page 21: Kate soldiering satellite tag battery packs. *Photo by Barb Lagerquist.*

Kate Stafford Cont.

For about the past 20 years, my research has focused on using passive acoustic monitoring to study vocal marine mammals and the environment in which they live. I am lucky enough to have studied animals from the Antarctic to the Arctic and many places in between. At present, I am a Senior Principal Oceanographer at the Applied Physics Lab and an associate Professor at the School of Oceanography at the University of Washington in Seattle. What these fancy titles really mean is that I'm a "soft money" scientist – I have to write (and be awarded) research grants in order to bring in my salary and pay any and all research expenses including funding research assistants and graduate students. On the one hand, if I can convince a granting agency to fund me, I can do whatever I want (science-wise). On the other hand, I have zero job security.

I would say that this way to earn a living is not for the faint of heart. The main reason for this is that it involves frequent failure (for example, funding rates at the National Science Foundation are often less than 30%), and potentially managing up to 7-8 grants at any one time. It's rare that a grantor will support more than 2 months of salary per year for Principal Investigators (PIs), and there is always pressure to reduce budgets (which generally means less salary support because ship time and instrumentation costs are fixed). Soft money scientists (like many NGO scientists) have no safety net - no tenure, no assured salary, no guarantee for the future. I am lucky in that to date I have no debt, mortgage or childcare-related expenses. My week-to-week life these days involves an ever-varying diet of writing proposals, programming and shipping instruments, field work (in some years I am in the field for at most 2 months, but in other years this can swell to six months), analyzing data, writing papers, going to meetings, advising students and outreach. I constantly feel as if I am juggling many things at once; more often than not, I worry that I am dropping balls. Along the way, I have been helped by mentors and senior scientists adding me to their proposals when I was a new PI, by mooring technicians providing advice about mooring designs, and I have always worked with collaborators who bring different, complementary, skills to a project. Collaborating with friends and colleagues, on projects and papers is one of the most satisfying parts of my job.

But how did I get here? I am a military brat which means that my family moved around a lot when I was younger, including assignments in Japan and Belgium, as well as around the US. While in Belgium we lived in a 400-year-old drafty mill near a lake and regularly had ducks wander in the house, the odd swan tapping on the windows to be fed, and hedgehogs snuffling about at the end of the street. My sister and I roamed freely on our bicycles and would try to catch bats at night by the lake with tennis rackets (in retrospect, not the best idea, but fortunately the bats' sonar meant that we were never successful). I suppose nowadays this would be called a 'free-range' childhood; looking back, having the freedom to explore the world around me with the added diet of Ranger Rick magazine, Cousteau documentaries, Wild Kingdom on Sunday night TV, and Girl Scouting put me on the path I'm on today. But that path has been fairly circuitous.

As an undergraduate at the University of California at Santa Cruz (UCSC) I double-majored in Biology and French Literature because I couldn't decide on whether I wanted to be a veterinarian or a journalist. A year abroad spent in France seemed to be moving me towards the latter but that changed with a course I took on Animal Behavior back at UCSC. In addition to classroom lectures, it involved going to the northern elephant seal colony at Año Nuevo state park and learning how to collect data in the field on wild animals. It had never occurred to me that studying animals in the wild could actually be a job. After that course, I volunteered for a number of graduate students who studied elephant seals. Somedays, I would come back from Año with sand in just about every crevice of my body but I couldn't have been happier or more eager to get out there the next day and help where I could. What I saw every day from my viewpoint as a wide-eyed undergrad was female grad students directing their research, driving small boats in choppy waters, and working hands-on with large mammals. There was no "men's work" or "women's work", it was just work. As a female undergraduate intern, I never felt like I wasn't treated exactly the same as the male interns. I wonder now though, how those kick-ass women viewed their experiences as female graduate students in labs that were led by only male advisors.

I suppose the normal path would have been to apply to graduate school during my last year in undergrad but instead, I applied for a Fulbright to go back to France for a year. I lived in a garret in Paris and taught English to French high schoolers while working as an au pair (neither of which, it turns out, were my cup of tea). In Paris, I studied Medieval French literature but also audited courses at the Oceanographic Institute of Paris. It was there that I got to see Cousteau speak in

person to a packed house which re-inspired my desire to study science. So, after a year of being young and poor and living in Paris (apologies to Hemingway) and hitchhiking through southern Europe and Turkey, I returned to Santa Cruz to work for a year while applying to graduate school. I still call that period my "year of slacking" because I worked for the State Parks and temporary agencies, and rode my bike, swam in the ocean, played tennis with friends and shared a tiny house with my sister Jane while researching and applying to graduate schools.

I was fortunate to get into the Department of Fisheries and Wildlife at Oregon State University (OSU) with Dr. Bruce Mate, where I hoped to study how deep sperm whales dive (this was largely inspired by Moby Dick and tales of sperm whales found caught on deep sea cables 2000m below the ocean surface). Fortunately, Bruce had a research project to do just that – put satellite tags with some dive depth information on sperm whales in the Gulf of Mexico. If only it had been that simple. While these days, the OSU tagging group has had many successes on a range of species (including sperm whales), during my master's work, this proved to be a pretty big challenge. Either we could find whales and not get close enough to them, or we couldn't find whales, or the tags that we managed to get on whales didn't transmit for very long… So after numerous field seasons in both the Gulf of Mexico and the Galapagos, and then off central California for blue whale tagging, I had no data. None. I was in full-on graduate student panic mode thinking that I would never finish my master's. Luckily, just down the hall was a group studying the sounds of underwater earthquakes and volcanoes and their data was full of "whale noise." The man who became my PhD advisor, Dr. Chris Fox, offered to let me use those data for a master's degree. To be fair, Bruce had initially suggested this as a project for me when I first arrived at OSU. But, heady with dreams of Cousteau and field work, I longed to be an ocean-going researcher (not that I had any real idea what that meant at that point) and so I jumped at the sperm whale project. By moving to an acoustics-based master's project, I ended up where I would have started, just several years later. Still, I wouldn't exchange the experiences I had in the field or the friendships I forged because of them, even if it meant a more direct route through graduate school.

And so, quite by accident, I started to study blue whale acoustics using the US Navy's underwater arrays that listened to low-frequency sounds in the North Pacific. I was fortunate in that this was a time during which a "dual use" program was in place that aimed to use some Navy assets for civilian purposes like monitoring seismicity, tracking illegal fishing, and studying the sounds of large whales. I had to wrap my brain around an entirely new field of study (and spend my days in front of a computer instead of in the field), but it was as if a whole underwater world had opened. My only prior exposure to acoustics in marine mammal studies was using hydrophones to help find sperm whales. Year-long low-frequency acoustic data were something else altogether. But I was eager to learn (and finally finish my master's degree). Which I did – four years after starting graduate school. By then I was broke, and needed a break from school as I wasn't sure what I wanted to do. I ended up working for Chris on the same acoustic data stream and a couple of years later decided I was ready to get a PhD. I chose this path because I wanted to be able to decide what direction my research went in and lead my own projects. Because I was interested in how the environment influences the occurrence of animals, and I'd had to think a lot about how this environment influences sound transmission, I switched to the Oceanography department at OSU with Chris as my adviser.

During this period, I was fortunate to meet two people in particular who were also working with the Navy arrays. The first was the late Dr. Bill Watkins. It was incredible to meet the man whose papers I had devoured and discover that he was generous with his knowledge, and time, and stories of his remarkable life. This generosity of spirit from someone I considered to be a giant in the field left a lasting impression on me. I would say that, with some exceptions, this has been my overall experience in the marine mammal field. The second person was Dr. Sue Moore. She was the first 'established' female scientist that I ever met and worked with. Sue is confident, competent, smart, and a big picture thinker and I do not think that it is an exaggeration to say that I owe many of my post-PhD opportunities (if not my entire career) to Sue. I ended up doing a post-doc with her at the National Marine Mammal Lab in Seattle (now the Marine Mammal Lab) and continued to work on blue whale acoustics. Through connections Sue had, or facilitated, I ended up working not just in the northeast Pacific but in Brazil, the Maldives, the Antarctic and finally, the Arctic. And the French Literature degree? Turns out it was pretty useful in my current profession. Because I speak French, I have been asked to be on French dissertation committees and established long-standing collaborations with colleagues in France. And every now and then, they invite me to visit!

Looking back on my time as a master's and then PhD student, what strikes me is, as I had witnessed at UCSC, there was no question that whatever needed to be done in the lab or in the field could be done equally well by male or female students. Whether it was building and testing tags, soldering battery packs, or driving boats, Bruce Mate showed no gender bias towards his students, and he was always professional and respectful in the field. For that, I will be forever grateful to him. Chris Fox and his engineer Haru Matsumoto trusted me to program instruments and re-battery acoustic releases. This early experience meant that later in my career when I was first working with mooring instrumentation, including archival

Bowhead whale.
Photo by Kate Stafford.

hydrophone packages and acoustic releases, it never occurred to me that I shouldn't be the one to check (and double check) the o-rings, program and battery instruments and to come up with different ways of getting things done at sea. I was allowed to learn (and make mistakes!) on the job. This assumption of competence (with the right training of course) is how I approach students in my lab and in the field. As a woman in science, I strive to mentor other women. I do this by bringing them into the field with me (both on research vessels and on the ice), by training them to program and refurbish oceanographic instrumentation, and by providing them networking opportunities with other labs, other scientists, students, and PIs. I also make a point of checking in with other students I have met via email, offering to read paper drafts and watch practice talks. I am fortunate to have benefitted from strong female role models but also male allies who gave me the exact same opportunities my male colleagues were provided. I feel a deep obligation to pay this forward.

Generally, I think I was spared a lot of the blatant sexism that still exists in sciences, and always exists when there are lots of smart young women interested in entering a field largely led by men. I am hopeful that things are improving as there are now many labs all over the world led by amazing women (some of whom have contributed to this issue of *Whalewatcher*). Hopefully these days, it's understood to be inappropriate when a male (or female) program manager sunbathes in a tiny too-tight swimsuit in front of students on watch on a ship's bridge. Hopefully a University-owned and run research vessel no longer tolerates girlie posters and postcards mounted in the galley and common areas. Maybe that crew member who wore a remarkable number of misogynistic t-shirts (the least offensive of which was "10 reasons a beer is better than a woman") has to cover those up (or better yet, understands why they are not appropriate). Maybe senior researchers won't casually say to female students that they wouldn't hire female assistants because they get pregnant and then they can't do field work, or that before women were allowed in the Antarctic it was the most peaceful place on Earth. Perhaps the captain of a ship doesn't make a point of telling the women on board that he has assigned them all to the same lifeboat so the "girls don't have to think in case of emergency." I'd like to think these examples from my life are a thing of the past (or less common) and that we have made progress towards women feeling safe and respected in the field.

Where I know we haven't made much progress is in diversity in the marine mammal field. I have been actively trying to be more visible as a woman scientist via public engagement and I have also been thinking a lot about white privilege and economic privilege. How have these influenced who we see as leaders, teachers and scientists? How do we provide equitable educational and research opportunities to students who face social, cultural, racial, and economic barriers? I don't pretend to have the answers to this, I need to listen more and learn more. I do know that when I look at the makeup of the population of marine mammal scientists and oceanographers I see at universities and national and international meetings, I want to see more diversity, and I want to be a part of helping to make that happen.

My path to where I am today has been anything but direct, and is largely the result of things going not quite (or at all) as planned. But because I've had the ability (and the privilege) to adapt, or perhaps because I am tenacious, things have more-or-less worked out. If I had any advice for new students or scientists, based on my experiences, it would be to take your science seriously, but don't take yourself too seriously. Be able to laugh at, and learn from, your mistakes (and forgive those of others). Find time for art, be it music or literature or art exhibits. Vote. Get out in nature as often as possible as a reminder of the incredible planet that sustains us and why so many of us do what we do. And finally, something I am still working on, is to be willing to keep learning and be open to changing your mind: about people, about scientific ideas, about methods, and about what a "marine mammal scientist" looks like.

I have the impression that I just started my career a couple of years ago. But looking back has reminded me that I have had more than my share of amazing experiences, seen so many places on the globe that most people will never see, and met many incredible people over the last two decades or so. And more and more, I want what I do to have conservation implications because I can't remain dispassionate in the face of the changing climate. My work in the Arctic is certainly driving that home. When I first went north I was excited to study the sounds of the Arctic, especially bowhead whales. I did not expect to be using acoustics to listen to climate change in the Arctic. More and more to me, conservation and education is what matters. Not publications or grants or accolades, but applying what we learn as scientists who study the natural world to help conserve that same world, not just for our species, but for all the species with whom we share Earth.

Pacific white-sided dolphin, Mexico.
Photo by Mridula Srinivasan.
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THE ODDITY EFFECT

MRIDULA SRINIVASAN

My identity as a marine mammal scientist is defined by my passion and core interest in cetacean behavioral ecology. With time, I realize that I am also defined by my social identity, i.e., a woman of color and an immigrant— it is this perspective I would like to share.

Mridula Srinivasan Cont.

Early in my career, I did not consider my gender, race, or nationality as being a hindrance or deterrent to achieving my career ambitions. Born and raised in India and briefly, in Africa, my love for animals and scientific curiosity blossomed in a multicultural and STEM-heavy academic environment. As a child, animals fascinated me and enveloped in wild and beautiful Nigeria my interests grew. When not wandering outdoors, I was fixated on watching animal movies and Attenborough, Jacques Cousteau, and other nature documentaries. One documentary on humpback whale song piqued my interest more than anything else — and just like that, a simple childlike curiosity about a singing whale changed into a full-fledged desire to learn more about marine mammals and the oceans. By the time I was in middle school, I knew I wanted to be a marine biologist and ultimately, study marine mammals. I had no idea what I would specialize in or what question I would ask – all I knew was I wanted to study animal behavior in their natural habitats. Later in high school and college, the works of Darwin, Huxley, Tinbergen, E.O. Wilson, and Lorenz inspired me to sharpen my knowledge of the theoretical concepts of ethology.

Compared to my peers in India, I had a somewhat privileged and carefree upbringing allowing me to explore the outdoors, travel the world, experience different cultures and school environments, and develop a natural affinity and empathy for different people and animals. While Math and Science were the focus in school and college, there was little thought given to stimulating independent thinking and questioning, and non-traditional career streams. Thankfully, my parents never dampened my enthusiasm for science. During the crucial years, my mother and brother encouraged independent learning and helped me develop critical thinking, problem-solving skills, and a voracious reading habit of fiction and non-fiction that continues to this day.

My extended family provided other sources of inspiration. I was surrounded by strong, spirited, and progressive family members. The superwomen in my family taught me everything I know. Even today, I am guided in life by the wisdom of my maternal great-grandmother, grandmother, mother, and aunts. They taught me to dream, never stop learning, to accept wins and losses equally, embrace positivity, and to look ahead. However, despite my strongest desires, my family could not send me to do foreign internships or even seek wildlife experiences within India. There were no colleges or universities in India that offered marine biology degrees, let alone marine mammal science. Most of the places I grew up in were land-locked and studying marine animals was a distant thought. Still, undeterred by peer-pressure, I set my sights on a college degree in Zoology. I knew eventually that to study and make a career in marine biology and marine mammal science, I had to travel to the United States for advanced degrees and training. In the end, despite debilitating personal struggles and embittered academic environments, I learned to persevere to become a marine mammal scientist. Undoubtedly, the early grounding and training I received from my family prepared me for life in the United States and beyond.

When I first arrived in the United States as a graduate student wanting to build my marine science credentials (of which I had none), I realized that "who I was" was more important than "what I did or was capable of." I grew up with the belief that the United States was a meritocracy. But when you are "different" from the rest, it is not smooth-sailing. During my

Humpback whale. Kaikoura, NZ. Taken under NZ permit.
Photo by Mridula Srinivasan.

Page 24: Left: Fin whale, California Current.
Photo by Mridula Srinivasan. Property of NOAA. NMFS Permit 14097-04.
Top: Mridula trying on a survival suit on a NOAA cruise.
Photo by Suzanne Yin.
Bottom: Mridula at home in Bauchi, Nigeria.
Photo courtesy of Mridula Srinivasan.

master's program in the United States, I experienced lost opportunities and indifference whether related to grading, financial awards, conducting projects, or just being accepted in social circles. With only four female students of color in the entire department of nearly 100 plus undergraduate and graduate students, we were aware of the differential treatment. I thought we were just not good enough compared to the other marine science students – which was true because I lacked many skills that my peers had. But we got no encouragement or support to excel. I had to outcompete my peers who had access, opportunity, and early exposure to the marine sciences.

My initial foray into the marine mammal field was largely due to timely interventions by mentors in the field, like Dr. R.H. Defran, who helped me select suitable graduate schools and internships to fill gaps in my skill set. My mentors were gracious, earnest, and supportive of my career path. Occasionally, during doctoral studies, work experiences, and in-field settings, I was irked about being an outsider and feeling isolated. Looking back now, those academic years were tough, but it was tougher in the professional workspace. I recognized that any behavior I perceived as offensive might be considered perfectly acceptable in the workplace and often, unconsciously performed. Entrenched bias or homogenous workplace cultures can be hard to change since most in the marine science workforce have limited to no interaction with cultures other than their own. These problems are not limited to the United States or countries dominant in marine science. Regressive attitudes and marginalization of less privileged communities pervade other nations where marine science professions do not exist.

Still, it is not all doom and gloom. At the end of the day, at the core, I am defined by my work ethic and performance. Doing my daily job and working for marine mammals and in marine conservation, gives me the motivation to overcome the vicissitudes of the profession. Besides, there are more kind and understanding people than negative ones. And meritocracy remains dominant in the United States workplace despite failings. For every lost opportunity, there are many other doors that open, and it is important to grasp even the slightest chance.

Consciously, in life, I seek and surround myself with positive, inspiring people. My mentors and life coaches have ranged from a neurologist, foreign service officer, civic administrator, a businessman, to the former Under Secretary of Commerce for Oceans and Atmosphere, Dr. Bill Evans and former NOAA Research Assistant Administrator, Dr. Rick Spinrad, who in my opinion, was one of the finest leaders I have ever encountered in recent times. I was also privileged to have a brilliant and top-notch Ph.D. advisor (Dr. Bernd Würsig) and committee (Drs. Bill Grant, Jane Packard, and Ben Wu) — they continue to be esteemed colleagues that I respect, admire, and rely on whenever I need advice. Early in my professional career, I met other marine scientists like Drs. Lisa Ballance, Rebecca Lent, and Sarah Mesnick, who helped me navigate the trenches of building a career in marine mammal science at NOAA.

I continue to work on strengthening these relationships and do not take their support for granted. I was instantly drawn to them for their kindness, willingness to impart wisdom, and knowledge without looking for a benefit in return. I never had any formal mentor-mentee relationship or any declaration of mentorship with any of the people listed above. I got advice from people I admired and could learn from and when I needed it. I have had few mentors in my career, but they have rescued me from despair at life's various turning points. Further, with every research activity, fieldwork, or project collaboration, I encounter extraordinary students and marine mammal researchers globally that help me rediscover the joy of studying marine mammals and motivate me to be a better human being and scientist. That said, my husband and family, remain my pillars of strength and perpetual life consultants.

The journey to my present professional appointment has been long and arduous but worthwhile. I continue to covet new challenges that expand my learning and skillsets – novel life experiences keep me going even with professional setbacks or career inertia. These days, however, I spend a lot of time thinking about the next generation of underrepresented students of color and the barriers they face to succeed in marine mammal science. When I attended my first Biennial Conference on the Biology of Marine Mammals in 2003 in North Carolina, I was surprised by the lack of diversity among the attendees and skewed representation of male professors and presenters despite the majority female student membership. Nearly two decades later, things have changed (slightly) but the progress is inadequate in nearly all marine science and marine mammal conferences I have attended. I am still struck by the lack of people like me. Truthfully, it is hard to maintain longevity in the field. Achieving a leadership position as a woman scientist is hard, being a woman of color just compounds the struggle and scientific studies support that assertion.

Left: Mridula Srinivasan scanning in Admiralty Bay, NZ.
Right: Short-beaked common dolphin, California Current.
Property of NOAA. NMFS Permit#14097-04
Photos courtesy of Mridula Srinivasan.

The question then must be asked— Can a woman of color succeed in the marine mammal field? The answer is a resounding YES. The reason is that we are not alone in our struggles. There are other women of color globally who have sacrificed and succeeded in shattering many obstacles in marine mammal science and STEM fields. The next crop of scientists can stand on their shoulders to look farther ahead and attain new heights. A word of caution to future scientists — follow the collaborative research spirit and do not shun genuine support from all quarters of the scientific community. Do your best to associate with other underrepresented groups globally and build each other up. I have benefitted from seeking comfort and advice from other minority or immigrant friends within and outside work due to a common understanding and shared experiences. For my part, I believe that I have a responsibility to encourage and empower women and men of color to enter and succeed in marine mammal science. The marine mammal field will be enriched with these new entrants as have Silicon Valley, Health, Legal, Space, Finance, Auto, Aviation, and other industries.

One thing is clear to me, if you are skilled, hardworking, and committed, you will be rewarded regardless of who you are. Yes, you may not be the first, second, or even third choice. You may be sidelined among other competitors. But you must work to be the best and not feel perpetually victimized. At the same time, I believe, the marine mammal community needs to do more to eliminate the marginalization of certain communities.

We – the marine mammal community – should educate ourselves and embrace different individuals, not just the popular ones who conform to norms and deep-rooted views. We need to do better to attract students of color early in their school lives. Students and researchers of color can provide a refreshing perspective on research or conservation practice, bring novel skill sets and thinking to solve complex research and conservation problems even those without established marine science credentials.

Parting words for aspiring scientists of color...

- Be inspired to pursue your marine mammal scientific dreams. Seek inspiration from people you admire, species you care for, or conservation problems that affect you.
- Seek mentors who care for you and are prepared to invest in you. If they share a similar personal journey, culture, or race, even better.
- Identify multiple mentors, each with different strengths who can instruct and guide you on the proper path and problem-solve when the time comes.
- Work hard, dedicate yourself to the task, no matter how small. If you are given an opportunity, give it your 200%. A good first impression can do more for your professional journey than a dozen internships. But don't worry if you have a few bad experiences in the beginning– Learn from your mistakes.
- Be collaborative in life and research. Lose your egos and work equally with experts and novices in the field – We are working towards a common goal.
- Be prepared to be slighted or offended by ignorant and negative people. Do not get demoralized, be motivated to be better than them.
- Share resources and experiences with other minorities and underrepresented communities, collaborate professionally, build networks, and support each other's careers.
- Do not accept injustice and inequality so easily in the academic or work environment. If you can, document and use all proper channels to address the issue. Build professional linkages to help garner support. You are not alone.
- Let your professionalism do the talking and do not always suspect malicious intent in the professional or academic workspace.
- Be humble—They are many bright, talented, knowledgeable folks out there – learn from them and never stop learning.
- Persevere—It is a marathon. As a minority, you will face more roadblocks, challenges, and setbacks than your peers, but do not give up. Your success will be twice as satisfying.
- Smile often—Your moment will come to shine with the right attitude, competitive skill set, and a strong peer network.

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SEA CHANGE: REFLECTIONS ON A CAREER AS A FEMALE MARINE MAMMAL SCIENTIST

LISA T. BALLANCE

"Remember, you are here as a scientist, not a domestic helper." This was the advice whispered to me just after dinner by my master's adviser. The year was 1984. I was a graduate student, just beginning to learn what field science was. We were at the home of a person who was to me a "famous" marine mammal scientist. Aside from his wife, I was the only

Left: Lisa's early introduction to bottlenose dolphins off Mexico in the late 1960's.
Right: Olive ridley sea turtle in the eastern tropical Pacific with Carl Safina and Robert Pitman.

Page 27: Lisa with a type C killer whale in McMurdo Sound, Antarctica.
Photos courtesy of Lisa Ballance.

female. My upbringing had taught me that it was common courtesy to help clear the table after dining at the home of a host. As I instinctively prepared to do that, my adviser held me back. There were two powerful lessons in this simple sentence. Women and men are taught to behave differently by society; and society in response, treats them differently. And advocates can be male or female (my adviser was male), as can be adversaries (more on this later).

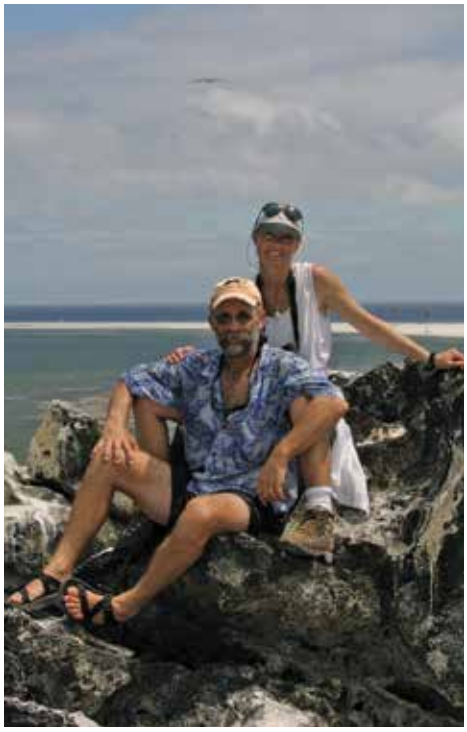
Fast forward to 2019. It would have been my father's hundredth year. I am a member of an international scientific team in the ocean south of Cape Horn that obtains the first biopsy sample from a live "Type D" killer whale, an almost completely unknown ecotype, perhaps the least known large mammal on the planet, that could turn out to be a new species. After 31 years with NOAA and what I could characterize as a love affair with our agency's mission and my colleagues, I accept a new position in academia, bringing personal and professional upheaval and rebirth to my life. I and my family suffer an immense loss with the death of my mom's partner, a second father to me. I turn 60.

Today, I am Director of Oregon State University's Marine Mammal Institute, Endowed Chair of Marine Mammal Research, and Full Professor in the Department of Fisheries, Wildlife, and Conservation. I have 31 years of experience with NOAA (National Oceanic and Atmospheric Administration), conducting research on cetaceans and seabirds around the world, including the tropical Pacific and Indian Oceans, Antarctic waters and the greater Southern Ocean, the Bering Sea, Maldives, Clipperton Atoll, and Cambodia's Mekong River. Among my two most significant positions with NOAA: Director of the Southwest Fisheries Science Center's Marine Mammal and Turtle Research Division for over a decade, providing scientific leadership and oversight of some 70 scientists with a $9M annual budget; and Chief Scientist of NOAA's Eastern Tropical Pacific Dolphin and Ecosystem Assessment Surveys which have provided the scientific basis for the "Dolphin Safe" label found on tuna cans in supermarkets all over this country. I hold a Ph.D. in marine ecology, an M.S. in marine science, and a B.S. in biology, have published over 100 peer-reviewed papers, working papers, and technical reports, been invited to speak at dozens of scientific conferences, universities, public lectures, and congressional briefings, and been awarded research funding from a wide variety of sources including National Science Foundation, U.S. Navy, and Bureau of Ocean Energy Management. In my role as professor, I teach and advise graduate students and post-doctorates, and serve on a variety of academic steering committees and working groups. I am recipient of the Department of Commerce Bronze and Silver Medals, NOAA Fisheries' Supervisor of the Year, and have been featured on the cover of the Association for Women in Science.

It is an honor to be invited to contribute to this issue. And it is a surprise. Of course, I know of (and have met a few) people with what seem like other-worldly talents. I speak of the "big names" in our field, people of great ideas, high productivity, striking innovations, riveting presentations, and easy charisma. Some truly are other-worldly. I am not one of these people. Yet, as I age, I believe more and more that most of us have the potential to achieve greatly, to make important contributions to our field. Our greatest skill is our passion and the desire to throw all that we have at our highest priorities and aspirations. And in this way, we all have much in common. What is not common among us, what we do not share is equality of good fortune, and here I speak of two things. First the breadth and depth of positive influences in our lives in the form of people who can, and will, support, nurture, and facilitate our growth, as a person and as a professional. And second, the good luck to be born in the right place, at the right time, in the right society. Let me explain.

I have been fortunate to have been surrounded by people who, through the course of my career, have positively influenced, facilitated, and supported me professionally (and personally). A giant in the field of cetacean biology who, during my doctoral research, schooled me in the basics and fine points of the physical and biological ecosystem in which we were working, shared insights and data and offered collaborations and the opportunity to take the lead. A senior leader in my agency who, even as this person was promoted up the ladder and continued to excel, repeatedly appeared throughout my career, magically it seemed at the most critical junctures of my professional path, with opportunities and advice for my own advancement. Another high-level leader who, just after I had begun a new position, reached out to me with an offer of an informal lunch, an open door for the future, and a clear message directed to me: "We leaders here (I was clearly being included in this descriptor), we have each other's backs." My husband and closest colleague: comfortable with a professionally ambitious female, willing to share his own remarkable insights with me, to let me take them and run. I owe a huge debt to him for my professional success. And my parents, who taught me from the very beginning that I could do *anything*, and (I know now, that literally through their blood, sweat, and tears) made that possible.

I have, to be sure, had challenges associated with being a female in our society and in a male-dominated profession. 1974: my high school girlfriend and I are trapped for three hours, twice a week, for three weeks with our Driver's Ed instructor who, while



Left: Lisa with husband Robert Pitman at Clipperton Atoll in the eastern tropical Pacific. Right: Lisa photographing while Robert Pitman attempts to place a satellite tag on a type B2 killer whale in the Weddell Sea, Antarctica. *Photos courtesy of Lisa Ballance.*

we drive, talks about and asks questions focused on sexual topics. We don't know what to do, so we do nothing. 1980: I ask for a letter of recommendation for graduate school from a professor. His wife (also a professor) meets with me to say "No, you need to learn how to use your mind, don't wear your clothes so tight." 1982: I am on a summer internship in the field. Much of my evening work is conducted in the senior scientists' room, during which he repeatedly massages my neck, shoulders, arms. I need a letter from him for some evidence of success in this internship for my graduate school application, so I just sit there, with fear and discomfort, and take it. 1988: I have just begun my doctorate. An authority figure two levels above me gives me an expensive piece of jewelry. What does this mean? I barely know this person. 2018: We are five peers in the larger work unit – each of us oversees 2-3 levels below us. The position above us is vacated and an "acting" is needed to temporarily fill it. Although I am the senior of the five (in this role longer than any of the others), and the only woman, three of the four males are cycled through the acting role. I am never asked to act in this role. For me, these were examples where my professional capabilities were discounted because I am a female, or where males used their positions of authority in inappropriate ways. A few of these experiences left deep scars; all made me stronger. And I want to make it explicitly clear, that I encountered strong allies in both males and females, and endured destructive blows from both. In the examples above, 4 of the 6 allies were males, and 2 of the 5 adversaries were females.

Fortune. I was born into a wealthy country, where education tends to be a given. I am of the race that our society tends to promote. And although I am female, I am a professional at a time when women are increasingly successful at fighting for professional equality. Doors were open for me that have historically been closed to women.

Common wisdom is that hindsight is 20/20. So, what is my advice to you, reader of this piece? 1) Follow your passion, even when it leads you on paths that point against all odds. If you have the fortune to do so, you are not likely to look back and regret that time spent. 2) Seek out mentors. And be aware that great names are not necessarily great mentors. 3) Understand that life is inherently unfair. Society is composed of parts that are not equal. You will almost certainly be the undeserving recipient of blows associated with these truths. Take each as they come; assess and move on when you can allow yourself to do so. When you cannot, take on the unfairness. But do so in a constructive way. Don't fall prey to victimization, anger, and resentment. They can be deeply destructive. 4) Encourage those around you to change preconceived notions about who can be successful. Lead by example. 5) Think critically. Question authority. Be true to your principles. And, sadly, be aware that these practices can make you vulnerable, and the fallout can be severe. 6) Finally, and here I return to something I have already written, remember that although we may have vastly different backgrounds and opportunities, we all have the same right to succeed, and we all have deep-seated passion that brings power. Have confidence in yourself. Instead of looking on from the sidelines in awe at those currently considered to be the leaders in our field, get out on the dance floor and be part of the action. The world needs you.

FROM BATS, TO SEALS, DOLPHINS AND WHALES

A GLOBAL TREK TO MAKE A DIFFERENCE

SOFIE VAN PARIJS

Bats in the UK Country Side

I never imagined when I started my career that 25 years later young women would tell me that they looked to me as an example of how to be a successful marine mammal scientist, actively working in the field of bioacoustics, with a husband, 2 children and a balanced work/life style. It never occurred to me at the time that I might need to make a choice between having a family and having a career, in particular a career that I was passionate about. This was not because these issues were not part of my generation, it was simply that I never looked that far ahead. I was passionate about bats and communication and this is what I wanted to study and work on. As an undergraduate at Cambridge University in the UK, I set out to find a field project on bats during my summer vacation. In doing so I wrote so many 'can I please work on bats?' letters that I lost count of the number. As is always the case though and is important to remember, you really only need one person to reply to set you on your way. I was thankful that a Professor at Bristol University, Gareth Jones, wrote back to offer me unpaid work on his research project recording pipistrelle bats around southwest UK. Luck did come my way in that he put me to work collecting data on pipistrelle colonies in different areas which led to the discovery that they were two rather than one species based on their difference in echolocation. Luckier still, he wrote a paper and put me on as a co-author. This opened up my next path for me in a way that I could never have imagined. I was not scientifically brilliant, my grades were decent but I had no capacity to sell myself or my science, I was painfully shy and insecure but keen and persistent. Gareth's kindness in including me on this research paper is something I never forgot. It gave me the leg up that I needed and it made me very aware of the value of helping others advance in their careers.

Scottish Seals in the Highlands

When I began my search for a PhD project, I looked at the US but was terrified of having to take GRE's so kept a firm eye on the UK. Again I wrote to everyone I could think of asking for opportunities to work on bats. A bat expert, Professor Racy at Aberdeen University wrote back, telling me he didn't have any projects but that a colleague of his, Professor Paul Thompson, who worked

Sofie with bioacoustics equipment. *Photo courtesy of Sofie Van Parijs.*

on marine mammals did. I was rather disappointed, who wants to work on marine mammals after all when you can work on bats? However, the project sounded fun, we were going to find out if male harbor seals made underwater mating calls, since no one really knew for sure. Thankfully for me, they did, even though the calls they make sound like a toilet being flushed so are not very glamorous to listen to. This is where my journey started into marine mammal science, not by desire, but by opportunity. The Lighthouse Field Station in northeastern Scotland was a wonderful place to spend time throughout my PhD. In the winters we were a small group crowded in a damp, leaky lighthouse keeper's cottage huddled by the heater drinking tea. While in the summers we were out driving the land rover on the beaches, catching and tagging seals, radio tracking them from cliff tops and taking to sea to photograph dolphins. I took courses in cartography, earned my large vessel license, learned to drive on sand, wrangle seals with large teeth and helped out in the auxiliary coastguard. I learned to fix outboard engines, to solder my own acoustic preamplifier boards and pot free hydrophones donated by the UK air force. We helped each other out and learned to do an awful lot with a little. People often talk about how doing a PhD is hard and seems never ending, however, I found the question of what to do next the hardest. There was no one helping me onwards. The enquiries I wrote to try and find a postdoctoral position didn't amount to anything concrete. Even though I had 4 papers published from my thesis, I seemed to be competing with people who were way better than I was. No one seemed to want a marine mammalogist, I would have been better off sticking with bats. So... I went to the 1st World Marine Mammal Conference in Monaco with no job, very little money and no idea of what to do next. What happened? I met the love of my life, an Australian researcher called Dr. Peter Corkeron, to whom I have been married for over 20 years now.

Inshore Dolphins Down Under

With a lot of applications in and nothing to do I bought a round the world ticket and went to visit Peter in Australia, why not? He had a research project starting up on Indo Pacific humpback and Snubfin (then Irrawaddy) dolphins and needed an acoustician to help out, perfect! So I moved to lush hot insect ridden tropical Australia and spent long days on the water in oppressive heat looking for elusive inshore dolphins. It taught me that working on seals is awfully straightforward since they spend at least part of their day out of the water. It was here that I started to understand what it meant to work in conservation biology. Watching Peter's passion to understand and protect these

threatened and little known species was inspiring. I had only thought of science as an intellectual pursuit, gaining knowledge of a species and its environment. It hadn't occurred to me what it meant to work in areas that were not as heavily affected by humans compared to the European North Sea. It taught me a new understanding of what nature should really be like and what we've already lost. Imagine my joy when I set up a side project studying the acoustics of fruit bats! Just as I was settling into life in Australia, I heard that I'd been awarded a Marie Curie Postdoctoral fellowship to work with Professor Kit Kovacs on bearded seals in the Norwegian Arctic... what to do?

The Land of Ice and Snow

We moved to northern Norway in November, to a town with 6 foot high walls of snow and 2 months of total darkness. I said we, because Peter gave up his position at James Cook University in Australia and came with me. When there are discussions about how women often have to make sacrifices in the workplace to maintain a relationship or family, it is important to remember that there are men out there too who are prepared to make these hard decisions, who choose to put their relationship or family before their careers. To be a successful women in science I have found that it really helps to have a partner who meets you halfway, in this case way more than half way. Field work in Svalbard, the Norwegian Arctic Islands was unbelievably beautiful. In the spring time the islands are covered in a white blanket of deep snow, with glaciers spewing out at the mouths of fjords. I worked mostly on the acoustic underwater behavior of bearded seals who produce long alien-like trills that make you think there has been a supernatural underwater invasion. Field work involved driving around on snow scooters or small metal boats from one fjord to the next to make recordings at the ice edge. My scooter would frequently get stuck in snow drifts and my helpful Norwegian field assistant would come, pick up my heavy scooter and put it back on track, shaking his head wondering how I ended up stuck in the first place! Amongst other useful skills, he taught me how to shoot a WWII rifle and use a flare gun in case we came across a polar bear, as well as how to break through ice in our small metal boat when we were trapped by ice floes. Kit and her partner, Dr. Christian Lydersen, took me on many adventures catching and tagging bearded, ringed seals, walrus and belugas. We circumnavigated Svalbard in a sailboat. I also was able to go to the 'West Ice' off of eastern Greenland to record harp seal pups and record killer whales as they gorged on fish discards in a Norwegian fjord. All of these were out of this world experiences. However, Norway was a really tough place to live, especially for someone like Peter coming from tropical Australia. After a near death experience giving birth to our daughter and 4 years with many dark winter nights, we decided to take a leap of faith with no long term job prospects in site and nowhere to go. It was terrifying.

Conservation Acoustics and NOAA

What do you do when you have nowhere to go? You talk to your friends and colleagues that you've met along the way and ask them for help. Professor Chris Clark, offered us a place in his research lab at Cornell University, allowing us time to figure out what life was going to bring next. Another colleague of mine from my pinniped days, Dr. Brandon Southall, put me in touch with Dr. Richard Merrick, the head of the protected species branch at the time, at the Northeast Fisheries Service in Woods Hole, MA. He was looking for an acoustician to run a pilot project on ocean noise and right whales. This seed project

Sofie's student, Ilse Van Opzeeland, recording a harp seal.

Page 33: Left: Sofie with harp seal in Norway.
Top: Small boat in Norway.
Bottom: Killer whales off Norway.
Photos courtesy of Sofie Van Parijs.

led to the permanent job I have now, one of the first positions that was created within NOAA for a passive acoustic research scientist. My job was a blank slate when I walked into it, but the years of experience around the globe have shown me the value of gaining perspective, understanding different oceans, environments, species adaptations and societal attitudes. It is this and my conservation minded dedicated marine mammalogist husband that have made me understand the value and urgent need for conservation biology. Which is why I chose from the start to focus my job on using acoustic technologies for the purpose of conservation. My research program has grown enormously starting off simply focused on finding endangered baleen whales and other cetaceans using their sounds. It has expanded to understand long term distributional, behavioral changes and anthropogenic challenges for all marine animals. We also use acoustics to identify spawning aggregations of overfished fish species, characterizing soundscapes to monitor the long term health of a habitat and monitor illegal vessel activities in marine parks. The initial seed project on ocean noise and right whales grew into a larger project working with Chris Clark, and Dr. Leila Hatch. Leila started her job at the National Marine Sanctuary Office, NOAA in Scituate, MA, at the same time as I started my job. We have worked together these past 14 years and have developed an amazing relationship which spans from deep loyalty, trust, support, friendship and a shared belief in doing meaningful science that will make a difference. Together we've put our joint effort into expanding the value of passive acoustics and its use throughout sanctuaries, marine parks and other ecologically important areas. Working within an institution like NOAA is both a blessing and a curse. Passive acoustics was not well known when I started and although there was much encouragement, there was little financial support to do any research. However, this is where my long history of making things happen for myself by writing grants, putting out new ideas and being resourceful paid off. I received funds to work on research from outside of NOAA and largely still run our passive acoustics research program through this mechanism. It makes us need to stay competitive and always come up with new creative solutions and ideas. Over this time, my research group and I have made major inroads into increasing an understanding of the value of using sound as a tool for understanding the oceans.

For Those Young Aspiring Scientists

My time in Norway was marked by my first ever students. I took on three undergraduate honors students and for the first time was able to start to help others become who they wanted to be as scientists. Dr. Ilse Van Opzeeland was so keen on the project I had to offer, recording harp seal mothers and pups, that she chose it over working on chickens in the basement at Groningen University in the Netherlands. Did she regret her choice? Well, she spent the wild trip out to the West Ice sick and immobile in her bed. To this day she swears that halfway to the ice pack, that chicken project was looking really good to her! Once at the ice pack, the ocean swell disappears and you are left

Left: Sofie trekking the arctic expanses in Norway.
Right: Norwegian sky.
Photos courtesy of Sofie Van Parijs.

with an ocean filled with flat pancakes of ice upon which thousands of hooded and harp seals and their pups lie. We would be helicoptered from the ship to the ice pack, and when the helicopter left and the ship was behind the horizon, it was as if you were no longer on earth. The sensation of feeling so removed from humanity was incredible, it felt like being on a different planet. So, I think she ultimately was happy with her project choice. Ilse is now a scientist at the Alfred Wegner Institute in Germany, working on polar acoustics, I was on her PhD committee and still work with her today. Dr. Denise Risch came to me from Humboldt University in Germany and Nina Jensen came from University of Oslo, Norway to work on bearded seal acoustics. They both spent a month at Cornell in Chris Clark's Bioacoustics Research Program. Denise explored the geographical variation in bearded seal trills across the Arctic. After her thesis she joined me in the US and has since worked with me for many years, including during her PhD. She is now at the Scottish Institute for Marine Research using acoustics to listen for marine mammals in UK and European waters. I still work with Denise whenever possible. Nina looked at how changing ice conditions affected bearded seal trills and, inspired to make a difference, went to work for and eventually led Norway's World Wildlife Fund. She is now the CEO for RevOcean, a multimillion dollar venture aimed at ocean exploration and conservation.

What is most important to me throughout the careers of these young scientists and others since then, is to make sure that whenever I could help them find the next step or some work to tide them over, I would help them find this. Having struggled so much to find my 'next step', I enjoy helping others through that tough time whenever it is possible for me to do so. Seeing those in my research group past and present... just a few of these are Danielle Cholewiak, Genevieve Davis, Annamaria DeAnglis, Jenni Stanley, Paul Caiger, Tim Rowell, Rob Valtierra, Joy Stanistreet, Julianne Bonnell, Keith Hernandez, Heather Heenehan, Liz Vu .... grow and find their way is what makes this task so enjoyable and keeps my desire to keep going strong. My position has allowed me the freedom to create and raise a group of scientists who all will hopefully walk into their 'next thing' with an understanding of the value of using acoustics for conservation and the urgent need for us to use our science for the improvement of our oceans. You don't need to be the smartest, you need to be motivated, work hard and be keen. Marine mammal science and conservation especially requires tenacity and a belief that we can do better, because we can. Connections and relationships are what build your next opportunities. These do not just need to be tenured professors, they can be anyone, people you meet in the field, at a meeting, via email, planning a project. They may be the ones who cook the food, teach you to fix your equipment or help you run a statistical test. You don't know who it will be who will help you when you next need it, so be open, collegial and work together. My position allows me to make sure I don't repeat the things that bothered me as a student. I reply to all my emails (no matter who is writing), I make it clear that not everyone is a great orator and that in time you can get better, I make sure to be inclusive... it is your choice to do likewise when you become a scientist in your own right. We are facing a very serious conservation crisis on land and in the oceans. It's not going to be for the faint of heart. We can't all have the career we dream of but we can make ourselves into someone worthwhile who is doing their bit to improve our environment. Travel, go see other oceans and species, see what it means to be in a productive ocean versus a depleted one, learn what it means to see a healthy whale versus a sickly emaciated population, like the North Atlantic right whales. Gain perspective so that you can better understand what the environment used to be like and not presume that what you see is how it's always been. Understand different cultures and human challenges. Explore, speak up, appreciate and give back.

Jom during a survey off Lubang Island, the Philippines. *Photo by AG Saño.*

WHEN A WHALE LANDS ON YOUR LAP

JO MARIE ACEBES

Unlike many people in my field, I did not grow up wanting to be a biologist, let alone a marine biologist, and I definitely was not inspired to study cetaceans from my first visit to a marine park. My first visit was to Sea World in San Diego during my family's first trip to the U.S. when I was 13 and somehow surprisingly, the performing orcas didn't stick with me. It was the sea otter that got me! I just thought they were super cute!

I didn't even see my first whale in the wild until I was 25 and it wasn't in the Philippines either. It was during another visit to California. It was just a blow from afar while I was sitting in a golf cart while waiting for friends. I wasn't even sure what I saw.

Jo Marie Acebes Cont.

Although my memory isn't very clear about it, according to my elementary school yearbook, I wanted to become a lawyer like my Dad. But somehow that dream dissipated. What I do know is that even as a young child, I loved animals. I've had so many different kinds of pets from ducks, birds, fish, dogs, cats, even a civet! But yes, that was way back when I was too young to understand what was right and wrong about keeping wild animals as pets and before any of those laws were passed in our country.

Fast forward to my senior high school year, I remember wanting to apply for a veterinary medicine course. But my parents had a simple answer, "no, that university is too far, take biology instead in any of the universities within Metro Manila." Born and raised in the Philippines, my parents' generation and the ones before them were believers in only three promising careers or "real" professions: doctor, lawyer or engineer. You pick one. And I completely understood that, it was never easy for them back then and being any one of those three guaranteed them financial security so that's what most people aimed for.

Being the dutiful daughter that I was (or more like, I wasn't that hardcore into a specific career yet), I followed their advice and took biology. I thought, ok, I can be a doctor. A "real" doctor, as my mom called it.

I finished my Bachelor's in Biology and got accepted to a medical school together with my friends. It was all good. Until after 4 months into med school I started getting sick. I had unexplained fevers and the doctors didn't know what was going on. In the end, the doctors thought it was all psychosomatic – that my body (and mind) wasn't ready for med school so I was advised to take a leave of absence. I was assured that I could just come back a year later and pick up where I left off. It was that year that led me to veterinary medicine. During that break, I took a part-time job and found myself checking out the veterinary medicine program at the University of the Philippines in Los Baños – that far away university my parents didn't want me to go to in the first place. Without my parents' consent I submitted my application, took the entrance exam and got in. Telling them about my plan to enter was devastating to them, especially my mom, but my Dad was a lot more understanding and with his help my mom learned to accept it. Vet school came relatively easy for me so I thought it was my calling. Even back then, I had no interest in cetaceans, I was looking into primates…the closest species I could get to in the country at least.

It was during my college years studying biology that I got really interested in primates and large cats, both animal groups we don't have in the Philippines (not counting macaques). I remember browsing through my Dad's old copies of the National Geographic Magazine and distinctly remember finding a copy with Dian Fossey on the cover. That began my little obsession with mountain gorillas. I watched documentaries and movies, read magazines and dreamed of going to Africa to see them. By the time I was in veterinary school, I was hell bent on becoming a wildlife veterinarian in Africa. I even tried looking for wildlife veterinary internships in the U.S. but as fate has it, there were too many roadblocks that prevented me from even qualifying to apply, mainly because I was Filipino. So, there I was, a fresh veterinary medicine graduate with a shiny new license and nowhere to go.

In search of jobs in wildlife medicine, I tried our local zoo and volunteered, but in a week, realized it wasn't for me. The real journey into cetology really began shortly after that. My Dad was driving me from a local animal shelter where I went to check out volunteer opportunities and remembered a friend's advice to check out the office of

Left: Jom after her exams at Oxford University.
Right: During a small boat survey off the Babuyan Channel.
Photos courtesy of Jo Marie Acebes.

Page 36: Jom conducting fieldwork off Babuyan Islands, the Philippines.
Photo by Sonny Thakur.

WWF-Philippines. Since it was within the area, we went there. I was only planning to drop off my cv but fortunately, the head of the Species Unit back then, Dr. Yaptinchay, was available to talk to me. I don't remember now exactly how that interview went but it was the meeting that steered my career path. It was the year WWF-Philippines confirmed that humpback whales were migrating in the Philippines. Dr. AA Yaptinchay had just come from one of the islands in the northern Philippines and saw it for himself. They wanted to start an investigation of it but didn't have the funding yet, so they wanted a volunteer to help them do some literature search in the meantime. He asked if I was willing to do it for free. I said yes. A whale just landed on my lap.

I worked as an unpaid volunteer for WWF-Philippines for 8 months before they finally got funding and hired me as a researcher. At that point, I learned everything about humpback whales from the limited papers we had access to. Dr. Yaptinchay thought that if I was going to study cetaceans, I better get some formal classes on it and he directed me to the only marine mammal course being offered in the country back then – a summer course in Silliman University in Dumaguete City, Negros taught by Dr. Bill Perrin and Dr. Louella Dolar. It was learning from them that really inspired me to continue in this field, a field I literally started out not knowing anything about. It was their confidence in me and all the support I received from several other people that convinced me this is actually worth it.

The pay was terrible, especially since I had no specialized qualifications for it. The work was long and difficult. With little funding, we had to make do with what we had to be able to do field work.

In 2000, I was entrusted by WWF-Philippines to lead the first boat survey around the Babuyan Islands to document the humpback whales breeding there. With less than 30 hours of "boat time" on my belt and having seen only a handful of species in the wild, I felt insecure to lead such an expedition. I had never even seen a humpback in real life!

I led a team of volunteers: three biologists, three veterinarians, an engineer, and a photographer (none of which had ever seen a humpback whale in real life) on an old wooden outrigger boat with personal and borrowed equipment, tasked to embark on the first ever boat-based cetacean survey in that part of the country.

Having conducted interviews along the coast of the Babuyan Channel, I had the most knowledge about the islands and the living conditions there but had never set foot on any of the islands. The Babuyan group of islands is composed of five main islands: Camiguin, Fuga, Dalupiri, Calayan and Babuyan Claro. The nearest island from the mainland is about 50 kilometers. Our objective was to survey around all the islands and document all cetacean species that we might find and hopefully document humpback whales.

Two out of four of the islands had electricity but it was limited. Running only at night for 4 hours in a few houses in the community. There was no mobile reception in any of the islands which meant we were out of communication range as soon as we left the dock on the mainland. There are no hotels there or rooms for rent or campsites. We lived with the two coast guards stationed there in their little hut. No electricity. No plumbing. We cooked our meals on a wood fire stove and washed ourselves in the nearby stream. We surveyed around the island every day. We surveyed around the four main islands, staying on one island for about 4-5 days and then moved on to survey the next. We first surveyed around Fuga Island where humpback whales were first confirmed to occur. No whales. We decided to go to the other island on the East, Camiguin and try our luck there. After five days of surveying around Camiguin, we saw nothing but dolphins.

On the fifth night, we gathered around a lamp and chatted with one of the fisher neighbors. He was telling us how he would be fishing at night just a few kilometers off the coast and he would hear an eerie bellowing sound coming from the sea – he said it sounded almost like a cow. So the very next morning he took three of us out on his small fishing boat to the spot where he said he would usually see a whale. We got there, turned off the engine, and waited, looking out at sea. Within a few minutes, we heard it- the low bellowing sound of a humpback whale. You can just imagine how we all felt at that time. It was our first time to hear a humpback whale singing! Within a couple of minutes, a whale surfaced about 100m from us. It was our first humpback whale sighting. The rest, as they say, is history.

That year, we managed to survey four islands out of five and we photographed humpback whales (mothers, calves, competitive groups, singers) and documented 4 other species of cetaceans. We were able to make the first song recordings, too. That was the first cetacean survey in that region of the Philippines and the first on a large whale. Not bad for a group of inexperienced researchers onboard a wooden outrigger boat in a far off group of islands in the northern Philippines! The following year, 2001, we were able to take the first nine humpback whale fluke photo-IDs and acquired our first sloughed skin samples and biopsy samples from humpback whales.

It wasn't exactly smooth sailing from then on because we still struggled, like other research projects, with limited funding. We had to deal with training volunteers every year- most of whom had never seen a dolphin or whale…or had never been on a small boat in the open sea! From our

Jo Marie Acebes Cont.

rough, small beginnings, we managed to keep on sailing.

When WWF-Philippines concluded their humpback project in 2006, I together with a few other former volunteers, decided to continue the work. Through a small grant and contributions from volunteers, we managed to organize the first humpback whale survey independent from WWF in 2007. From then on, we continued working towards achieving the goals of the original WWF project. Today, the Humpback whale research and conservation project is run by BALYENA.ORG. We are a small non-profit with a mission: "To support the conservation of cetaceans – whales, dolphins, and porpoises – and their natural habitats in the Philippines." We aim to achieve this through participatory research, advocacy, education, and capacity development for the empowerment of local communities and relevant stakeholders. We monitor the status, distribution, and abundance of humpback whales in the Babuyan Islands through boat-based surveys and photo-identification. In addition, we record humpback whale vocalizations and take biopsy samples for genetic analysis. We also monitor and assess potential threats to cetaceans in the area.

Running a small research and conservation NGO in the Philippines is not easy. It definitely does not put food on the table. That is why in order to do this I had to make sure I had a normal day job. I was fortunate to have had opportunities opened up for me, including the opportunity to go to graduate school. After working for a little over four years with WWF-Philippines, I felt the need to know more, to broaden my horizon beyond humpback whales and issues about cetaceans. That's what working for a conservation NGO in the Philippines does to you, I think. It opens your eyes to all the different problems facing the environment and the people. I sought for a masters course that I thought would give me a broader perspective. I wanted to move away from becoming a whale specialist and become a generalist, if you can say that. I found a couple of courses which were totally out of my league, but I sent my applications anyway. I applied for several scholarships, too, but with no luck. But luck did knock on my door again when I was accepted at the University of Oxford. The downside: no scholarship; I obviously could not afford to go there. I honestly did not seriously consider going; I had accepted that I just had to search more and wait another year. But when I mentioned to my parents that I got accepted, I was surprised when my Dad even asked how much it would cost. He then said that if I really wanted to go, he might be able to find a way. I couldn't believe it. I couldn't imagine where we could get that money. After some time, he said it was possible to sell some

land to cover for my first semester and the rest we just have to figure it out. With that I thought: okay, there must be some funding I can get somewhere to at least cover for my flight to the U.K. (which I did) and I can just work part-time to cover for my food. Long story short, I managed to walk the cobbled streets of Oxford and survived the rain, cold and dreariness. It was the best of times, it was the worst of times...(I should cite that). I met an amazing group of people from all over the world during my stay there and learned so much more than I expected. It was one of the toughest times in my young career, too, because I worked 12 hours a week while studying full time. I worked as a library assistant in the wee hours of the night, as an invigilator (watching over students taking exams) or as building security after office hours or during special events and as a scout (dormitory/college house cleaner). I lived there through the generosity of my parents, my friends, professors, and hardship grants. But I regretted none of that! It was actually fun (although the cleaning was backbreaking sometimes). Thousands of peanut butter sandwiches (my lunch on most days because it was all I could afford) and a year later, I got my degree. One thing I do regret is not finding the money to fly my parents to attend my graduation.

I went straight home after graduation with no job prospects waiting for me. It was then that I started to learn how to search for research grants. With some contacts I was able to get consultancy work to live on and eventually got hired by another conservation NGO, Conservation International – Philippines. During this time, I was juggling with the research on humpbacks (with no pay and run on volunteers' contributions) and a normal day job. It was also during that time that I finally decided that setting up my own NGO would be the only way for me to sustain the research on humpback whales in the Babuyan Islands.

One bit of advice I can give to upcoming or young researchers is: it pays to attend conferences and do volunteer work. Attending conferences and networking is how you meet all these people who can mentor you and open doors for you. Never get tired of applying for travel grants to attend conferences! Volunteering gives you field experience. It is through volunteering that people will know what you are capable of beyond what is written on your cv.

I got the opportunity to do a PhD through someone I met during a conference. He introduced me to the man who became my PhD supervisor and he also pointed me to the PhD scholarship that made it all happen. At this point in my life, my interests have broadened to include historical hunting for large marine vertebrates. As some have said, this was when I turned to the "dark side." Joking aside, I think it was an inevitable shift. Maybe not even a shift but just a re-framing.

My Dad hailed from a town in Bohol in the central Philippines where manta rays were hunted for at least over a century. My grandparents were buyers and sellers of manta meat back in those days. I spent my summers in that town when I was growing up. The pull towards Bohol was never resisted. I remember learning about local whaling there while I was working at WWF-Philippines and it has always interested me. That's why I chose to investigate the history of local whaling for my masters dissertation. It was then that I found a link back to my Dad's home town and manta ray hunting. My PhD journey was not easy either. It is when I learned, the hard way, that your nationality, research experience in a site, familiarity of the culture, and academic credentials don't matter much. You can still be seen by those outside your "normal" field as a novice. It took me over a year to convince my supervisors that I was clear on what I wanted to do for my dissertation and that I was ready to go in the field (which was my home). The learning curve was steep and I constantly felt that I had to prove myself. It was tough but again I was lucky to have parents, friends and colleagues who believed in me. Doing a PhD was difficult, no matter who you are or where you are from. Doing a PhD in a foreign country, in a foreign language, where you have no family, where you are making new friends, and under time constraints (the scholarship was only for 3 years) all adds several other layers to it. But again, I was lucky to have been part of a great group of people at the Asia Research Center and for meeting friends who were undergoing a similar experience.

With my student visa up, I had to submit my dissertation for examination then fly back home. I had to wait for my results from home. The uncertainty of life back home was again upon me but luck knocked once again and I got an offer for a teaching

Top: The 2020 humpback whale survey team. *Photo by Lidia Krinova.*
Bottom: Jom conducting interviews with fishermen on Panaon Island. *Photo by Cameron Hookey.*

Page 38: A humpback whale breaching in the Phillipines. *Photo by Jo Marie Acebes.*

Jom with her team during a small boat survey off the Babuyan Islands in 2002. *Photo by AG Saño.*

position at my old university in Manila. Although my teaching-stint was brief, it taught me a lot. The most important of which was, being an assistant professor at a university here was not for me. They were heavy on the teaching and allowed very little time or opportunity to do any field research. I had a new found respect for all teachers and professors while I was there. Teaching is a calling. It is not for the faint-hearted. It is not just about talking in front of a class for 15 or so hours a week. It includes hours preparing for your lecture, hours talking to students for consultation, hours preparing exams, and even more hours marking exams. I even had to teach courses I barely knew anything about which frustrated me. But I definitely had good days, too. Those days where a student came up to me to say how he or she enjoyed my class or whenever a student asked, "how can I tell my parents that I don't want to be a doctor? I want to study plants" or "I want to become a veterinarian." I also took every opportunity I could to take my classes out on real field trips and not just to the usual nearby beach or mangrove area. I took them to different islands to actually see dolphins and whale sharks and interview fishers and tourists.

The call of the whales never left me the entire time. I somehow found a way to still go on the humpback whale survey during their breeding season. What eventually prompted me to leave teaching was when they changed the academic calendar. It meant I would miss the humpback whale season because I had to teach classes. At the end of the semester before that new calendar was implemented, my contract ended at the university and I was relieved because it made the decision easier.

My venturing into environmental history and dipping my toes in fisheries and more "social sciencey" stuff didn't mean I forgot about whales. In fact, it made me more aware of the importance of looking at issues from a different perspective or perspectives. How I managed to keep our NGO afloat while I was doing my PhD and after I came back is another long story. In summary, it was through the help of friends and colleagues. That struggle hasn't ended…it just evolved. I still dream of someday having paid staff, a small research boat and our own field station in the Babuyan Islands or at the very least, guaranteed funding for at least three years! It is free to dream! For now, and for the past ten years, we have stayed afloat by keeping our normal day jobs and doing everything else during our free time. And of course, by finding innovative ways to raise funding. Working on BALYENA.ORG full-time is definitely the aim. I am striving for that and hope that in one to two years it will happen.

If you ask me what advice I would give to aspiring cetologists, especially those from developing countries like the Philippines, I would say meet other researchers, attend conferences if you can, attend talks, and volunteer for projects. Yes, it won't pay and, in most cases, you will have to spend money, but if you stick to it, it will pay off. Maybe not as a paid job at the start, but it will at least get your foot in the door. When you volunteer to assist in research projects you will learn much more and they will get to know you, too. To Filipinos who are already in this field and are struggling, don't give up. I sincerely believe that if you really want something, you will find a way to get it. Legally of course!

I'm saying this from experience. It is not easy being from a developing country like the Philippines in this field. Degrees and field experience carry much weight and we don't get those easily here. Getting funding is hard enough, but being a Filipino with no marine biology degree, PhD or experience in the marine mammal field makes it even harder.

Find your niche, your species, your field site, and know everything that you can about it. Don't ever think that you cannot do it simply because you are not from the US or Europe or have been educated outside of a Western institution. Don't let anyone stop you just because your English is not good enough. Seek mentors. There are many good people out there who are willing to guide you. When you have found it – whether it be a species found in the waters in your hometown or one great idea of a project, stick to it, don't give it up and make it your own. Don't let anyone take it from you.

I am grateful for where I am now and what I have done so far. I don't take credit for all of it because most of it was made possible through the kindness and generosity of others. I do take credit for the perseverance and hard work. Overall, I have been extremely lucky. Not everyone gets to have a whale land on their lap!

Denise conducting her research among Atlantic spotted dolphins in The Bahamas. *Photo courtesy of Denise L. Herzing.*

STUDYING DOLPHINS IN THE WILD: MY STORY

DENISE L. HERZING

When I was 12 years old, I used to read the Encyclopedia Britannica, and I would always stop at the whale and dolphin page. I wondered what their lives were like in the wild and what they were thinking. At that time Jane Goodall was out studying chimpanzees, Dian Fossey was out observing gorillas, and Cynthia Moss was sketching out individual elephants for identification. All these researchers had

Denise L. Herzing Cont.

one thing in common: they had planted themselves in a wild location to observe a wild animal society and had committed themselves to decades of field work to try to understand their subjects. I wondered if I could find a place in the world to observe wild dolphins on a regular basis. Then, on TV, Jacques Cousteau introduced the underwater world to us, and I was hooked. As soon as I was old enough, and after the ice had finally broken from the rock quarry near my home in Minnesota, I got SCUBA certified. Once certified, I immediately hopped in my car and drove to Florida so I could dive in some warm water.

I am a pretty disciplined person and as a student I stayed on track to study marine mammalogy and gain experience, with the hope of eventually focusing on dolphin communication. I studied under Dr. Bruce Mate in Oregon for my undergraduate work and had opportunities to count whales from a lighthouse, help with tagging work in Mexico, pick through preserved sperm whale stomachs for squid beaks, and watch harbor seals at the local salmon hatchery. All experiences, no matter how large or small, add to the process of learning science, learning data, and helping you along in your career.

For my graduate work I studied under Dr. Diana Reiss in the San Francisco Bay area. Although I learned a lot during our work with captive bottlenose dolphins, I was focused on working in the wild for my future career. I had spent my pre-undergraduate days sailing on Regina Maris, a training ship for young scientists, and other research vessels. I knew I wanted a life at sea. I realize that I was lucky in this regard, having a passion so early on in life.

I really had great mentors during my academic time. In addition to Bruce Mate, Jim Sumich and Jim Harvey were also instrumental during my time in Oregon. There never seemed to be any issues about men or women or who could do field work. I was always expected to participate in any science opportunity that came up. And I took every opportunity I could find to get exposure and experience. I really had nothing to discourage me in my career at that stage. Although I had emotionally supportive parents, I lost them very early. So, I was independent at a young age but found many unforeseen helpers along the way: everything from supportive teachers to car mechanics. So, you never know where your help and support will come from.

While in San Francisco studying with Diana Reiss, I also found a great part time job at an institute that studied mind/body phenomena. Ken Pelletier was my main mentor there, and more than inspiring, Ken showed me how to walk a fine line when studying new aspects of the natural sciences. Pushing the boundaries for ideas and methodology is always an issue in science, and learning how to be a well prepared and a knowledgeable scientist was something I learned from him.

Top Photos: Denise at sea.
Bottom: The R/V Stenella.

Page 42: A group of Atlantic Spotted Dolphins confronting a group of Bottlenose Dolphins.
Photos courtesy of Denise L. Herzing.

Obstacles Along the Way

I didn't really have many obstacles in my career until I started doing work in the Bahamas. I was young, a graduate student, and taking an alternative approach to funding as well as fieldwork. I had set up my own non-profit to support the work and I decided to work underwater to observe the complexities of dolphin society. After a few years of documenting the incredible underwater behavior of the spotted dolphins in the Bahamas, I began to see some obstacles. I am still not sure if it was jealousy, or folks just wanting to take over the project I had developed, but I experienced some uncomfortable run-ins with professors and their up-and-coming graduate students who wanted to grab things and run. Along the way I have also had a lawsuit with a previous employee who did take the data and run. So, securing your data, either with legalese or with the copyright office in D.C., is never a bad idea. Data is about all a scientist has, and it is hard earned and worth fighting for.

Of course, women continue to have all sorts of challenges in science careers. These challenges can appear in the form of funding, family, or opportunities. I am a white, American woman but other cultures can have different challenges as women and as citizens of other countries. But even as an American, I found evidence of not-so-equal opportunities, despite our laws. I remember one of the marine mammal society conferences I attended when Ken Norris stood up and congratulated the society for having 50% women at that time. Applause erupted. But I didn't feel like it was really 50%. I decided to review and tally the women listed in the conference (and previous years) that were chairing sessions or running symposia and noted that only a few were listed. After doing my tallies I wrote a letter to the then-President of the Society, noting the lack of women in these roles, even though parity was thought to exist in the Society membership. I had already attended an ECS conference in Europe and noted how many women were in these positions already. I thought it strange because I had always thought the USA had the best laws and equal opportunities, but such laws are only as good as they are enforced or enacted. Equal distribution of power and exposure opportunities are critical during the development of a career, and women still have to fight for them or make them happen for themselves. I partnered with various women colleagues over the years to put on workshops and symposiums to drive the field as well as promote other female researchers. Exposure to colleagues in the field is often obtained by chairing sessions, working on committees, and collegial projects. It's a bit like the golf course where business folks, historically only men, often networked to do business. Things have come a long way, but not without women standing up for, and encouraging, opportunities for other women.

Friend or Foe?

Although it's easy to think only women can be our allies that is simply not true at all. Some of my best allies have been men. And some of my non-allies have been women. I think it's a matter of the person and their ethics in their life and in their careers. I have known female colleagues that have tried to steal data and credit for personal gain. And I have known male allies who fought behind the scenes for my work, some that I didn't even know did so until later.

My experience has taught me that you need to choose your friends and colleagues carefully. It's a small field, and if you can't trust your colleagues with your data or your reputation, then it is not worth joining forces. If we are to transcend bias, gender, and racism, it is the person themselves we must look to, not their external attributes.

I think most of my problems during my career stemmed from my new, but perhaps unorthodox, way to do work. Mine was a situation where I had to enter the water to observe dolphins. Although I had terrestrial models for observing animals, you can't easily build a blind to observe dolphins or whales underwater. Cetaceans are mobile animals who often only allow us a small glimpse of their world. Finding new methods to analyze underwater data also involved some creative rethinking and remodeling from the terrestrial research world. As marine mammalogists, we sometimes think we need to reinvent the wheel. Already existing methods can further expedite our studies in marine mammalogy. Some of the questions I received during manuscript reviews were: How could someone really sex dolphins underwater? Can you observe natural behavior underwater without influencing the animals? Interestingly, the question about observing natural behavior and habituation was one that we researched thoroughly during our review process. We found that most researchers, in their papers, said something like "the dolphins started getting habituated around our boat, so we then started seeing natural behavior". It was rare, other than cliff-based observations, that anyone could really measure "habituation". So, we simply argued this point in our reviews, citing other published papers that had to deal with the issue of "habituation".

In addition, because of my great viewing field site, my work was often covered by the media. They simply wanted the best images they could get, and I simply wanted the best place to observe animals underwater, but I can see how this would look like too much media coverage to some. Nevertheless, I was excited to share this underwater world with a larger audience and do our bit for education.

I think in the end, because I was so determined to just observe dolphins in the wild, I really didn't spend too much time worrying about opinions, jealousies, and other factors that reared their ugly heads on occasion. I tried to collect good data, do honest analysis, and work through publication reviews like any scientist must do. I think it's important to work through the problems, address the obstacles as fairly and clearly as possible, and then move on, continue to do the work, and stay as professional as possible.

Denise at the bow overlooking Atlantic spotted dolphins.
Photo courtesy of Denise L. Herzing.

I think women still have many challenges, but of course many doors are now open that were not before. However, women still find it hard to incorporate family life with full blown careers. Field careers are especially hard and demanding on time, and although there are some programs that try to support women to reenter science fields after some time off, women do lose time and opportunities that are often hard to recapture. Of course, it might depend on your partner in this world, but I am NOT a believer in the superwoman. I think women suffer greatly by trying to do everything, and it may just come down to some simple choices. I think there are many ways of being a productive human in the world. To me, passion and perseverance are key elements to doing work in the field and even science, since it demands so much of our spirit and energy. Observing how mentors work with, and give, other female students opportunities, should help illuminate what environment you are moving into in any institution or situation.

A Thought for the Future

In the end, I am a big believer in doing good work with commitment and spirit. And if you can't find a way in an existing system, then make a new one. Find another way to get funding if the "club" doesn't let you in or if the funding institution is too antiquated to handle cutting-edge ideas. Reach out for help with trusted allies and colleagues. Work through hard data, or develop new methods, if you are trying to challenge a paradigm or a long-held belief about your research area. This is sometimes hard-fought, but it is also the way science evolves and learns. In science, we use the best tools we have available at the time. When new tools become available, we sometimes discover that what we thought we knew is outdated. This is a hard pill to swallow for any senior scientist. Our careers are based on the work we have done and conclusions we have drawn. So, kudos to those of you who can challenge old work and outdated ideas. My motto is "Never Give Up, Never Surrender". I hope you never do.

DUGONGS AND DOLPHINS IN ASIA: AN INTERNATIONAL RESEARCH STORY

ELLEN HINES

"Research is easy; conservation most decidedly is not," George B. Schaller (1993).

Fishing boat used as a research vessel off Thailand. *Photo courtesy of Ellen Hines.*

Ellen Hines Cont.

I almost did my dissertation research modeling habitat use and distribution for eastern Pacific gray whales off the western coast of Vancouver Island in British Columbia, Canada. Since the late 1980's my advisor, Dr. Dave Duffus, from the Department of Geography at the University of Victoria, had been studying the Pacific Coast Feeding Group grays that returned to Clayoquot Sound, BC each summer.

That changed when I went to Thailand. In 1999, I tagged along with another grad student and Dr. Phil Dearden, one of my committee members. With our headquarters at the Phuket Marine Biological Center (PMBC), then part of the Thai Department of Fisheries, we traveled to dive sites, gauging the effect of recreational diving on coral reef fish assemblages. While at PMBC however, I was immediately impressed by the knowledge and dedication of the Thai scientists. Committed, busy and creative, they were so inspiring that I found myself (in one of those semi-guided moments) approaching a very serious young women in the Marine Endangered Species Unit and asking "if a western PhD student could get funding, how could they contribute to your research?"

While I was at PMBC, numerous young westerners came up to the scientists, asking to participate, to help, wanting to experience working with marine mammals or turtles. Most were sent away, always sweetly. What made the difference in that I was not? Perhaps I was older than most, or the words "PhD student, funding, or contribute". However, the young woman said "you can help me with dugongs" and gave me a pile of papers to read. That is how I began my long friendship and many collaborations with Kanjana Adulyanukosol, the 'mother' of dugongs in Thailand.

The next day I returned, papers read, totally intrigued, and was shown skulls, tusks, and we talked and talked and planned. I met others in the MESU, including Dr. Kongkiat Kittiwatanawong, now the Director of PBMC, even then his creative brilliance was evident. Then I was invited to lunch (canom jin or Chinese noodles, a PMBC favorite), and began to meet everyone, from drivers to technicians to directors: seagrass scientists, coral, mangrove, turtle, dolphin, wetland, everything marine, and became part of the family, as is common in Thai culture. There was no turning back.

I went back to Victoria and wrote proposals. Thanks to a dissertation fellowship from the International Development Research Centre of Canada, and what was to be the first grant of many that resulted in more than a decade of support from Ocean Park Conservation Foundation of Hong Kong, I had a project to work on with Kanjana! Our research would be three-fold: Aerial surveys to assess dugong distribution and abundance along the Andaman or western coast of Thailand, seagrass surveys in areas where dugongs had been seen by villagers, and interviews in fishing villages along the coast.

As my labmates and advisor were painfully aware, I had never seen a dugong, much less tropical seagrass. But Dave and Phil had faith in me, and their support empowered me to move forward. I started learning a bit of Thai sawatdee ka (hello and goodbye), cow pat (fried rice (you'll never starve says Phil)), korp kun ka (thank you). In January of 2000 and 2001, with a red-haired Canadian translator, I headed to Thailand.

After 10 days in Bangkok, permits, permissions, etc., the Thai Department of Forestry (in charge of marine parks) helped us access a helicopter for several days of reconnaissance flights along the Andaman coast. There, in southern Trang province, I saw my first group of dugongs from 1000 feet! As soon as I landed, I called Dave Duffus, and heard his relief and ("she saw a dugong!") cheers from my labmates. These flights enabled us to identify six areas within which to concentrate more detailed aerial and seagrass surveys, and interviews.

Kanjana then connected me with Nimit Sittirod, a microlite pilot. We created a strip transect methodology, using Distance software and a dugong-sized piece of wood for strip width at 150 meters in altitude (see Hines et al 2005a), and set off down the coast.

Starting in Trang province, one of the first sights that first survey day from the air was a carcass tied to a mooring. Local wildlife officers helped me to tow it in, we saw that the head and the armpits (where the nipples are in a dugong) had been removed. They told me that the villagers wanted the tusks and the nipples for medicine (Adulyanokosol et al 2010). We froze the carcass and sent it to Phuket Marine Biological Center, to Kanjana, for a necropsy. Was this bycatch or direct catch? We could not tell.

The surveys were going well, we saw many dugongs, surveyed seagrass, and started interviews. Then I found another stranded dugong. Kanjana and her team came down, conducted the necropsy and found the marks of a fishing net around the animal's peduncle, definitely a case of bycatch. I started to learn more about bycatch and other issues affecting artisanal fishermen during the interviews with these local men and women. Commercial trawlers were coming too close to shore, ignoring the 3km government restriction. The trawling gear was destroying the seagrass, damaging small-scale fishing nets and creating a sometimes violent conflict. For example, a village-sponsored patrol boat named the Golden Dugong was fire-bombed at night. My respondents were asking me, how my data would help, how my project would help?

As a consequence, my project evolved from how I had originally envisioned it. It had become clearer to me that I had to consider not only ecology but also conservation in a more direct way than I had anticipated. This sounds obvious now. In my masters project on the California spotted owl in a southern California National Forest, also a specialized forager with strict habitat requirements, I was aware of and wrote about the issues that endangered the animal. However, this research was a geographic information systems (GIS)-based risk assessment (still a theme of my work) of how modeling errors from low resolution satellite imagery were critical in habitat depiction (Hines et al 2005b). There was an obvious distance inherent in this project. I was mostly behind a computer.

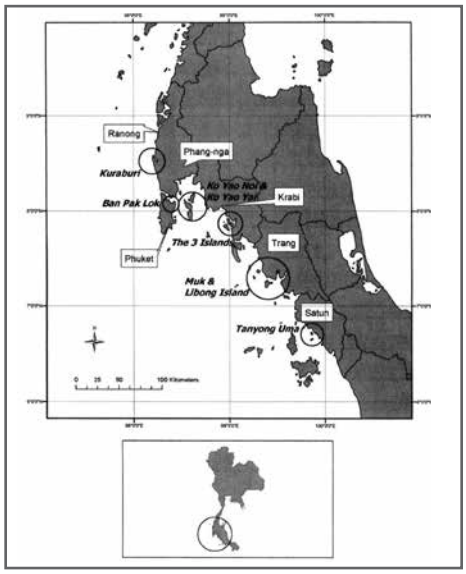
Here, learning about small-scale fishers in remote coastal Thailand from directly speaking to the fishermen, I was challenged. What difference would my work make in either their lives and conflicts, or the conservation of the dugong? I went back to Bangkok and consulted with Phil Dearden, as well as Drs. Dachanee Emphandhu and Noppawan Tanakanjana from Kasetsart University. We rewrote the interviews to ask more about the issues, opinions and values of the respondents. My dissertation question expanded to encompass these issues and became more interdisciplinary (Hines 2001; Hines et al 2005c; Hines 2012). In my dissertation chapters, I explored examples of how scientists have contributed to conservation efforts and the fine line between science and activism. There have been wonderful examples in marine mammal science: John Reynolds, Andy Read, Barbara Taylor. As a geographer, I had the opportunity to expand and train further into the social sciences and found myself fascinated with the cultures and economies of small-scale fishers.

After I completed two years of fieldwork and my PhD, I was hired as a tenure track professor in the geography department at San Francisco State University. Luckily, they were specifically looking for an environmental GIS position in marine science. I was afraid I would not see Kanjana or Thailand again. However, in January of 2002, Brian Smith invited me to co-teach a course in marine mammal scientific techniques back at the Phuket Marine Biological Center! This was a wonderful course for 25 students from throughout Asia. Here I reconnected with Kanjana and my Thai colleagues and met many future collaborators and friends. Three of these attendees have received their PhD's since: Dipani Sutaria, Jo Marie Acebes (who just completed a Fulbright Fellowship in my lab), and Petch Manopawitr (in 2019 with my co-adviser Phil Dearden and myself on his committee).

The course also led to Kanjana and myself being funded in 2002 and 2004 (World Wildlife Fund and Ocean Park) to do interviews and aerial surveys for dugongs in Cambodia and Vietnam (Hines et al 2008). Then in 2002, I received a call from Wildlife Fund Thailand (WFT), an NGO founded by the then Queen of Thailand. They had heard of several dugongs being stranded along the eastern Gulf Coast of Thailand and wondered if I was interested in research using the techniques developed for the Andaman Coast.

With WFT sponsorship and funding from Ocean Park in 2003, 2004, and 2005, Kanjana and I flew transects and, with her team of young Thai scientists, conducted interviews along the coasts of Rayong, Chanthaburi and Trat provinces. In 2003, with Nimit and our trusty microlite, we found a small population of dugongs, and, we began to see Irrawaddy dolphins as well. In 2004 and 2005, we started to see the dolphins seemingly racing each other through the water column, sometimes up to 30 or more animals distributed vertically in the water!

The tsunami of December 2004 was a horrible disaster in Thailand, and our 2005 field season was cut short by strange weather and the need for my Thai colleagues to



Top: Ellen in a Thai classroom with local students learning about marine conservation.
Photo by Isabelle Groc.
Middle: Map of aerial survey location off the Andaman Coast of Thailand (Hines et al., 2005).
Bottom: Kanjana Adulyanukosol and Ellen in the field.
Photos courtesy of Ellen Hines.

Page 46: A mating herd of Irrawady dolphins.
Photo by Laura Morse.

Left: Satako with her hydrophone. *Photo courtesy of Ellen Hines.*
Right: Ellen with Anouk on the bow. *Photo by Isabelle Groc.*

Page 49: Mating herd of Irrawady dolphins. *Photo courtesy of Ellen Hines.*

return to Phuket to assist with recovery. Soon afterwards, Kanjana became the Director of the Marine Endangered Species Unit at PMBC, and started her PhD studies at the University of the Ryukus in Japan on dugong ecology in Thailand, so she was quite busy. I too became wrapped up in my local work around San Francisco.

In 2007, I was able to put together, with the support of Ocean Park, a research cruise through the Myeik Archipelago of Myanmar. During the 2002 PMBC course, I had met Mya Tha Thun, a senior fisheries officer (now retired). Through him, I was able to get permits and visas for a crew of scientists to put together a training for local scientists in dugong research, seagrass mapping, and genetic sampling. Leslee Parr, a geneticist from San Jose State University, Donna Kwan, a dugong scientist from Australia, and Alyssa Novak, a seagrass scientist from the University of New Hampshire came along. We did not see any dugongs, but mapped seagrass and had sightings of Asian bottlenose dolphins, false killer whales, Indo-Pacific humpback dolphins and Brydes whales.

I was also very interested in interviewing people from a local Indigenous group, the Moken, or the drowned ones, or sea-gypsies. The Moken are nomads who have been living in these islands for at least two centuries. They live in small boats, or kabangs, that they regard as living spiritual guides, through the dry season, and travel in flotillas throughout the Archipelago. During the rainy season, they live in shacks along the shore. In our three weeks of research, we were able to complete quite a few interviews, as luckily, our Captain spoke the Moken dialects (a mixture of Malaysia, Melanesian, & Burmese). The Moken believe that the spirits of the sea bring animals to them to hunt, so they will eat marine mammals as they encounter them. However, they do believe that when a boat sinks, a dolphin will come and save them. Respondents in islands toward the south of the Archipelago (toward Thailand) told a story that when dolphins get older, they go into the seagrass and turn into dugongs; when a dugong gets older, it goes into the jungle and turns into a pig (Hines et al 2007; Hines et al 2012a).

In 2008 and 2009, Kanjana and I decided to conduct ship-based surveys on Irrawaddy dolphins along the eastern Gulf Coast of Thailand and yet again received support from Ocean Park. However, she was still quite busy. So I began to work with some of her colleagues from the new agency formed for Thai marine research, the Department of Marine and Coastal Resources: Mr. Somchai Manananansap, a senior marine scientist, and a young scientist fresh out of her Masters in Marine Science at Kasetsart, Chalatip Junchompoo (Ong). They brought along a wonderful crew of Thai scientists and technicians. I was incredibly lucky that Anouk Ilangakoon, who I had initially met in the 2002 class, wanted to come along. Anouk did not need that class! She has been working on marine mammals in Sri Lanka and much of Asia since the 1990's and in 2001 came out with the first comprehensive volume on Whales and Dolphins in Sri Lanka (Ilangakoon 2001). She is one of the most accomplished and professional scientists I know. I had worked with Anouk and Dipani Sutaria in 2008 to raise funds for interviews about dugongs along the Gulf of Mannar in Sri Lanka and India. The interviews were based on those I had put together for my original research in Thailand. They did an amazing job of adapting those interviews to in-country conditions and cultures and led a paper that came out in Marine Mammal Science (Ilangakoon et al 2008).

A young PhD student from Malaysia answered an inquiry for a research assistant, once again a tremendous stroke of luck! Louisa Ponnampalam joined the crew with all of her experience from her PhD research in Oman and helped make those long hot surveys fun. We discovered that our racing Irrawaddy's were actually mating herds and Louisa led a paper documenting that and other behaviors (Ponnampalam et al 2013).

The next few years, I largely worked locally with my students. Then I noticed a call for proposals from the Australian Indo-Pacific Cetacean Research and Conservation Fund. Thanks to this grant and yes, support from Ocean Park, I had enough funds for three more years of research starting in 2012! Somchai came back, and now Ong took a leadership role, bringing a wonderful group of Thai scientists. Anouk and Louisa returned! Also, in 2012, two amazing Vietnamese scientists joined us: Professor Duc Hoang Minh and his student, Long Vu. These two men were incredible naturalists and wildlife photographers. Long soaked up all the methods eagerly, returning each year, and starting his own research and NGO in Vietnam (Center for Biodiversity Conservation and Endangered Species, cbes.vn), in turn training young Vietnamese scientists and working to spread the word about marine conservation. Cindy Peter, from Sarawak, Malaysia, fresh from her surveys of Irrawaddy's in Kuching Bay joined

us. Satoko Kimura, then a postdoc now a professor at the University of Kyoto, joined us and taught us how to do acoustic surveys. Isabelle Groc, a Canadian wildlife photographer, came along to document our work. Laura Morse, then at NOAA came along to lend a hand. Martha Delaney, a marine mammal vet from the University of Washington joined us one year. Suwat Jutapret, just finishing his dissertation on humpback dolphins in the western Gulf of Thailand joined us as well. A couple of my grad students, Andrea Dransfield and Jennifer McGowan came along. Justine Jackson-Ricketts, from Dan Costa's lab in Santa Cruz, made our project into her doctoral dissertation (Jackson-Ricketts 2016; Jackson-Ricketts et al 2018, 2020, and in process). Tara Whitty, doing her dissertation at Scripps Institute, used our research area for one of her fieldsites (Whitty 2014). We had an amazing group… at one point, ten nationalities!

We concentrated our work for these three years in Trat (Hines et al 2015a), the province at the extreme eastern coast of Thailand, abutting the Cambodian border. Our surveys were successful and as the Thai's say, sanuk, or fun. I always had my birthday in the field, and always was surprised by the crew. For one celebration, Justine had brought a custom-knit dugong hat!

I am still going back. In 2013, Louisa and I and a whole crew put together the 3rd SEAMAM meeting in Langkawi, Malaysia (Hines et al 2015b). We all became SEAMAMA's, forming a family of support and communication ever growing as more young scientists in Asia become interested in marine mammals.

In 2017-2018, a team of us worked together to create a Bycatch Risk Assessment (ByRA) tool to assess the spatio/temporal risk of marine mammal bycatch (Hines et al 2020; Verutes et al In Press). Visit our website with Truong Anh To's wonderful graphics: cons.scienceontheweb.net/bycatch.

We all traveled together to our field sites in Thailand, peninsular Malaysia, Sarawak Malaysia and southern Vietnam, and I was so proud to see everyone's name on our letter to Science (Johnson et al 2017) about how difficult it will be for data-poor countries to address bycatch requirements of the U.S. Marine Mammal Protection Act. That paper is the result of many fascinating discussions.

The current SEAMAMA WhatsApp group has 53 participants from India to Papua New Guinea, and we are planning the 4th SEAMAM meeting in Kalimantan, Indonesia. You may have seen some of the wonderful plenaries at the World Marine Mammal Conference in Barcelona: Louisa, now a Pew Fellow and the Director of MareCet, a Malaysian NGO (marecet.org), Danielle Kreb, and Dipani Sutaria.

The summer of 2019 I was honored to become a Fulbright Fellow, awarded an ASEAN research grant to work with Louisa and her crew in the field in northwestern Malaysia, and with Long in Vietnam to explore whale temples (another long story)! Pretty much the whole lot of us gathered in Ho Chi Minh City the beginning of June for Long's wedding to his long-time partner. In September, I went to visit Ong in Thailand. Ong is now a mother and the Director of one of DMCR's research stations. She put together a ByRA workshop in Phuket, at PMBC, where it all began. I missed Kanjana so much, she left us in 2015 (Hines et al 2015c). Dr. Kongkiat, the busy Director, went out of his way to welcome me and acknowledge my dedication to marine mammals in Thailand. I met some old friends, and just-starting, dedicated young scientists.

In an edited volume on Sirenian Conservation that I put together with the help of colleagues from all over the globe (Hines et al 2012b), a group of us wrote a chapter on the role of scientists in developing countries. We discuss the responsibilities of supporting and training, of realizing that "…

Left: Ellen in the field.
Photo by Isabelle Groc.
Right: Ellen with the research team in 2012.
Photo courtesy of Ellen Hines.

cultural attitudes, languages…philosophies, religions, and other belief systems are often relevant and sometimes critical in wildlife conservation, and must not be ignored" (Hines et al 2012c, pg 244).

There is so much we don't know about marine mammals around the world. So many populations that we have scarce, if any knowledge of, are already or will soon be gone. I was able to find funding to keep returning, to show respect, to become involved. This kind of international funding is critical and growing ever more scarce. I urge the American Cetacean Society, the Society for Marine Mammalogy, the International Whaling Commission, as well as national and international NGO's like Ocean Park to continue to increase their efforts to prioritize the importance of the exchange of scientists, and the support of local research for global marine mammal conservation.

Reaching out beyond familiar comfort and culture is scary but rewarding. My career has been incredible. I have one graduate student who is working with Ong and DMCR on a habitat distribution model for Bryde's whales in the northern Gulf of Thailand for her thesis; the second generation. We are and should be a global community, yes a family of scientists and international citizens, working together towards supporting the equity of global scientists, and therefore the knowledge and conservation of the animals we hold dear.

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Alison tagging a humpback whale. *Photo by Ari Friedlaender. NMFS Permit 808–1735, ACAP Number 2009-014, and Duke IACUC Number A041-09-02.*

MAKING CHOICES AND FINDING BALANCE AS A MARINE MAMMAL SCIENTIST AND PARENT

ALISON STIMPERT

I was honored to be invited to contribute to this issue of *Whalewatcher*, but I will admit that I have struggled in writing this article. I procrastinated until the last minute, then wrote something I wasn't happy with, and then procrastinated through two-more COVID-19 pandemic-related delays, and here I am

Alison Stimpert Cont.

again, right before it's due, wondering what to write. I think part of my struggle was that this issue covers personal topics, and I am a pretty private person. However, I also wasn't sure I was the right person to contribute. Do I have imposter syndrome about being a woman in science? I never really thought much about gender issues in science toward the beginning of my career. I received a lot of support at each stage of my education and training, with helpful and encouraging mentors who did not seem to discriminate based on gender. I did frequently end up working with groups of mostly men, especially in the field, but that never bothered me. Looking back, I can remember times where I felt I was fading into the background (during research discussions, for example), but I connected that more to my personality than my gender. Perhaps it was some of both.

Regardless, my thinking and activism on this topic has increased exponentially since having my son. Where I have felt greater challenges is in being a parent and a part-time worker, while trying to maintain my foothold in an academic culture where the expectation is often long workdays and essentially round-the-clock availability because of the pervasiveness of technology and constant communication. Technically, these challenges should not be limited to women, but should be felt by any parents, as well as others who may not work full time due to other commitments outside of work. However, I do believe women are harder hit, at least in relation to having children, because of the initial physical demands of childbirth and breastfeeding.

My Career and Family Path

I spent several years volunteering, working, and doing lots of fieldwork and travel in my field before beginning graduate school. This included wildlife rehabilitation, photo-ID of dolphins in the Bahamas, cognition research and training with dolphins in Hawaii, small boat-based humpback whale behavioral research in Maui, aerial surveys of right whales in the Northwest Atlantic, and a handful of large vessel cruises in various locations. During graduate school I studied humpback whale acoustic behavior at the University of Hawai`i at Mānoa. My project used sound and movement tags (DTAGs) to attempt to correlate sound production with fine-scale behavior of humpbacks when foraging, and also when in competitive groups on their breeding grounds in Maui. I assumed, based on the model I had seen before when assisting with tagging projects, because of my small frame, and a little because of my gender, that I would not be the one deploying the tags. However, when I got to Maui, luckily the folks (men) I was working with did not make such gender-biased assumptions. We practiced, tested, developed a method, and then successfully deployed many tags on adult humpbacks in the thick of competition in Maui, with me as the tagger, and it went just fine. My experience during my PhD helped me secure a position on a humpback foraging ecology project in the Antarctic with Duke University, where I helped manage the tagging portion of the project. At the time, I was one of few women deploying tags, and I felt both lucky and proud of what I had accomplished (though I quickly realized that the meat of the science happened afterwards, and getting involved with the details of analysis was on some level as exciting as the tagging). My postdoctoral positions, affiliated with Duke University and the Naval Postgraduate School, continued to be filled with exciting fieldwork, continuing the Antarctic project as well as studying the effects of naval sonar on cetaceans in Southern California. I then moved to a soft-money Research Faculty position at Moss Landing Marine Laboratories in California, where I was able to develop my own research projects and begin taking graduate students.

Partially due to this transient lifestyle and expectations to be available anytime to take advantage of all field opportunities, I did not meet my partner until my life became a little more stable after I completed my PhD, and I did not have my son until after I had completed my post-docs. My partner's and my plan, initially, was to have him be a stay-at-home father and I would go back to work

Humpback whale. *NMFS Permit 20430. Photo by Alison Stimpert.*

Page 52: Alison with her son. *Photo courtesy of Alison Stimpert.*

after 3 months. But, work circumstances changed, which turned out to be a good thing, because I quickly realized that 3 months was way earlier than I was ready to return to work. Luckily, my employer was understanding, allowing me to return part-time, but working largely from home to maximize my time with my son, with the added benefit that I could continue to breastfeed rather than pump. Even as breastfeeding became less of an issue, I knew I still wanted the time with my son, and as of four years later I have continued on in my soft-money position at part time. This is despite the massive challenge that it has been to maintain soft-money cash flow, complete administrative tasks, mentor students, and do research, in the hours that I manage to piecemeal together when my son is in some form of childcare or sleeping. Enter a global pandemic, when there is no such thing as childcare, and any work-related productivity I did have has disintegrated (sacrificed sleep and a generous partner have been allowing me to hang on). The silver lining is getting to spend even more time with my son, and to learn even more about his life, school, and development. Thoughts of leaving science to focus on family resurface.

However, I don't feel that I could easily step back much further from my career and still be able to return when my son is older. Science is a field that moves at a fast pace, making it hard to keep up even when keeping a foot in the door. The other reason I don't completely step back is that I do still love what I do. I feel lucky to be in such an interesting career, and despite the challenges, to have the opportunity to continue to break down barriers for parent scientists, building upon the efforts of those who came before us. As a young scientist in the field, I had very few female mentors, and I don't remember seeing any of them with children. Now, more and more women of my "scientific cohort" are having kids, and there are initiatives and support programs within the sciences to support parents in

Top: Alison Stimpert in the field.
Photo courtesy of Alison Stimpert.
Bottom: Humpback whale breaching, NOAA Permit 1000-1617.
Photo by Alison Stimpert.

several different ways. I have put many of my efforts into maintaining and expanding these programs.

I have particularly enjoyed working with scientific societies to change the culture of work-life balance from within. I have co-organized workshops and co-written articles (Hooker et al, 2017; Neilsen and Stimpert, in press) , started support groups, helped develop conference parent/mother rooms, and raised and distributed conference funding to help those with dependent care obligations, and all of these initiatives are becoming more and more common, both at academic conferences and within institutions. This is very encouraging, and I hope that as the culture becomes more accepting of varying schedules, more scientists will feel supported to start a family, or devote time to alternate pursuits, without worrying about giving up on their careers. I believe this will make us all more well-rounded and improve the quality of our science, as well as creating a much more equal landscape that will be the model for future generations.

General Advice

The biggest thing that is important to keep in mind is that everyone's situation is different, and everyone has their own personal challenges. During this journey I have met many women, with kids and without, happy and not in both those situations. Some women wait to have children until their careers are well established, but this strategy runs the risk of fertility issues as women age – an issue that is often marginalized in the current culture of promoting women's careers. Some women have children early on, but it may be harder to return to science without having published, created a network of colleagues, and gained field and analysis skills. As many have said, there may not be a "good time" to have a family, so my advice is to just go for it, regardless of where you are in your career.

Also, remember that it is hard to predict how you will feel about time balance between work, kid(s), and self-care until you actually have the kid(s). Many speak of passion as the fuel for persisting against adversity, and our field is full of people with amazing passion for marine mammals and marine mammal science. When you discover another passion, however, it can be difficult to merge the two. Give yourself credit, accept your feelings, and allow yourself to change the plan. Some women completely leave their career after having children, while some get back to it full time as soon as physically possible. I won't pretend to understand or predict anyone's concerns, but I will say what is important to me is to accept my own feelings on my priorities. Despite the societal pressure that I feel to perform and be an example and do "all the things" as a woman in science, I choose to scale back my responsibilities and say no to things in order to preserve time to spend with my family and give my son what I think is best for him in terms of care and parent presence and engagement. This choice makes me feel I am being the best I can be, and others may come to that best version of themselves through different strategies. I also try to be transparent with my colleagues about the reasons that I do this, and my resulting schedule and availability. I have missed career opportunities, but have gained so many more wonderful experiences in raising my son that there is no question to me that it has been worth it. As a mentor, I also encourage my students to maintain their own work-life harmony through setting appropriate boundaries -- to be productive while working, but to also take the time they need for other things as they come.

Hooker, S., Simmons, S., Stimpert, A., McDonald, B. 2017. Equity and Career-Life Balance in Marine Mammal Science? Marine Mammal Science 33(3): 955-965. doi: 10.1111/mms.12407

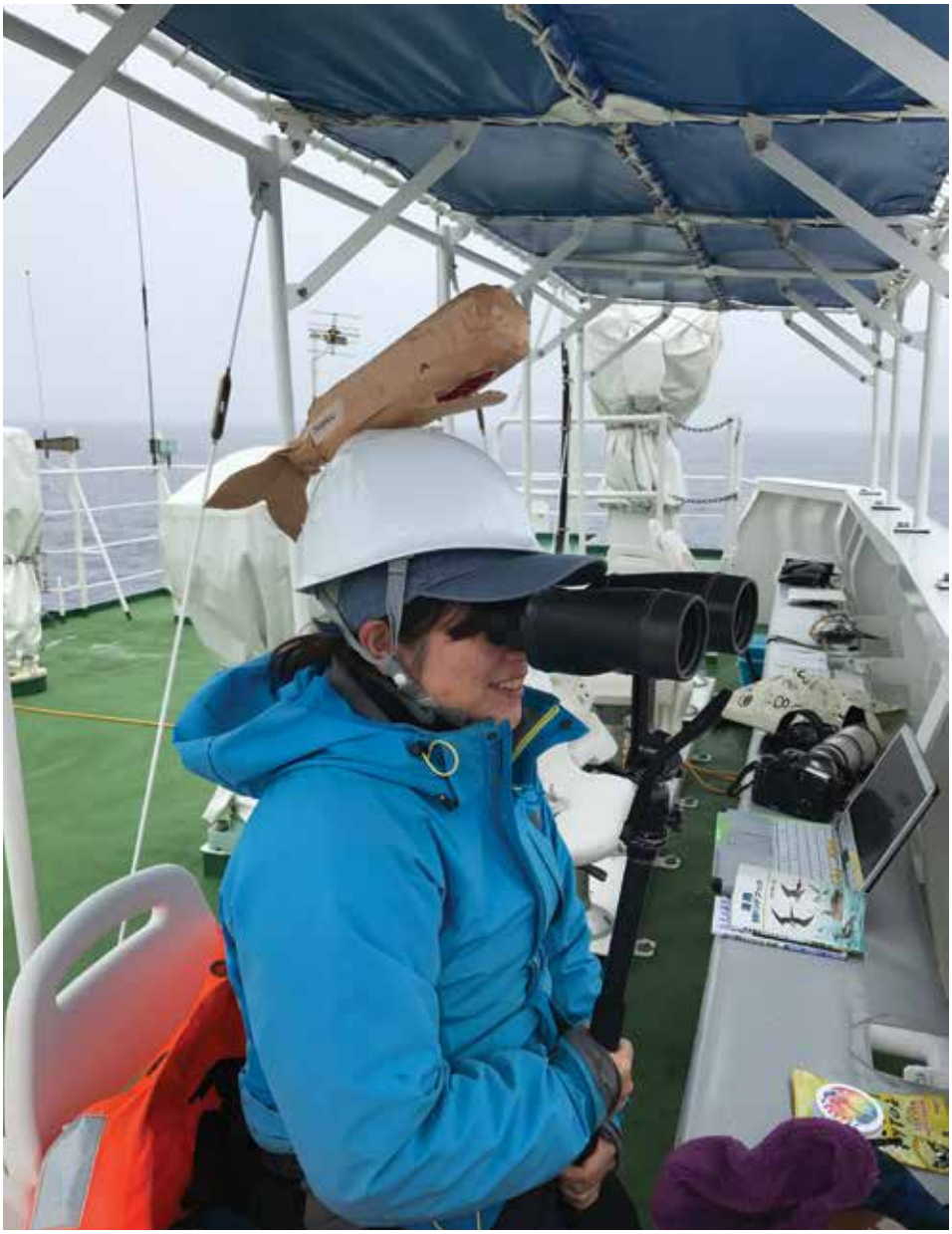
Neilsen, T. and Stimpert, A.K. in press. Work-parenting harmony. Acoustics Today.

HOIST YOUR SAIL WHEN THE WIND IS FAIR

YOKO MITANI

When I was in elementary school, I loved the "Doctor Dolittle series" and wanted to be a veterinarian. But in junior high school home economics class, I wasn't very good at sewing. So I thought, "With such clumsiness, I can't operate on a dog or a cat!". Then, I decided that I wanted to give up on becoming a veterinarian and become a person who studies animals.

About the same time, I watched a nature TV show about humpback whale migration and wondered why they travel such a long distance and I decided to study whales. At that time, "researchers studying free-living whales" on TV or in books were people from abroad. In Japan, I didn't know which university I could study whales and the Internet wasn't well developed. So I read the page of the translator for the book "Whales and Dolphins" (written by Martin, A. R. and translated by Kasuya, T., 1991) and found that two translators graduated from Kyoto University, so I decided to go to Kyoto University. When I was studying for the university entrance examination,



Yoko Mitani Cont.

the International Whaling Commission (IWC) was held in Kyoto in 1993. I read the newspaper and realized that whaling was criticized. From this, I was able to recognize the difference in the values of whales and it keeps me thinking about the meaning of studying whales in Japan.

Let's go back to when I started university. I was admitted to the School of Agriculture, the Department of Fishery Science, Kyoto University. At that time, there were no professors working with marine mammals at Kyoto University, and there were no lectures on marine mammals. There was a welcome party for new students and when I said I wanted to study whales, the seniors said, "Every few years, there's a student who wants to study dolphins (although they can't)". However, I'm an optimistic person, and I don't give up when people tell me to, but rather I don't give up until I've done it myself and seen the results. So I was wondering if there was something I could do. But at the same time, I knew that it would be difficult to become a marine mammal researcher, so I decided to become a high school teacher if I couldn't get an academic position, and I got my high school teaching license.

Then I met Professor Wataru Sakamoto, and Assistant Professor Nobuaki Arai, whose lab studied migrations of fish and sea turtles using bio-logging and chemical tracers, so I joined their lab. I wanted to attach satellite tags to cetaceans, but there was no project in the lab at that time that conducted such an expensive study. I couldn't even study living whales for my graduation research. But I was told that I could analyze dolphin teeth because they were available. A senior student was doing trace element analysis of fish otoliths, so I used the same analytical instrument to analyze the teeth of dolphins and fur seals. In my master's research, I changed the research topic. An alumnus of our lab was working at the Institute of Cetacean Research and had proposed a joint research project to a post-doc in our lab, who was conducting stable isotope analysis of fish, and we decided to conduct stable isotope analysis on minke whale baleen plates. These analytical techniques are also utilized in my current research.

There was no one in the same laboratory who was studying marine mammals, but there was Masanori Shinohara, who was studying wild dolphin behavior in the Graduate School of Science, and we decided to hold a study group on marine mammals with the other students, Tadamichi Morisaka, Takushi Kishida, and so on. I was able to participate in their wild dolphin fieldwork, gaining experience and interacting with cetacean researchers from other universities to expand my network. They are still very good mentors, friends, and collaborators today.

I've always wanted to study whale migration, but until my master's I could only do research on analyzing part of the body from dead individuals (I had never seen living minke whales). My advisor introduced me to Professor Yasuhiko Naito at the National Institute of Polar Research, and I entered the Department of Polar Science, the Graduate University for Advanced Studies. Although the research was not on a whale, I had the opportunity to put a data logger on a free-ranging Weddell seal in Antarctica. At McMurdo Station, Antarctica, I worked with a team from the University of Minnesota. It made me realize how difficult it is to communicate in English and how important it is to communicate. Also, since it was the first experience to do my own fieldwork, I was keenly aware of my lack of preparation to conduct research in the field (especially in Antarctica) in physical and mental aspects. Students wishing to pursue marine mammal

research are encouraged to improve their English language skills and gain plenty of field research experience.

With the strong cooperation of the team, especially the team leader, Michael Cameron and my supervisor, Katsufumi Sato, I was able to get great data. Data loggers can record the behavior of seals, which cannot be tracked by the human eye. But we have to translate the numbers recorded by the data loggers into seal behavior. Although it was very difficult, it was very interesting and I was hooked.

At that time, bio-logging research was developing with various technologies, and the first International Bio-logging Symposium was held in Tokyo. During the conference, I was exposed to the most advanced research in the world, and as one of the hosts, I was able to interact with researchers from all over the world, expanding my world even further. This gave me the opportunity to do a postdoctoral fellowship in Professor Davis' lab at Texas A&M University, where I participated in the sea otter survey. And I also joined the northern elephant seal survey conducted by Costa Lab, UCSC.

The one year and nine months of American life has had a profound impact on my subsequent research life, one of which is the way I think about gender roles. My major when I was a student was fisheries and polar science, and in this field, most of the professors and researchers around me, both as a student and now, are "male field workers". In particular, at the National Institute of Polar Research, most of them were field workers in Antarctica for a long period of time, and I often heard stories of male field workers, such as "My child has been born while I was in Antarctica, and finally met him after he was born," or "I saw my baby for the first time in a year, and he cried". At the time, all I could think of was how hard it was to be in the field for so long, but I never thought that it would be possible with a wife who spent so much energy and time raising her children when her husband was away. During the 20-odd years that I grew up in Japanese society, the idea that "women should raise children" may have been a common belief, and I probably never questioned it.

In the United States, however, it was very refreshing to see a male graduate student with a sleepy look on his face saying, "Yesterday, my child was crying so much at night". This is because I had never heard men talk about the "hardships of child-rearing" in Japan (maybe there was a culture of embarrassment to talk about such hardships to others?). There were also students who brought their kids to the lab because their wives were working, students who left the lab early to pick them up from kindergarten, and postdoctoral fellows who came to the lab early in the morning and left early in the evening in order to have dinner with their families. I think that it was great to meet men who "do" child-rearing, rather than men who "support" child-rearing before I had children (most of the Japanese husbands at that time were "supporting" their wives, who take care of children mainly, rather than taking the initiative).

After I returned to Japan, I had a child and was able to get a job at Hokkaido University. Later, I gave birth to two more children and raised them, while simultaneously establishing myself in the field, and I now study marine mammal migration as I had envisioned as a high school student. There were times when I felt disadvantaged by being a woman, such as not being able to participate in a survey because the ship's cabin was only available for men, or being told by an elderly male professor, "how I pity your baby, who is so small but left at daycare!". But it wasn't my fault, there were many things I couldn't help. I think that's the way it is. On the contrary, with the trend of the era of more equal treatment of women, such as affirmative action, it was possible for me to get a job. In addition, the small number of female field workers gave me the advantage of being immediately recognizable to local people in the field, therefore, it was advantageous to be a woman in some aspects.

My dream didn't come true right away. There were many things that didn't go as expected, but I was able to continue because I love marine mammal research, and the people around me have helped me a lot. It's all been about making connections, and I've been able to seize opportunities at the right time, and that's been my path so far. I think that women researchers may stumble at various stages and in various situations. But we can change it in many ways, like removing a pebble, so that the next person who comes in doesn't stumble. There are times when there is a headwind... But hoist our sail when the wind is fair and move on!

Yoko placing a data logger on a Weddell seal at McMurdo Station, Antarctica.

Page 55: Yoko during an elephant seal survey with the Costa Lab, University of California-Santa Cruz.

Page 56: Yoko during cetacean sighting survey from T/S Oshoro-maru, Hokkaido University.
Photos courtesy of Yoko Mitani.

Alisa touches a curious Baja gray whale in San Ignacio Lagoon, March 2014. She has made over a dozen trips to Baja, usually as trip naturalist. *Photo by Shane Keena.*

BRIDGING CETACEAN RESEARCH TO THE PUBLIC– THROUGH EDUCATION AND CITIZEN SCIENCE

ALISA SCHULMAN-JANIGER

I have always been fascinated by animals and their behaviors - and strongly drawn to the sea. I first waddled into the ocean at 18-months-old: screamed with delight, and refused to leave! My parents quickly signed me up for swimming lessons; I later became a certified swim instructor and lifeguard. I spent hours examining sand crabs, baby grunion, and more with my dad, Allan Schulman - an avid body surfer and health food company owner who shared my passion for animals and the ocean, encouraging me to explore nature and ask questions. I was especially intrigued by grunion, the fish that buries its eggs in the sand. I hatched grunion eggs during a kindergarten field trip to the Cabrillo Marine Museum, where I first met John Olguin. He was the Cabrillo Beach head lifeguard who became the Museum's first Director, was featured in a National Geographic article about grunion - and was a founding member of the American Cetacean Society. John's child-like enthusiasm, storytelling, and very animated body language antics ("dance like a grunion!") inspired me to become a funny teacher who incorporated story-telling, which I practiced on my three younger sisters. My kindergarten teacher brought a jar with a huge preserved octopus into our classroom; I spent lunch studying it, asking endless questions that often went unanswered - and decided that I had to learn everything about octopus! Those interactions started me on my life's path as marine biologist and educator.

When did I choose whale research as my career? I insisted on watching all TV programs featuring nature and animals, especially those focusing on whales, dolphins, apes, elephants, ravens and parrots (wildlife with "higher intelligence", long rich emotional lives and strong family ties), Jacques Cousteau, Sylvia Earle, Jane Goodall, and "Flipper". My "ah-ha" moment occurred in the school library at age 12: a bottlenose dolphin book by John Lilly in one hand, and a chimpanzee book by Jane Goodall in the other. I suddenly froze, felt caught in a spotlight: this was the moment that I would choose my life's path. I decided on wild cetacean studies, which made more sense for a California girl - and to focus on getting to know individuals, like Jane Goodall does. I took all possible science classes, and became a SCUBA certified diver (with my Dad) at age 15. My kindergarten experience inspired me to explore grunion development by raising them at home in 9th and 12th grade science research projects; I also raised tropical fish and guinea pigs, studying their behavior.

How did I set out to become both a whale researcher and educator? I met future whale researcher John Heyning in my university Marine Biology class in

Alisa Schulman-Janiger Cont.

1978, and we became very close lifelong friends. John took me to my first Cabrillo Whalewatch Program class, which was founded by John Olguin; it is co-sponsored by the Cabrillo Marine Aquarium and the Los Angeles Chapter of the American Cetacean Society (ACS/LA). John Heyning had attended this naturalist training program since high school; later we both became program instructors. A truly mind-blowing moment: when I heard John Olguin say "dance like a grunion!" - and suddenly realized that he was that same crazy teacher who had first inspired me in kindergarten! Being a naturalist provides a great opportunity to encounter and photograph cetaceans, and to do research while educating the public: sharing wildlife characteristics, behavior, ecology, research updates, interesting stories, and conservation/environmental protection issues. I joined the ACS/LA Chapter in 1979, then the Board of Directors in 1983; I still serve on that board.

Although I took multiple graduate courses (including marine education), I decided to pursue cetacean field research and hands-on outdoor education. John Heyning worked on the Los Angeles Unified School District (LAUSD) Sea Education Afloat ("SEA") Program, on boats teaching marine biology; he encouraged me to apply in 1979. We worked on those floating classrooms as marine biologists while earning our Bachelor of Science degrees; mine was in Zoology (emphasis on Marine Biology). This job provided a great opportunity to photograph cetaceans and study their behavior. I loved those ten years as a naturalist and educator for thousands of students (K-college) who were out on fun field trips! We usually went whale watching, and investigated what we caught in otter trawl nets, plankton tows, or during our SCUBA dives in the Port of Los Angeles. When I joined the SEA Program, all other marine biologists were male. By the time I left, I was the head marine biologist; all our key marine biologists were women I had trained.

A dead whale brought romance! In 1980, I heard that a whale had been hit by a container ship off Ensenada and was carried on its bulbous bow into the Port of Los Angeles. I raced to the harbor, photographed the dead juvenile blue whale from shore as it was towed into the harbor - and spotted a handsome bearded guy riding on top of this whale: Dave Janiger, my future husband! An unusual "scent of romance": working on my first dead whale for a week, under Cabrillo Beach's hot July sun; thirteen years later, we got married overlooking this very memorable site. Dave is now the Marine Mammal Collections Manager at the "Whale Warehouse" of the Natural History Museum of Los Angeles, where he can look at "our" blue whale's skull! We have responded to many other strandings since then - although I prefer to study them before they die. Dave enjoys collecting and archiving marine mammal research papers ("Janiger's Journals") and making them available to others: a fantastic source of background material benefiting researchers world-wide. In 1982, we saw our first wild killer whales: southern residents from shore, during our first trip to San Juan Island. I spotted famous matriarch J2 Granny, and Dave spotted J1 Ruffles: a very special launch to my killer whale field research! It is wonderful to have a supportive partner who encourages me to follow my passion, even when it takes me far from home.

In 1979, I went to my first Southern California Academy of Science Conference. I attended my first Biennial Conference on the Biology of Marine Mammals in San Francisco, 1981. I have attended all ACS Biennial Conferences (since 1984), and other conferences, including talks by the Cousteaus - and by my early female scientist role models Sylvia Earle and Jane Goodall. Most scientists that presented papers or posters 35-40 years ago were white males. Today, many more scientists are female and/or of color. Although diversity has increased, we still have a long way to go in order to see a more balanced, real world representation in both presenters and attendees. Marine mammal conferences are great opportunities to learn about research in different fields and meet others with similar interests; they can lead to friendships, internships, jobs, collaborations, and potential mentors. I also explored various marine biology opportunities, including Fish and Game Seasonal Aide (only men could wear shorts), and several marine environmental impact studies. One potential job that I had to pass up: Marine Mammal Observer on a Japanese ship; only men were allowed to fill this position, due to harassment concerns.

The ACS/LA Gray Whale Census and Behavior Project became a whale of a citizen science research effort: still going strong after 37 seasons! While working on the SEA Program and naturalizing on whale watch trips, I became very intrigued by a pilot Gray Whale Census project (staffed by citizen scientists) that operated for a few to several weeks (1979-1981) within Marineland of the Pacific, just west of the Port of Los

In May 2016, Alisa took photo-ID images of over 30 Bigg's transient killer whales from at least 10 matrilines with Monterey Bay Whale Watch.
Photo by Bart Selby..

Page 60: Left: Photographer Bob Talbot and Alisa are on top of a dead juvenile blue whale killed in a ship strike off Mexico, brought into the LA Harbor on a ship's bow, July 1980. This was her first whale necropsy- and where she met her future husband, Dave Janiger.
Photo by Dr. Barbara Brunnick, Palm Beach Dolphin Project Director.
Middle: Alisa and John Heyning work on a juvenile gray whale that came up near the Port of Los Angeles; drowned in a gillnet in February 1987.
Photo by Dave Janiger.
Right: Summer 1985, Alisa narrates a whale watch trip off of Gloucester, Mass. She was a naturalist and staff scientist for Cetacean Research Unit for two seasons- primarily studying humpback whales.
Photo by CRU research team scientist.

Angeles. This Gray Whale Census was coordinated by two Cabrillo Whalewatch Program instructors: paleontologist and eccentric high school marine biology teacher William ("Bill") Samaras, and ACS co-founder Elizabeth ("Bemi") DeBus. I decided to reboot and expand it into a full season effort: seven days a week, averaging about 12 hours per day. I started our ACS/LA Gray Whale Census and Behavior Project at Marineland on 1 January 1984, training teams of volunteers to spot, track, and record gray whales and other marine mammals utilizing the nearshore migratory corridor, and record behaviors. Since many grays were already here by January, subsequent seasons started on 1 December. This baseline data can be used to clarify long-term trends: providing perspective for changes seen in gray whale counts, calf numbers (recruitment), distribution, and migration timing - and shifts in other species utilizing our coastal corridor (species diversity and seasonality). Bill Samaras and John Olguin were important supporters of this project at Marineland and then at Point Vicente, Santa Catalina Island, and Santa Cruz Island. Dave Rugh (NOAA Fisheries) ran NOAA's southbound Gray Whale Census at Granite Canyon. Dave is a cherished mentor who suggested refinements to project methodology and other aspects over multiple years; we collaborated on several Gray Whale Census papers, including "Status Review of the Eastern North Pacific Stock of Gray Whales". I am still the Principle Investigator, Director, and Coordinator of this daily project, which runs sunrise to near sunset, 1 December through late May, from the Point Vicente Interpretive Center (within a mile of our original Marineland site), from a public patio. I've trained hundreds of observers over our 37 years, including students, home makers, educators, lawyers, nurses, teachers, retired professionals, and more. Each season, about 100 citizen scientists work in small team shifts to collect data and help educate the public; we display sightings on our Census Whiteboard, and can address questions during breaks between sightings. I share our gray whale migration data with NOAA Fisheries (who shares it at IWC meetings) and other researchers; it has been used to help inform conservation legislation. such as the 1990 CA nearshore gillnet closure bill. Nearly all of my most experienced shift anchors are women: strong female guidance and mentoring is a hallmark of this project.

I have also had inspiring mentors along my killer whale research journey. One of my favorite speakers at early marine mammal conferences was Dennis Kelly, marine biology professor at Orange Coast College; we were both very interested in identifying individual killer whales off California. On 29 January 1984, our census team anchor called me before daybreak (interrupting my third dream that night about watching killer whales) - saying he "just spotted orcas off Marineland"! Photographer Bob Talbot and I set out on his Zodiac and finally located them: our first sighting of a group that I named "the LA Pod;" I later matched many distinctive individuals to a 1982 Malibu sighting. Dennis and I began collaborating on this California killer whale effort. He gave me his archived killer whale images that year, so that he could focus on his bottlenose dolphin research. I was also lucky enough to spend time with two kind and generous killer whale experts who encouraged and fueled my passion. Ken Balcomb, founder and chief scientist for the Center for Whale Research, is a passionate and endless reservoir of knowledge, especially regarding his beloved southern resident orcas; I've visited him many times on San Juan Island. Canadian researcher Mike Bigg ("founder of modern killer whale research"), who was first to recognize that individual killer whales could be differentiated by shapes of dorsal fins and gray saddles, came to my home. We spent hours talking about killer whale research; he gave me archived images, and shared insights on how to proceed with killer whale photo-ID studies. Mike often sought out and encouraged budding marine mammal researchers.

During my Gray Whale Census off-season, I continued exploring field research and science education, including working as a trip naturalist and expedition guide in California, Baja California (Cabrillo Marine Museum, ACS, and others), and Alaska (Princess Cruises). I relocated to Massachusetts for two seasons to work as staff scientist/naturalist with Mason Weinrich (Cetacean Research Unit, aka Whale Center of New England) on whale watching boats, focusing primarily on humpback whales: photographing and identifying individuals, and sharing life history details. I also became an ambassador for the Sea Grant Program: presenting to educators, and conducting workshops training teachers to do hands-on marine biology lessons. For several years, I was a Natural Science Workshop Instructor (Ichthyology) for elementary students at the Natural History Museum of Los Angeles County, and Program Assistant at the Cabrillo Marine Museum; a highlight for both was hatching grunion

Alisa Schulman-Janiger Cont.

eggs! I became the local cetacean media outreach contact. I do annual presentations for a variety of groups - primarily on local cetaceans, killer whales, and our Gray Whale Census Project.

In 1990, my goal of becoming coordinator of the SEA Program shattered when that position was pink-slipped as I was completing my Life Science teaching credential. A year later, I was invited to apply to the prestigious San Pedro High School Marine Science Magnet (LAUSD's only Marine Science Magnet) as a marine biology instructor; those teachers knew me from years of going out on my SEA Program trips. I was a reluctant classroom teacher: a field marine biologist who happened to teach in a classroom. I loved working with that wonderful staff of dedicated, innovative instructors and magnet students for 21 years. I was given lots of latitude to develop my own curriculum, which included creative cross-modality assignments, hands-on activities (like raising grunion) - and many field trips. I especially enjoyed getting students out of the classroom to observe animals in their natural habitats - such as whale watching and tidepool exploration. This helped to engage them, making it more likely that they would care about those creatures and their environments - and hopefully want to protect them. Students came from all over this massive school district to join our unique and quite ethnically diverse Marine Science Magnet program; a busing program brought them to their preferred magnet campuses. I mentored several students who wanted to go into marine science careers, including young women of color who had experienced severe economic hardship. I encouraged them to seek scholarships and internships; most were accepted! Some motivated students lunched with friends in my classroom: asking for advice on marine biology programs and potential job opportunities, asked about cetaceans and my field experience stories, and borrowed books on marine science careers. I still return for "Career Day" and follow many former students on social media - thrilled that some have become marine biologists, environmental stewards, and educators!

While teaching in the classroom, I kept one foot in cetacean field work and outdoor education. I continued to coordinate the ACS/LA Gray Whale Census and Behavior Project, collaborating with NOAA Fisheries Gray Whale Census scientists and other whale researchers, training naturalists, teaching instructors how to incorporate hands-on science into their classrooms, giving public presentations, working on natural history programs such as "The Whale That Ate Jaws", building an informal whale sighting network, and going on boats as naturalist or researcher. My dream trip as a naturalist: a 2005 whale watch excursion off Santa Barbara that included primatologist Jane Goodall, her family and friends! Five cetacean species - blue whale, minke (with calf), humpback (breaching), Pacific white-sided dolphin, and Risso's dolphin (with fetal-fold calves) - came near where she stood (with her

stuffed chimp). I asked Jane if she had seen everything that she had wanted to see; she quietly told me: "all I wanted to see was one whale" - her first ever! I spent several weeks a year in Monterey Bay, collaborating with marine biologists Nancy Black and Richard Ternullo (Monterey Bay Whale Watch co-owners) on killer whale research. This led to our publishing the only California killer whale photo-identification catalog. Nancy and I continue that collaboration in our non-profit California Killer Whale Project, focusing primarily on Bigg's transient killer whales. On one 1992 trip, we encountered a large group of "unknown" killer whales that I later identified as the first sighting of offshore killer whales documented in California. In 2000, I confirmed a large sighting (by Nancy Black) as the first documentation of southern resident killer whales in California. I joined several cetacean surveys, including a NOAA Fisheries Alaska research survey led by Marilyn Dahlheim. That cruise was particularly outstanding: a strong, all female scientist team - including acoustician Kate Stafford.

I "retired" from classroom teaching in 2011 to concentrate on cetacean research. I joined cruises including NOAA Fisheries 2015 Collaborative Large Whale Survey (CLaWS), Alaska-San Diego; my legs focused primarily on photo-IDs/biopsies of Pacific Coast Feeding Group (PCFG) gray whales. Another adventure: 2016 ACS/Cheeseman Antarctica trip, including humpback and killer whale photo-IDs (citizen science). I am a Research Associate at the Natural History Museum of Los Angeles County, and am on NOAA Fisheries Large Whale Entanglement Response Network and Stranding Response Team. I focus on cetacean photo-IDs and on individual killer whales and their life histories, especially those sighted in California: Bigg's (transient) killer whales, plus offshore killer whales, southern residents, and killer whales from the Eastern Tropical Pacific (ETPs). I anchor additional shifts at our ACS/LA Gray Whale Census and Behavior Project, and take photo-ID images, confirm calf presence, and watch for potentially entangled cetaceans; we have spotted and monitored a few entangled whales, assisting the Entanglement Response Team efforts. Our photos have helped track unusual sightings and confirm unique individuals, such as killer whales, sperm whales, flukeless grays, and the well-known Pacific Coast Feeding Group female gray whale "Scarback". We can document body conditions of some gray whales, giving insight into the current gray whale Unusual Mortality Event (UMI). I continue to collaborate with other Gray Whale Census researchers, John Calambokidas and team (Cascadia Research Collective), Ted Cheeseman (Happywhale: citizen science humpback whale photo-ID matching image processing algorithms), and others. I do ACS/LA and other social media posts, including Gray Whale Census daily summaries and "Whale Alerts" for unusual sightings such as large pods, high counts, calves, unusual behaviors, and rarities; we have documented over twenty marine mammal species!

My non-traditional life's path has been very interesting. It has provided travel opportunities while conducting cetacean field research, and enabled me to be an educator and conservation advocate in a typical venue (high school classroom) as well as in many atypical venues. Forty years of killer whale research continues to yield fascinating results, particularly in our studies of multiple generations of Bigg's transients. Our ACS/LA Gray Whale Census and Behavior Project is especially rewarding: it is the longest consecutive full season Gray Whale Census, and one of the longest-running cetacean citizen science projects! Some Gray Whale Census volunteers have been with us for over 25 years. These trained citizen scientists help collect crucial data (impossible to do with professional scientists due to budget constraints), contributing to a unique long-term local research effort. They also educate the public about local cetaceans, safe whale watching practices, and the scientific process; their contributions are priceless, illustrating the power of citizen science in tackling conservation issues. I have had some amazing mentors and role models, both male and female - as well as countless opportunities as an educator to be a mentor. My advice to aspiring cetacean scientists: find your passion, follow your dream, do not give up, and be open to unexpected opportunities! Join the MARMAM mailing list: a site where scientists post internships, jobs and new publications related to marine mammals. Volunteer, seek internships, and attend marine mammal conferences; these are great ways to gain invaluable experience and make connections. We stand on the shoulders of those that come before us; hopefully we will influence future generations of scientists who will follow their passions - and care about protecting our planet and its inhabitants.

Top: Reporter Conor Knighton (KCET SoCal Connected) interviews me about orca behavior, Bay Delta, southern residents dependence on salmon, March 2015. *Photo by Gray Whale Census observer.*
Middle: Circa the late 1980s, Alisa shows intrigued students a sand star they caught in an otter trawl (Port of Los Angeles) before they handle it, during a Sea Education Afloat (SEA) Program field trip. For many of the diverse K-12 students bused in across LAUSD, this was their first look at the ocean's inhabitants. *Photo by trip chaperone.*
Bottom: Alisa (with friend Eric Martin, Manhattan Beach Roundhouse Aquarium Co-Director), encountered her favorite group of killer whales, the Bigg's transient matriline CA51s, off southern California, December 2018. Young male CA51C Bumper is especially curious: Alisa nicknamed him "Bumper" due to his habit of sometimes greeting boats with a very gentle bump. *Photo by Gray Whale Census observer Gordon Gates.*

Page 62: Alisa during small boat photo-identification of cetaceans off of the west coast of Vancouver Island, launched from the RV Reuben Lasker, during the NOAA Fisheries 2015 Collaborative Large Whale Survey (CLaWS), September 2015. Taken under NOAA Permit #14097.
Photo by CLaWS research team scientist.

DON'T LET THE 'ISMS' GET YOU DOWN

NAOMI A. ROSE

Taking a detour on the Road of Life

Up until a couple of years before I finished my Ph.D., I was working toward a career in academia. I assumed I would be a professor by day, a scientist by night—or by season, anyway. I loved being in the field, observing free-ranging marine mammals living their lives and I felt exploring the unknowns of their biology and ecology would be a grand way to spend the rest of my life.

Then two events occurred that made it clear I wasn't cut out for the academic life. They were related, I think, to the kind of woman I am. According to my mother, I was born forceful and confident and I remember a number of incidents from my childhood, from publicly chastising my middle school teacher, who kept calling on me instead of others with their hands up,

Left: Naomi with husband Chris Parsons in New Zealand, 2013.
Right: Naomi with California Assemblyman Richard Bloom and former SeaWorld trainer John Hargrove in 2016, after passage of Bloom's captive orca bill.
Photos courtesy of Naomi Rose.

Page 64: Naomi revisiting her field sites with author David Kirby during research for his book *Death at SeaWorld* in Johnstone Strait, British Columbia, Canada, 2011.
Photo by Chris Parsons.

to bossing my friends around (forceful as a child can be decidedly not endearing to one's peers!), that support her assessment.

The first event was my graduate advisor sexually harassing me. I never considered not doing something about this, although this was years before the #MeToo movement; I filed a complaint with the university. I wasn't the only one speaking out about his behavior, although I think the other complaints were focused more on his increasingly erratic and potentially dangerous actions—I don't think I was the only woman he harassed, but I may have been the only one who did anything formal about it. Given his mental health history (he had a diagnosed condition), the administration followed up on these complaints, but because he was tenured, I felt the steps they pursued were barely adequate. He left the university soon after, failing even to show up for my oral exam. I had to switch advisors more than midway through my dissertation work. The entire experience was not only disruptive and stressful, but in several ways soured me on the American university system.

The second occurred in the context of my work as a teaching assistant. I like preparing and delivering lectures and presentations to this day, but dealing with students one-on-one (during office hours, for example) was more challenging for me. As long as the students were following my explanations, I was fine, but if they were struggling, I had difficulties figuring out how to help. I lack patience in general, especially with those who can't understand what seems obvious to me (unlike being forceful, which I see as mostly positive, I consider my impatience to be a fairly grievous personality fault, especially when I'm dealing with subordinates rather than peers). In one interaction with a student, I tried three different ways to explain some basic genetics concept. I became frustrated with her lack of comprehension and she started to cry. I immediately shifted into apology/comforting mode, but I realized rather abruptly that if my normal manner could lead to this outcome, I was probably not suited to teaching as a profession.

Self-awareness is useful in all walks of life. Acknowledging weaknesses of character or personal faults is not a negative, although I feel western society, and perhaps particularly American society, where self-reliance is far more valued, considers it to be. Literally, nobody is perfect, and accountability is woefully underrated. One good reason not to shy away from the parts of yourself that are least admirable is because they will come into play in your life whether you want them to or not, most often when dealing with other people. When they do, if they don't blindside you because you've already made your peace with them, that's one less shock you will have to weather in the midst of whatever challenges you face.

In addition, I had started to feel uncomfortable about whales and dolphins being held in small concrete tanks, after several field seasons with them in the wild. I had been relatively neutral on the topic until then, as I believe many marine mammal field biologists are. However, after stopping each season to visit the orcas at Vancouver Aquarium (which had a very small enclosure holding three of the massive animals) on my way to spending long summer days watching their wild cousins do what they do in the vast stretches of the Inside Passage of British Columbia, I concluded it wasn't in their best interests to be in zoos or aquariums. I began to wonder if perhaps my personality was more suited to actively fighting to change things for the better than studying them as they are. Science is key to making good conservation and welfare policy, but unless an advocate (who can be the scientist or another person) takes the information forward into the policy arena, it is unlikely to reach, or to be understood by, decision makers.

I wasn't sure how to switch tracks so late in my graduate career, but when I started job hunting in the year leading up to my graduation, I focused on positions at non-profit charities (aka non-governmental organizations or NGOs). I thought I would try a couple of years at environmental advocacy and see if I was any good at it. I had no experience with wildlife activism beyond being a member of a few environmental NGOs and writing some letters in response to action alerts, but certainly I felt strongly about marine wildlife and habitat protection. I wasn't aware at this point that combining science and advocacy was in any way unusual. However, the scientific method is objective and advocacy, of course, is all about having a point of view and promoting it to others. There are many within the scientific community who believe the two do not mix well (I strongly disagree, but that's another story!).

My job hunt did not start out auspiciously—I found it very challenging to root out job opportunities (this was in pre-internet days and the resources for specialty employment listings were far more limited or difficult to access than they are today). I also am not good

Naomi Rose Cont.

at glad-handing and social networking, an odd paradox given my confidence in most situations. I'm an introvert (not as contradictory as it sounds—introversion is not shyness) and definitely not comfortable talking about myself with strangers. I've pushed past this reluctance to cold-call or meet relevant strangers several times, to amazing effect (so I highly recommend making the effort!), but it doesn't come naturally. I've improved at this with time—I think certain social skills are often innate but can, if needed, be learned.

Anyway, if a job opening isn't obvious, I'm likely to miss it. Some people, when looking for work, might submit 50-100 job applications in a few months. I wasn't able to identify enough open positions to submit even two dozen in the same amount of time! But one of those applications was for a position with an animal welfare organization as a "marine mammal scientist," which I saw advertised in a publication listing environmental jobs. Given I was getting a bit desperate and starting to apply for "wetlands biologist" and the like (having nothing whatever to do with my dissertation on the social dynamics of killer whales), I was gobsmacked at the serendipity of such a job title.

Luck has played an active role in my life, but I am a firm believer that "luck" is really just having a positive and responsive outlook when opportunities do arise.

Whatever You Do, Don't Take It Personally

My two years of testing the advocacy waters has become 27. Turns out my personality is very well suited to both confronting opposition and working to persuade others to share my point of view. I never joined the debate club when I was in school, but I woulda been a contender if I had! I'm logical, not a trait considered traditionally "feminine," but it definitely suits advocacy. It helps me dismantle the fallacious arguments of my adversaries. I probably would have made a decent lawyer, but I have no regrets about pursuing a degree in science. There are far more lawyers in wildlife advocacy than biologists, particularly when it comes to marine mammals—the advocacy community needs more minds solidly versed in the biology of the animals we seek to protect.

As it turns out, my advocacy has made me a lightning rod for a single issue. This wasn't my intention, but in my new position, I was tasked with leading a campaign to end the captive display of cetaceans and I took the directive literally. I am now considered a world expert on the welfare of captive marine mammals. This isn't as mundane as it sounds—the people who operate facilities that display performing marine mammals feel extraordinarily proprietary about the animals in their care and do not necessarily respond rationally to those of us who consider the practice of keeping these species in captivity unethical or inhumane. My first year on the job, I was thrown in at the deep end, asked to take on major corporations and upend a paradigm even within the scientific community, which at that time considered captive marine mammals worthy of little or no ethical concern.

I noted immediately that the global campaign to end cetacean display was founded not on science or logic, but passion and empathy. The latter are essential to sustain an advocacy campaign, but I believed the former would have more influence on shifting the paradigm. I envisioned a long game, whose goal was to clarify that there was a sound biological foundation for arguing cetaceans don't belong in captivity and to develop arguments that resonated with members of the public who never gave much thought to what went on behind the scenes of a marine mammal exhibit from one day to the next. The ardent fans of dolphin shows were unreachable and the dedicated animal activists were solidly on side; I was focused on the undecideds, of which there were many when it came to this issue.

Over the years in my campaigning, I have no doubt pushed past sexism (and racism: my mother is Asian, my father Jewish) far more often than I am consciously aware of. Most often, I have considered people's arguments at face value (whether they are substantive, fallacious, or defensive)—I don't look for hidden meanings. But in retrospect, I suspect there have been many instances where my interactions with certain individuals would have played out differently had I been a man.

My work rather often pits me directly against established men (although a fair number of my adversaries are women) in the scientific, policy, and corporate arenas. I have faced down dismissive behavior from legislators, insults from executives and scientific peers, and Facebook pages

dedicated to ending my career. I've never considered these attacks to be primarily motivated by an "ism" at the time they were occurring—I've just judged these people as lacking character (this may be a coping mechanism, but I don't think of it that way; it's simply my instinctive assessment of their antics). Perhaps this is naïve—but I think of it more as pragmatic. Worrying about the motivations of people outside of your immediate personal circle is a waste of valuable time.

The corollary to this is, I never take any of this unprofessional behavior to heart, not even the racist memes maligning me that have circulated on the internet. "Don't take it personally" is my standard advice to anyone approaching me for words of wisdom as they consider a future in wildlife advocacy. The folks who feel compelled to behave this way toward advocates—either because they feel their livelihoods threatened, are self-righteous or arrogant, suffer from simple greed, or what-have-you—are indeed behaving unprofessionally. I have little respect for people who resort to ad hominem attacks because they don't have substantive rebuttals to my arguments. And as anyone who knows me well can attest, I truly don't care what someone I don't respect thinks of me.

Be fierce

Despite being a woman of color, I have never discussed my reactions to sexism or racism publicly before. I haven't discussed them not because I fear them or consider them harmful secrets to be hidden away. It's literally because I haven't spent much time considering the professional opposition I've faced through a gender or racial prism. I don't dwell on the negative forces I've encountered throughout my life and career. To me, they are simply obstacles that life naturally throws our way—we can deal with them head-on, maneuver around them, or run away from them. These are daily choices we make, but for me, my choices have always been instinctive. It truly never occurs to me to run. I sometimes move around obstacles because I'm constrained by time or resources or others convince me it's the appropriate strategy. But generally I simply bulldoze past the problem. I recognize that others may not respond this way—and perhaps in some cases it isn't the best way to respond, as it can unnecessarily antagonize others, which isn't helpful! However, for me, it's always been more a matter of learning how and when to back off rather than how or when to push forward. Few are born with the wisdom to know when it's best to do either—most of us have to earn that wisdom through experience.

Choosing to combine my scientific background and credentials with advocacy—on a controversial issue no less—has led to a life of confrontation and challenge that I never envisioned when I spent long hours on elephant seal rookeries or along the coast of orca habitat recording wildlife social dynamics. Being in the field observing marine mammals is as far as one can get from testifying in front of Congress. But ultimately I feel the value of my being a scientist has been maximized in the policy arena—there are many dedicated biologists studying marine mammals, providing the data that clarify their survival needs. But only a few choose to fight for their protection in the human halls of policy.

For advocates and activists, it's easy to burn out and it's way too easy to fall into the trap of attending policy meetings and conservation conferences and regulatory task forces without actively speaking up and out. Just being there isn't enough—one must be fierce and fearless of becoming a target. In some parts of the world, this literally means risking one's life. In others, such as the arenas I frequent, it simply means not caring what adversaries do or say, beyond the need to effectively rebut their arguments.

I cannot claim my career has been more difficult because of my gender or ethnicity, because I honestly haven't been paying attention to that. Certainly I can point to incidents where sexism or racism were elements of the response my advocacy has received. But as I said before, I view someone who would choose to respond to me this way as unworthy of respect.

And so I move on to the next battle, the next progressive step. Am I changing the world? Perhaps my small corner of it, but in the end, advocacy is about doing the right thing for its own sake. If you actually expect to change the world, you will probably be disappointed. That's a heavy lift—start small and be pragmatic about your expectations. Stay hydrated. Sleep well. And don't let the isms get you down.

Top: Naomi checking out Hobbiton in New Zealand, 2013.
Middle: Naomi speaking in California on behalf of AB2140, the Orca Welfare and Safety Act, in 2014.
Bottom: Naomi at the Planet On Film Festival with Ian Michler, Roger Payne, Jane Goodall, Louie Psihoyos, Norma Caudros, and Boy Olmi, among others in Bogota, Colombia, 2015.

Page 66: Naomi giving a public lecture on captive cetaceans in Shanghai, China in 2019. The event was live-streamed to tens of thousands of people via Weibo.
Photos courtesy of Naomi Rose.

FROM SAVANNA TO SEA: 33 YEARS STUDYING BOTTLENOSE DOLPHINS

JANET MANN

July 16, 2002. "Dodger has a sponge!" I yelled. This was completely unnecessary since our boat "Maziwa" (milk in Swahili), was only 4 meters in length and Dodger, a two-year old female, was right there at the bow, carrying a sponge on her rostrum. Dodger came from an important lineage. Her grandmother, Half-fluke, was the first dolphin ever seen carrying a conical marine sponge (used as a tool to ferret prey from the seafloor). Half-fluke's daughter, Dodger's mother – Demi was the first offspring I or anyone else had ever seen carrying a sponge 13 years earlier on June 12, 1989. This was a family of firsts. First sponger, first offspring with sponge, and now first grandoffspring (Demi's first-born!) with a sponge. I nearly fell off the boat.

I was not and am not a flipperphile. Nor did I follow Jacques Cousteau that closely as a child. "Wild Kingdom" enthralled me– even though I did not relate to either Marlin Perkins or Jim Fowler. But, the early tales of Jane Goodall, Dian Fossey and Biruté Galdikas – traipsing the forests of Tanzania, Rwanda and Borneo for glimpses of our closest cousins, chimpanzees, gorillas and orangutans fascinated me to no end. The "Trimates" as they were dubbed, were prominent role models for anyone who was interested in animals, evolution, and how we got here. I was not alone in this, as many well-known women scientists today credit the National Geographic Effect of the Trimates for launching their careers (Haraway 1989).

By my mid-teens, I had read every book about primates in the library – discovering a bevy of women primatologists – Sarah Hrdy, Alison Jolly, Jeanne Altmann, Phyllis Dolhinow, Jane Lancaster, and others. After stints in a primate lab at Hofstra University and an internship at The American Museum of Natural History in Manhattan during my high school years, and primate lab research while an undergraduate at Brown University, my goal to become a field, rather than lab biologist sharpened. In large part, this was because the lab conditions at the time were far from optimal. Monkeys were housed in small individual cages with little stimulation. It was no wonder they could not perform the basic cognitive tasks given to them. For my junior year at Brown, I decided that I would be a primatologist's field assistant somewhere in Africa. My first stop was to ask the professor whose lab I worked in for over a year for a letter of recommendation. To my surprise and dismay, he refused, "only the best can be field primatologists," adding that I "smiled too much." I did not understand this, as my volunteer record in his lab was perfect. One of the graduate students hinted that perhaps my obvious concerns about the laboratory conditions were not well received. I stopped smiling and retreated to my dormitory in despair.

A friend in medical school rescued me by introducing me to Jane Phillips-Conroy, a physical anthropologist in the medical school who studied baboons in Ethiopia. She helped me write letters to six primatologists, and to my surprise, most of them wrote back. Dr. Phillips-Conroy helped me sort through three that were willing to consider my application, but her advice was clear. Work with Jeanne Altmann at the University of Chicago. Jeanne is most famous for her

Ashley, Dodger's younger sister, swimming with her friend Osprey, also descended from a long line of Spongers. *Photo by Ewa Krzyszczyk.*

studies of savanna baboons and particularly, observational methods. Her 1974 methods paper has been cited over 15,000 times. Jeanne was my first real mentor, giving me papers to read and asking me what I thought the next day. She tested me by asking me to read a dissertation where the student likely falsified his data. Fortunately, I noted that some numbers were too perfect and others didn't make sense. But most importantly, she trained me in observational methods, long-term study design, and how to be a field biologist while studying savanna baboons in Amboseli National Park in Kenya. This formed the foundation of my career and for the Shark Bay Dolphin Research Project which I now direct.

With so many female role models in field primatology, it was an easy choice to attend The University of Michigan for graduate school as Barbara Smuts' first graduate student. She was an up-and-coming primatologist with two seminal books "Primate Societies" and "Sex and Friendship in Baboons". It was Barb who introduced me to dolphin research, as she had become intrigued with a field site in Shark Bay, Australia, that was initiated by Rachel Smolker and Richard Connor. Her field assistant backed out and she asked me to come along and help. It was a chance to do fieldwork in Australia and the prospect of getting involved with dolphin research was intriguing, but I only expected to help out for a few months and that would be that.

It was 1988 and in preparing for the trip, I found little research on dolphin or whale behavior in the wild. Although this is not surprising given how hard it is to study wild cetaceans, it was evident that few individuals had been studied in any detail. The clear and sometimes calm waters of Shark Bay afforded a different view. It was not unlike forest primates that go in and out of view, but their distinctive dorsal fins stood out at every breath to advertise individual status. And, with clear water, not only did views of their ventral sides allow us to tell their sex, but we could also approximate their ages - as they conveniently speckled ventrally around sexual maturity. Clear waters also afforded us views of the details of their behavior, literally what body parts touched when they pet each other. Few believed me when I described how often I saw nursing. Now the challenge was to find methods to systematically measure all of these fascinating behaviors.

I had found a research home. Barb had become quite taken with dog behavior and was willing to let me continue the research she had started. Her interest was in female reproduction and mother-calf behavior, something which I focused on in my graduate and undergraduate research. It wasn't "aww, babies are cute". It was – how can a marine mammal navigate the intensive and extensive costs of maternal care while feeding herself? At the time, the literature insisted – as it sometimes does to this day, that bottlenose dolphins nurse their young for less than 2 years – typically 12-18 months. So, on this first trip, I thought I would study some mother calf pairs for a couple of years and move on to other things. But, the calves were nursing for much longer than that! Mouse, daughter

Janet Mann Cont.

of Minnie, recruited early on in the study, nursed for over 7 years. Clearly something else was going on. Nothing in the literature suggested that dolphins maintained such prolonged dependency. But mothers and calves were rarely observed for more than a year, even in captive settings. As it turns out, hundreds of calves later, we now know that mothers nurse their last-born a very long time – sometimes 8 years or more. This way she ensures the survival of her last calf and avoids the costs of producing another calf that is unlikely to survive.

The other striking features were how important and complex their social relationships were. The fission-fusion dynamics, where group composition changes 5-6 times per hour, were nothing like the fission-fusion dynamics described for chimpanzees and spider monkeys. Bottlenose dolphins were much more flexible socially. One could go off to hunt, return to a group and set off again minutes later. The shocking thing was that calves did this too—even very small ones—a few months old. They would zip off hundreds of meters or even a kilometer away -and either find some other calf or seagrass to play with and zoom back. How did they do that? And wasn't this Shark Bay? And if there is 'babysitting' as I had read, who is babysitting whom?

So, I was hooked. After developing systematic focal sampling methods that catered to wild dolphins, I thought that I could contribute something. Several papers with Barb Smuts as my co-author focused on mother-newborn behavior, including a test of the babysitting hypothesis. Following another famous primatologist, Sarah Hrdy, the reasoning was that allomaternal behavior (allo for other) was of 3 types: allomaternal care where one does behaviors that protect and nurture the calf a way the mother would- at some cost to itself and at some benefit to the mother since she does not have to do that investment; allomaternal abuse, where another harms or costs the mother or calf; and, allomaternal behavior, which is neither – simply social interactions that involve the calf and non-mother. The latter might offer some benefits to the calf and the allomother, but if it didn't benefit the mother, it would not qualify as different from any other social interaction. It was evident that when young dolphins, invariably female, ventured off with someone else's calf, mothers were more vigilant, not less, and the interactions were not different than when two calves swam off together. Babysitting does not seem to be a thing among Shark Bay bottlenose dolphins.

As for how mothers and calves navigated these separations, our work with Rachel Smolker showed how important communication, and particularly signature whistles are for mediating separations and reunions. Oddly enough, it was the calf who would whistle (mothers rarely), and the calf already seemed to know where the mother was. Typically, the calf would whistle and then bee-line back to the mother, who hadn't whistled at all. To this day, I hope someone will test our hypothesis that calves passively listen to their mother's echolocation and track her the whole time. They know where she is, they whistle to let her know they want to come back. If she stops hunting, then back they go.

As for the risks of these separations, we tested this with my first graduate student, Jana Joy Watson-Capps. Basically we examined the survival prospects of calves that separated often compared to those that stayed close to their mothers. Contrary to what we predicted, it was the adventurous calves that survived. It seems that condition is key. Calves in good condition venture off. Those that aren't, stay close to mum.

So many questions. I was fortunate to get a tenure-track position at Georgetown University fresh from my PhD in 1991. The academic pipeline was different then, but all the pressures of a tenure-track job were there. There were very few women scientists at Georgetown in the 1990s and there were

Left: Janet Mann in the field.
Photo by Ann-Marie Jacoby.
Right: Janet with dolphins and tourists during an educational talk in Shark Bay, Australia.
Photo by Katie Gill Patterson.

Page 70: Two young male bottlenose dolphins petting each other.
Photo by Ewa Krzyszczyk.

virtually no women in senior administrative positions. Maybe because of this, the women supported each other. But I also had the support of one male Professor who guided me from early on.

The Shark Bay data became more and more valuable with time. Calves grew up and had their own calves. Soon I was studying grandmothers and great grandmothers. In 1997 I applied for, and received my first National Science Foundation grant. Since then, I have been continuously funded by the National Science Foundation. The value of that support cannot be overstated. Academia is full of challenges, but without funding how could I possibly maintain a long-term study site? The boats, the facilities, the airfares, the vehicles, food and fuel. Graduate students, undergraduate students. Mouths to feed. Stipends to pay. And exciting questions to answer.

None of it was easy. Shark Bay is the remote 'outback'. Few women were on boats. The men would stare, mostly laugh. I laughed back. Some wanted to talk. Talk about fish, talk about weather, talk about how to fix an outboard or electronic wiring to the radio or gps, talk about things they rarely talked with women about. A curiosity. A woman, a scientist, a professor and an American, from New York- no less. What could be worse? I was young, so the men were flirty more than hostile. But, battles broke out over money – if someone thought the researchers were stifling tourism dollars to protect their precious dolphins. Most understood that protecting precious dolphins was the best for tourism dollars too. People began flocking to Shark Bay more and more when they heard about the friendly dolphins. Some of the dolphins were fed fish handouts by fishers that evolved into an organized tourist operation. The dirt road was paved. A millionaire bought the campground and it became a 'resort'. Film crews showed up. Today there are two pools, tennis courts, a spa, two restaurants and cappuccino. We used to eat from cans.

Maintaining a long-term study is extremely taxing. We spend an inordinate amount of time cleaning data for the database. Returning to film and hardcopies again and again to make sure every identification and piece of information is accurate. Since 2005, I have been collaborating with a computer scientist, Lisa Singh, also a professor at Georgetown, who has proved to be an invaluable colleague in helping us build a truly beautiful database. In addition to my students, several other women have helped shape our current research. Dr. Celine Frere, a highly regarded molecular ecologist at University of the Sunshine Coast, has been working with me for 14 years on the genetics data. Dr. Shweta Bansal, a network scientist and mathematical modeler focused on disease transmission at Georgetown, works with me on Shark Bay data and our new study of bottlenose dolphins in the Potomac River and Chesapeake Bay. These collaborations have been so crucial in a rapidly changing academic and global climate.

I forged strong bonds with several women and men in marine mammalogy, but since my training came from primatology and animal behavior, I always felt a bit like an outsider to the field, but coming into it laterally probably made it a bit easier to pursue my ambitions. The approach to the Shark Bay research was very much in the tradition I learned from Jeanne Altmann. I inherited an entire network of alpha female primatologists and behavioral ecologists. I did not feel, like many of my female colleagues tell me, like I had to gain the approval of the senior men in the field. It was noticeable at conferences that there were many high-ranking men and many many young women trying to 'break-in' to the field. Many of the women who became icons in the field studied cetacean physiology and energetics, maintaining vibrant research labs, not field studies.

This does not mean there wasn't competition, envy or other problems during the course of my career. Every long-term field study has conflicts – marine and terrestrial, and many dissolve as a result. Women, unfortunately, sometimes cave-in during such conflicts in order to resolve a situation quickly. They accept lesser pay, lesser authorships or no authorship at all. Sometimes their expectations are lower than they should be. In academia, women do more service than men. We all know the negative stereotypes assigned to women who speak up for themselves. The fear of not being liked hurts many women in their career path. But, women might ask themselves if they really care about the opinions of those that wish for their failure. Fundamentally, doing good research was always of paramount importance to me. That clarion call, my wonderful colleagues, students and partner, allowed me to return to Shark Bay year after year, and keep the discoveries coming.

Haraway, Donna 1989 Primate Visions: Gender, Race and Nature in the World of Modern Science

Page 73: Top: Lori in the lab holding a dolphin brain.
Photo by Jack Kearse, Emory University.
Bottom: Lori speaking about dolphin brains.
Photo courtesy of Volker Barth.

MY JOURNEY TO SCHOLAR-ADVOCACY

LORI MARINO

On March 8, 2020 a young student at the University of Toronto published an article (Leckie, 2020) in the school newspaper that was like looking in a mirror. In the article she described her feelings about her first experience with vivisection in a physiology lab. She explained how she "practiced" on a dead mouse and then was given a live mouse to learn how to restrain him/her, clip the ears, and draw blood from the tail – all standard laboratory practices.

As disturbing as these conventional exercises were, the author found the cavalier attitude many of her student colleagues and teachers had towards them to be even more distressing. She experienced the systematic "toughening up" of students in physiology, neuroscience, psychology and other academic disciplines rife with the use of other animals as research subjects in labs. She was told she would "get used to it" and the implication was that if she wanted to be a real scientist she needed to put her deep concerns about animal welfare aside in order to do what needed to be done for the good of science.

Her article is a highly personal exploration of her mental state during the procedures she was performing in her role as "scientist-in-training" and how she was caught between feelings about the moral wrongness of harming a living being and her desire to be seen as a professional. She asks: "Do I join the team of people, of scientists, who are used to it? Do I convince myself of its value? Or do I stand still, arms crossed, in protest?".

Her dilemma is not resolved by the end of the article but she courageously concludes that it is important for her to feel the pain of apprehension in these lab exercises: "I want to continue to feel uncomfortable, distressed, and stunned." And upon reading this statement I was heartened to realize that she had great promise as an articulate and reflective scholar who intrinsically understood the gravity of what academic science training was doing to her psychologically. We should be anxiously squirming in our seats and questioning everything about using other animals in vivisection labs. We should never get comfortable with it.

Her experiences are so familiar to me. As a young student in college at New York University and then afterwards at The Rockefeller University I conducted invasive and terminal research on rats. And then, after deciding to give up invasive animal research, I was still confronted with the ethical questions surrounding keeping animals, i.e., chickens, in labs, as a graduate student at State University of New York - Albany. I decided I didn't want to do that either.

At around that same time I was looking for a Ph.D. dissertation topic when I came across a photo of a dolphin brain in a book on marine mammals. I knew then that I had to study such a brain. I wanted to know why it evolved to be so large and how it was different (and also the same as) the primate brain. And that is when I began my primary line of years-long research using magnetic resonance imaging (MRI)

to study the postmortem brains of dolphins and whales who had died naturally. For my dissertation I spent many months in a dusty basement of The Smithsonian National Museum of Natural History measuring the brains of modern dolphins and whales and devising a technique to assess brain size from their cranial capacity. From this work I discovered that some dolphin species have encephalization levels second only to modern humans and significantly higher than even great apes.

I then went on to ask questions about the evolutionary trajectory the dolphin and whale brain took on the way to becoming so large and I found myself again spending months in a different part of the basement of the Museum of Natural History – this time amidst the collection of cetacean fossils, using computed tomography (CT) to peer inside and measure the fossilized crania of cetaceans who lived over 40 million years ago. I was as if a "kid in a candy store!" pulling out shelves of fossils and discovering priceless treasure after treasure. Based on that work, my collaborators, paleontologist Mark Uhen and complexity theorist Dan McShea and I published a paper in 2004 tracing the evolutionary trajectory of brain and body size in odontocetes (toothed whales, dolphins and porpoises) and demonstrating that a major increase in brain size occurred ~35 million years ago in specific odontocete lineages.

Through the years my varied collaborators and I have used MRI to uncover some of the anatomical wonders of modern cetacean brains across a number of species and continue to map the architecture of a brain that has been on a different evolutionary trajectory from that of our own primate lineage for over 95 million years.

But it wasn't until I became a full-time faculty member at Emory University in Neuroscience and Behavioral Biology that I was confronted most powerfully with the ethical dimensions of conducting research on/with other animals and advising/teaching neuroscience to undergraduates. In the beginning of my position at Emory I conducted noninvasive cognitive research with captive chimpanzees at Yerkes National Primate Research Center and with dolphins and beluga whales at various marine parks. And, with Diana Reiss, had published the first evidence for mirror self-recognition in bottlenose dolphins in 2001 (Reiss & Marino, 2001). I told myself that I

wasn't harming any of my research subjects and that defense was enough to keep my apprehensions at bay... for a while.

But then "animal activists" started asking me about the implications of our findings for the dolphins themselves. I began to think about what the lives of the two dolphins, Presley and Tab, who passed the mirror test, were like as they circled endlessly in a barren pool in Coney Island, NY. And then, a couple of years later, I received the news that they were transferred to other facilities and died of common infections at young ages. And it was also at this same general time that I became aware of where many captive dolphins come from – the infamous Taiji dolphin drives where thousands of cetaceans are slaughtered every year underwritten by marine mammal parks all over the world. And, as if all of that were not enough, reality hit me squarely on the head with a "two by four" when one day I ventured into a lab at Yerkes and found my favorite chimpanzee, Clint, had died of heart failure at the young age of 24 and remained nothing more than a brain floating in a jar on a shelf. Heartbroken, that day I vowed never to step foot in that place again. And I never have. I recently wrote an essay about him (Marino, 2019).

And, as an academic advisor and instructor for the capstone Research Methods in Neuroscience course, each semester students would come to my office and fret about what they were told they needed to do to other animals – and how they were forced to feel about it – in order to stay on their professional trajectory (just like the student at the University of Toronto). I saw many capitulate and harden. I saw many punished for staying in but protesting. And I saw many abandon their lifelong aspirations rather than run the gauntlet.

Mid-career in the mid-2000s, having dealt with the tragic deaths of my research subjects, the anguish of those students who were forced into a mold of insensitivity towards animals, and my increasing need to contribute more than just academic papers to the world, I realized my role was not just to be a scientist but to be a scientist-advocate for the animals I studied. At that time, I gave up all research with captive animals (continuing my neuroanatomical work) and eventually, in 2011, created The Kimmela Center for Animal Advocacy, a nonprofit organization focused on providing professional opportunities and guidance for young academic scholar-advocates who want to pursue careers in science as animal advocates. Through Kimmela we show students that being a scientist is not equivalent to conducting coercive and invasive research and that there is no inherent conflict between studying animals and being their advocate.

And in 2016 I founded the Whale Sanctuary Project and brought together marine mammal scientists and other experts from all over the world to work on the mission of creating the first permanent sanctuary for captive belugas and orcas in North America. We are now working towards permitting for our chosen sanctuary site – Port Hilford Bay in Nova Scotia. With the sanctuary we want to instantiate a different and more respectful relationship with dolphins and whales than is currently typified in entertainment parks.

We have a long way to go before the world is a fair place for other animals and the people who want the world to be that way. But many of my colleagues – men and women alike - are becoming more active in scholar-advocacy for other animals. And we work together for a time when no student is bullied into making a choice between a moral rock and hard place and more animal advocates can enter the academic sciences to shape the future for others – human and other-than-human.

If you want to know more please go to kimmela.org or whalesanctuary.org.

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Top: Lori educating children in Florida
Photo courtesy of Ursula Schwuttke.
Middle: Lori and Executive Director Charles Vinick scoping out sanctuary sites on the water.
Photo courtesy of Sue Lowe Henry.
Bottom: Lori gives a lecture in Florida.
Photo courtesy of Ursula Schwuttke.

The MareCet team during field work to collect data on Indo-Pacific humpback dolphin social structure and acoustics, Kuala Perlis, Malaysia, September 2019. *Photo courtesy of Louisa Ponnampalam.*

ALTHOUGH THEY LAUGHED AT ME, I DOLPHINITELY CARRIED ON

LOUISA PONNAMPALAM

I was born into a regular average-income family in Malaysia, a developing country situated at the heart of Southeast Asia, a melting pot of ethnicities and culture, and a center of global biodiversity. My father worked as an accountant,

Louisa Ponnampalam Cont.

and my mother, a trained nurse who decided to become a homemaker so that she could raise my sister and I. Both my parents aren't exactly the adventurous outdoorsy type of people, but they did ensure that both Katrina and I had opportunities to spend time in nature – we had family trips to the beach, waterfalls and also the rainforest.

Our family has lived just outside the capital city of Kuala Lumpur ever since my parents married. However as my father had work projects on the east coast of Peninsular Malaysia, we would spend most of our school holidays by the sea, playing on the beach and splashing around in the shallow surf. It was on those trips that my love for the sea and marine life began, as far back as when I was 6 years of age. I recall as a kid, my mother would have trouble getting me to leave the beach to go back to our hotel room, and thereafter, she would have trouble getting me to get showered and wash off all that sand between my toes and on my body. As I grew older, around the age of 10, I remember standing at the beach during one of those school holiday trips, the waves lapping at my toes while I looked out to the horizon at sea, and thought to myself that someday, I will not be fit for a conventional office-based job. I would need to work in a field that lets me feel so free and invigorated, just like how I felt at that moment in time. Sometime in that year, I began keeping a scrapbook of any newspaper articles about marine life. One day, my mother showed me an article about coral reefs; in this article was a picture of a SCUBA diver hovering over a large table coral. I recall that the caption of the picture said something about a marine biologist inspecting the coral, and upon seeing that, I turned to my mother and told her that I wanted to become a marine biologist when I grow up. Did I really know at the time what marine biologists do? No. But was I serious about this ambition that I had just blurted out to my mother? Yes.

During my primary school years, there was a subject that was taught called *Alam dan Manusia*, which basically translates to 'Man and the Environment'. It was the one subject that I truly loved at school. It was the one that first taught me about the 3Rs and how to care for the environment. However, it is a pity that since 1995, this subject was discontinued in our national schools. Nonetheless, I carried on into secondary school with an ever-growing passion for the environment, especially all things marine. When I became a teenager, I started having an obsession with dolphins. There was something so charismatic about dolphins that attracted me to want to know more about them. I became rather "infamous" for this obsession as I had all things dolphin – I had dolphin-themed accessories and clothings, all sorts of dolphin figurines, dolphin plush toys (though I was never a fan of plush toys), dolphin-themed notebooks, bags, place mats, posters, and a school desk plastered with dolphin pictures torn out from the calendar of the year before. I was the only one in my whole school, and probably other schools in the district, with this crazy obsession. In school, I became known as "dolphin girl" – a phrase that I still get referred to these days when I bump into an ex-school mate I have not seen in decades.

At 13 years of age, I decided that I wanted to undertake my university studies in Hawai`i and that I wanted to study marine biology and then onward to a specialization in dolphin research. Why Hawai`i? Well, I figured it is a beautiful place (my perceptions were mainly influenced by watching Baywatch and Hawaii Five-O at the time), so why only go for a short vacation and then leave when I can be there for extended periods of time. I had this grand dream built up in my mind – go abroad for my tertiary education, obtain all the skills and knowledge about marine biology and dolphins while there, and return to Malaysia thereafter to establish my very own research institute and partake in nation building. With tenacity, I pursued this ambition. In my final year of secondary school, this was 1999, while all the other students were busy preparing for the ultimate examination of our schooling lives, I was busy applying to the University of Hawai`i at Hilo and harassing my teacher at school for letters of recommendation. I did not even have a contingency plan – the young and ambitious me simply decided that if I did not get accepted into UH-Hilo, then only would I think of where else I would like to apply to. My loving parents have always supported my dreams from the start, even if it was such an alien concept to them. They never did fall into the typical mould of Asian parents

Left: Louisa in the field.
Right: Louisa's first time since returning home and beginning her work as a qualified cetacean scientist, delivering a public lecture in Malaysia on marine mammals, at the Langkawi Nature Festival, Langkawi Island, Malaysia, November 2012.
Photos courtesy of Louisa Ponnampalam.

Page 76: Highly energetic group of Irrawaddy dolphins engaging in gregarious hunting of prey, observed during MareCet field surveys in Matang, Malaysia.
Photo credit to The MareCet Research Organization.

who ensured that their children must study subjects such as law, medicine, engineering or accountancy. I am sure that they had their worries because what sort of future was there for a Malaysian daughter returning home with a marine biology degree? In fact, when my parent's friends heard about my plans, they told me that "it was a shame" that I was not using my good grades from school to pursue Medicine or Law. Many of them also teased me and laughed, saying things such as, "You won't have any job opportunities when you return to Malaysia", "Are there even dolphins in Malaysia for you to study next time?", and "Why not study something more relevant and important?" Their comments irked me, but knowing that I had my parent's blessings, I carried on.

By the Fall of 2000, at the age of 17, I was enrolled at UH-Hilo in their Marine Science programme. I was the first amongst my peers to leave home for university abroad. My father traveled with me on my maiden trip to Hawai`i and we both attended orientation week together. Hilo, as we discovered, is nothing at all like the Hawai`i that we saw on television (which is mostly Honolulu). What is a 17 year-old so-called city girl going to do in such a small and quiet town that rained all the time (wasn't Hawai`i all about sea and sunshine?)? And then it hit me – I was now thousands of miles from home, in a different country with different culture, in a seemingly deserted town where many things were unfamiliar to me and I was simply a naïve teenager from Malaysia with some crazy dreams. Had I made a mistake? Did I take this dream too far? In that orientation week itself, I was utterly homesick and on several occasions, felt like I should just pack up and go home. My father, being the ever kind man that he is, said to me, "Do you really want to go home? You can, if that is really what you want. But, you've come this far." My father was the sole breadwinner of the family and he had saved up all that he could to afford me this dream of studying marine biology in Hawai`i. I couldn't just throw it all away simply because I was homesick, and so I decided that I will give it a go. But with that, on the day that my father was supposed to fly home to Malaysia, I refused to look at him, because I was afraid I would crumble. Eventually, life as a student at UH-Hilo was wonderful and Hilo itself grew on me. It was not until a beautiful morning kayak in 2001 in Kealakekua Bay, on the lee of the island, that I saw my very first live (and wild) dolphins. They were spinner dolphins – the species that I would go on to study for my PhD.

Fast forward to 2004, my enquiries for a post-graduate study position landed me in Scotland at the then University Marine Biological Station in Millport, a centuries-old research facility on the windy Isle of Cumbrae that belonged to the University of London (I know, it's complicated!). Bestowed with a prestigious Commonwealth Scholarship, I was given the opportunity to study the ecology of small cetaceans, particularly spinner dolphins, in the Sultanate of Oman. I had never heard of Oman before this! When my friends and relatives found out that I was headed to the Middle East for my PhD sampling, they were all concerned, naturally, because the Iraq War was ongoing, and there I was seemingly headed to a region of turmoil to study dolphins! I quickly found that Oman is a beautiful country which has kept a lot of its authenticity in the face of rapid modernization, and with a most friendly populace whom I found to be kind and generous. Still today, I am grateful for the experience and the majestic waters of the Sultanate of Oman remains to be the place where I have seen most of the cetacean species I have seen in my whole life.

My life as a PhD student was difficult, as I worked very remotely most of the time and often did not get the academic support that I needed. However, I will pay tribute to Gianna Minton who provided me with a lot of moral support and helped me from her base in Sarawak, Malaysia, as much as she could. On many occasions, I wanted to quit my doctoral studies as I felt I wasn't equipped to do the research. I felt I wasn't good enough and I believed I was becoming a total failure at this crazy dream I started about a decade before. One day, my father said to me, "You can quit, it is your life, but what would you have after this? And what would become of this dream that you are so close to achieving?" That brought me straight out of that pity corner in which I sat, in the puddle of tears. In 2008, I officially completed my PhD, aged 26. So, this was it - that moment I had worked towards, the moment I had played in my mind over and over again, that childhood dream coming true. I was now officially a dolphin researcher.

I returned to Malaysia thereafter, armed with this PhD, wearing rose-tinted glasses and with a head and heart full of enthusiasm. I was ready to serve Malaysia by helping her build up the field of marine mammal science.

When I was growing up in the 1990s and 2000s and obsessing over dolphins, I had found that the information on dolphins in Malaysia was rather limited, and so I had always known that I want to contribute to that vast knowledge gap. My first job was as a postdoctoral researcher at a local

Top: Learning how to cut open a beach-cast dolphin to extract its stomach for stomach contents, pictured here with Ken Findlay, Masirah Island, Oman, February 2006.
Middle: Louisa with her father at a UH-Hilo freshman orientation week field trip to Akaka Falls, Hawai`i, August 2000.
Photos courtesy of Louisa Ponnampalam.
Bottom: Rare capture of the face of a surfacing elusive Indo-Pacific finless porpoise, observed during MareCet field surveys in Langkawi Island, Malaysia, where it appears to be one of the best places in Southeast Asia to sight this species.
Photo credit to The MareCet Research Organization.

Page 79: A pair of young adult Indo-Pacific humpback dolphins observed during MareCet field surveys in Matang, Malaysia.
Photo credit to The MareCet Research Organization.

university. Whilst I was excited, I was also nervous, because I had been away from Malaysia for nearly a decade and I suddenly felt like a stranger to how systems work in my country. I had to reconnect with my writing proficiency in our national language, Bahasa Malaysia, and I had to figure out where to begin a career in dolphin research and conservation in this place I called home. I did not know anyone in the local government agencies, nor did I really have many contacts in the local marine science field, and nobody knew me. So I started by writing letters of introduction to various government departments that were to be of relevance to the work I want to do. I expressed in these letters my enthusiasm and intentions to help with nation building and requested to be included in any relevant roundtable discussions on matters pertaining to marine life. On several occasions, I found that I was still not invited to some of those meetings and realized that I needed to knock on doors till they opened.

When I finally did get invited to a meeting, I was met with some resistance and hostility. Many of the meetings at the time were dominated by men and there I was a young woman in her late 20s, graduated with a PhD, and unfortunately not of a certain race (a topic I shan't elaborate here). Some of these men did not want to acknowledge my presence and some tried to indicate that I was "trying to tell them how to do their job", when in reality, I just wanted to contribute my knowledge on marine mammals to help fill gaps in the country. It was then that I realized that I needed to understand how the local system works and how to dance with the right steps in this arena. It was tiresome and often demoralizing, but I had to keep trying to get a breakthrough into this purported circuit. I had to show them that I was a patriotic Malaysian with a lifelong dream of helping to serve my country, and that I was here to stay.

On the very first research grant that I tried to apply for to kickstart my first dolphin research project in Malaysia, I was dismissed by a highly regarded professor from whom I had gone to seek pointers. This professor plainly said to me that I should "go and do proper science" and that "this dolphin-watching interest should be kept as an annual hobby." Right at that very moment, I was overcome with shock, anger and disgust. How could someone as educated and esteemed as this professor think so little of my ambition to do marine mammal science? I allowed myself 24 hours of anger and then I channeled that anger into a source of fuel to prove the professor and any other naysayers wrong. I also soon discovered that the awareness of the basic fact that dolphins occur in Malaysia was incredibly low. Many people I came into contact with were often in disbelief when I told them that I studied cetaceans in Malaysia. They often thought that cetaceans found in Malaysia were just passing through from colder waters. I knew then I had to do more than just research.

I went on my first national oceanographic research cruise expedition in 2009, where I took the opportunity to collect data on marine mammal occurrence in the offshore waters of the Malaysian South China Sea. I boarded the expedition, not with any fancy equipment such as a CTD, but merely with a pair of binoculars and a DSLR camera. Over the duration of this cruise, once again, I was constantly teased and laughed at for being the crazy person observing vast tracts of empty sea daily. I was also the only female onboard in a leading role and was still a "newbie" in the local marine science circuit, and as such, was hardly acknowledged by many of the other male academics throughout much of the cruise.

In 2012, I co-founded The MareCet Research Organization together with a kindred spirited guy named Fairul Izmal, much to the doubt of various parties. Once again, when Fairul and I shared with peers on our idea of establishing MareCet, there were some who laughed us off and told us we were not going to succeed, that we were better off joining forces with existing NGOs. We pressed on anyway, and our organization is Malaysia's first and only non-profit NGO dedicated to the research and conservation of marine mammals and their habitats. We have since established conservation-based research projects on small cetaceans across two sites on the west coast of Peninsular Malaysia and we established a dugong research and conservation project on the east coast by way of a Pew Fellowship in Marine Conservation awarded to me in 2014. When I was nominated for the Pew Fellowship, I didn't know that it was something very prestigious and a recognition of one's excellence in marine conservation, not until some international colleagues told me how big of a deal it was. Later that year, the Malaysian government, in recognition of my being

awarded the Pew Fellowship, awarded me with the National Premier Youth Award. In 2013, MareCet organized the Third Southeast Asian Marine Mammal Symposium (SEAMAM III), a huge feat for a young and bare-bones organization. Post-symposium, I was so surprised when I received an e-mail from Randy Reeves, with an invitation to become a member of the IUCN SSC Cetacean Specialist Group. I thought: "Was this really happening?" In disbelief, yet very excitedly, I accepted his invitation with so much gratitude and honour.

I have grown so much, both as a researcher and a conservationist, and I owe this unexpected career success to my family, close friends, colleagues and a stellar team. MareCet has gone on to recruit and train up-and-coming Malaysian marine mammal researchers and conservationists, we have various types of outreach and awareness programmes, we have contributed to various national government policies (invited to do so without having to knock on doors anymore), and all our three field sites are now recognized as IUCN Important Marine Mammal Areas (IMMAs). Our efforts on the dugongs prompted the local government to propose a Dugong Sanctuary to be established, for which MareCet drafted its management plan. As of this writing, the Sanctuary is pending Federal government gazette. I have also provided mentorship to young and rising cetacean scientists and conservationists in Thailand, Vietnam and Myanmar. Since 2019, MareCet has established Malaysia's very first research project dedicated to the study of large baleen whales.

When I was 13, I dreamt of becoming a dolphin researcher with my own research institute in a country where marine science was in its infancy and that is what I thought I would do for the rest of my adult life. I never imagined that I would scale such heights, end up studying dugongs and whales as well, become a mentor and trainer to so many other young and aspiring women and men, or be working with local communities to make conservation possible. While there are still Malaysians who are unaware of the presence of cetaceans in our waters, many are now aware, and many of them report sightings of live or dead cetaceans and dugongs to us. However, my mission is not yet complete, for there are many more cetacean and marine conservation issues to tackle, knowledge gaps to fill and a bigger multidisciplinary team to build to undertake those increasing tasks. There is also still a pending Dugong Sanctuary to see to fruition.

In 2013 and 2014, the world lost two amazing marine scientists and conservationists in Kanjana Adulyanukosol and Choo Chee Kuang, and I lost two conservation icons who mentored and inspired me. Grief overcame me, but it is in their memory and honour that I have had the strength to carry on trying to do my part for science and conservation in what are otherwise very challenging and underappreciated fields of work. I also owe a huge part of this journey to Ellen Hines, who has believed in me (and many other Asian cetologists) since the day we first met in 2008 on her project in Thailand, and to the late John Reynolds III who was a calming voice of guidance. I am forever grateful for the privilege and opportunity to have collaborated with him.

Indeed, there were many who laughed at me, but I dolphinitely carried on. So just remember, you can too, if you persevere and don't give in to the naysayers. Oh, and don't forget to pay it forward just as how others would have helped you.

FROM ARCTIC CRASHES TO CONSERVING THE VAQUITA: ADVENTURES OF A MARINE MAMMAL BIOLOGIST

BARBARA TAYLOR

Page 81: Left: Barb checking cameras in the replacement Twin Otter plane the year after her plane crash.
Top: Discussing the vaquita crisis with (left to right) Carlos Slim, Mexican President Peña Nieto, Barb and Leonardo DiCaprio.
Bottom: Barb with vaquita painting "In our hands".
Photos courtesy of Barbara Taylor.

I have been most fortunate to have had fantastic and varied experiences throughout my career as a marine mammal scientist. My first project I joined fellow hippies at the Evergreen State College in 1977 to study the effects of polychlorinated biphenyls on harbor seal reproductive success. This group went on to found Cascadia Research Collective, which continues to influence our field. I spent a year of my life living on the ice counting bowhead whales. Little did any of us realize that climate change would mean our experience wouldn't happen again in many lifetimes. Among my experiences were some more harrowing ones, I've survived polar bear attacks and plane crashes into the Arctic Ocean.

In my first year of bowhead research, the ice was so thick it choked the Bering Straits and blocked the bowhead migration. My boyfriend and I walked about a mile from camp to photograph the midnight sun. When we clambered up the ridged ice to get a good view, we saw a polar bear sauntering our way. We tried to fire our rifle into the air to frighten the bear, but it was so cold the firing pin didn't move fast enough to trigger the explosion. The next 20 minutes we faced the charging bear, trying our best to act very un-seal-like. Eventually our yells were heard and we were rescued. I also survived a plane crash into the Arctic Ocean. Even this trauma did not dissuade me from continuing as a marine mammal biologist. I wanted to do more than gather data. I wanted to design projects, carry them out and analyze and publish the results.

So I switched to a more analytical bent during my PhD. By then, around 1990, the biodiversity crisis was obvious. I was interested in how to treat scientific uncertainty in a timely manner to allow needed management actions. Treatment of uncertainty formed key elements in developing, with colleagues, the Potential Biological Removal amendments to the Marine Mammal Protection Act. I worked with co-workers to develop criteria to use genetic data to delineate Units to Conserve for both that Act and the Endangered Species Act. At an international level we are still working to incorporate precaution in key elements used in the IUCN red list assessments.

My work with vaquita has allowed me to combine the field and analytical aspects of marine mammal science to make the science strong enough so that it has never been an impediment to conservation. The vaquita case also exemplifies the need for strong collaborations with many professions ranging from marine mammal science to sociologists, economists, enforcement officials, engineers and

politicians.

In all this work across different disciplines and cultures, I never felt held back by being a woman. In fact, sometimes I had a surprising advantage. When we had to present our shocking results to the Mexican Presidential Committee to Save Vaquita that showed the collapse of vaquitas as a result of illegal fishing activities, I was asked to do the task. In Mexico, older women are listened to and treated with respect. Even though the fishing representatives at the meeting were very upset with our findings, I was not a person to be shouted down—a fate my male colleagues would have faced.

As in all things in our profession, persistence and passion pay off. I didn't go back to graduate school until I was 30. It was hard to give up a good paying job and challenge myself to learn computer modeling, in which I had absolutely no experience. But the graduate training made me a much better thinker and versatile scientist. I didn't get my first permanent job until I was days from turning 40. Such jobs are even harder to come by these days and make having many tools in your toolbox even more important.

I feel like I stepped onto the stage at a most fortuitous time when barriers for women were dropping. Women had control of their bodies and their bank accounts. As I write this essay, I feel more uncertainty than ever before about whether I was lucky to have experienced a temporary improvement for women or whether those opportunities marked a permanent social shift. Like many, I was shocked that 52% of white women in the USA could have voted for a misogynist as leader of their country. I had taken for granted that feminism was the norm, that our success in our careers was evidence that women were far more than mothers and nurturers. I wondered why women of color voted so differently from white women. Could it be that white women had not felt the consequences of sexism as starkly as women of color? Had our white privilege blinded us to how recent our gains have been and how tenuous these gains still are.

My sister managed to do it all. She had a family and a very successful career as an English professor. I think that is possible, but even harder to do successfully in marine mammal biology. I spend months each year in the field and traveling. I even feel guilty about how much time my husband and I spend away from our pets! The work/life balance is very difficult for women and the current political climate makes clear just how precarious what has been achieved for women truly is.

I have so many colleagues, both male and female, that have had huge impacts on my career. While I have not felt insurmountable barriers because of my sex, I also have strong self-confidence that I sense has helped me in not always obvious ways. I often witness my female colleagues being interrupted when they are speaking or having their ideas picked up only after a male voices them. I try to pipe up and say, "Actually, that was Dana's idea and I agree it is a good one." Changing human behavior takes time. All of us, men and women, need to speak up when we see colleagues making such errors.

What I would like to see as our marine mammal field continues to mature is a higher proportion of women who choose to have families being able to maintain their careers. As long as I have been in this field, there have been more than 50% women in the under 30-year-old age bracket. Sadly, there are far less than 50% in the 40 and older bracket and I think this reflects issues that remain harder for women. There needs to be better and more-affordable child care, relationships that truly share family care and programs to train women back into the workforce if some years are taken off to focus on families. Such changes will be self-promoting as more women with families are able to fulfill leadership roles in their post-child-rearing ages. Science and society will be much the richer by extending the opportunities I have had to everyone.

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A LIFETIME OF MARINE MAMMAL STUDIES

CHRISTINA LOCKYER

From the earliest time I can remember, I always dreamed of being a marine biologist when I grew up. This was inspired largely by the magnificent films by Jacques Cousteau and the Hans and Lotte Hass series of underwater nature films that were so popular on television when I was a child. My first experience of the underwater world was at age 13, when I persuaded my anxious parents to let me go scuba diving when we

were on holiday at the seaside town called Swanage in Dorset, England. After that time, I quickly signed up for a scuba course and then joined as a junior member of the local British Sub-Aqua Club based at Kingston-upon-Thames. From then on, I was hooked on the watery world and spent most of my spare time joining other divers on wreck dives off the southwest coast of England and reading more and more about the marine world that I was observing at close hand.

After my final year at school, I enrolled at the then new University of East Anglia to join a Biology course which was considered somewhat revolutionary in its approach to the subject at that time. Indeed the first year I did very little biology and did mainly maths, biophysics, biochemistry, statistics, computer science, etc, and finally in the next 2 years some very hands-on biology. I took specialist courses in the final year on Ecology focusing on Ecosystems, Limnology, Oceanography and Fisheries. My final year project was a study on diurnal movements and feeding behaviour of starfish that required scuba diving several times a day under a pier in Swanage, often at night. My penultimate study year I took a summer job at the Whale Research Unit based at the British Museum of Natural History in London and it was here for the first time I encountered those whom I would later regard as my mentors and guides in whale biology: Niel Mackintosh – a veteran scientist from the South Georgia and "Discovery" investigations in the 1920s, Ray Gambell, and Sidney Brown. I spent that summer cutting and treating sperm whale teeth and then counting growth layers in them for age.

After I graduated, my first job took me to work with the then Royal Naval Scientific Service in Portsmouth at their Physiological Laboratory in Alverstoke. I worked with a team of researchers who were developing safer decompression tables for divers. I had to travel a very long distance to work and after a flood and storm swept the countryside in 1968, most of the railway line was demolished by a landslide. I could no longer travel daily to work and, being recently married, did not want to relocate. However, I was lucky enough to be offered a position back at the Whale Research Unit in London, but this time I was to directly assist Niel Mackintosh who was researching the life cycle and distribution of krill in the Antarctic. I worked with him for 4 years before he died in 1973. He was an amazing man and I learned so much from him. He encouraged me to do my Master's degree while working, a practice that is tough, but well worth it. In 1972, I presented my thesis[i] (later published[ii]) under the guidance of Niel Mackintosh. My external examiner was Richard Laws. It included my first sole author paper on the age at sexual maturity of fin whales using the ear plug[iii]. This was not my first paper however, as I was a co-author with Ray Gambell on a paper on age in sperm whales[iv] in 1967, even before I had graduated. Looking back now, I can see that these events were indicative of my future destiny. Age determination has been a major part of my work ever since.

My work continued on age determination in large baleen whales, especially investigating the application of the "transition phase" in the layering pattern to determine age at sexual maturity. This work yielded the first indications that age at maturity had been declining in the exploited southern hemisphere whale stocks[v]. I also had my first taste of whale aerial surveys aboard a Twin-Otter aircraft piloted by Ken Pinkerton, a S.African pilot, and vessel-based tagging work in the Indian Ocean onboard chartered whale catcher vessels "C.G.Hovelmeier" and "Peter Molenaar" in the early 1970s. The vessels were from the whaling company then operating off the Bluff in Durban, South Africa. Their vessels were former Norwegian whaling vessels that had operated in the Antarctic. It was during these cruises that I made the acquaintance of Peter Best, a long-term colleague who died only a few years ago. In those days we still used "Discovery" tags, designed to be retrieved once the whale was caught and butchered, thus informing about survival and also migratory movements. Use of these of course has ceased because of the global decline and stopping of whaling activities. The vessels were crewed by Norwegian skippers/gunners with Norwegian first mates and Norwegian or English radio operators. During the chasing of whales, the vessel used ASDIC – a form of sonar that caused the whales to "run," but it was a way of tracking them underwater. This is when I first became fascinated by the sperm whale deep-diving capabilities and, with the cooperation of the ship's ASDIC operator, was able to record how deep and for how long the whales dove.[vi]

I recall some humorous stories from these days. Once on a whale-tagging cruise, we scientists were given a humorous speech about emergencies and ship evacuation. (No humour in a real event that happened when

Christina with colleagues on a cetacean survey off Indonesia in October 2015, supervised by Danielle Kreb at Yayasan Konservasi RASI.

Page 82: Christina meeting belugas at Kamogawa Sea World in Japan, December 2009.
Photos courtesy of Christina Lockyer.

Left: Christina sectioning teeth on a freezing microtome in her home basement lab in Kongens Lyngby, Denmark, in 2003, after establishing her firm Age Dynamics.
Right: The stern view of the C G Hovelmeier, an ex-Antarctic whaling vessel, that operated off Durban during the whaling years in S. Africa that ended in 1974.

Page 85: Christina standing by the stomachs of a fin whale at the Icelandic whaling station Hvalur HF. The stomach size was measured and the food inside sampled and quantified for bioenergetic studies.
Photos courtesy of Christina Lockyer.

one vessel was holed by a whale it was towing back to port in a storm and very nearly sank!) The Norwegian skipper (gunner) told us that on his ship "... no women and children first here; when I say jump, you jump (overboard), because I will have jumped already." In fact, he was the most accurate and efficient gunner I ever knew and was a really splendid man. It was then that I learned that to be an efficient hunter, one must really love and understand the behaviour of one's prey. Many years later, I was to recall these days again after I relocated to Norway in 2005. Amazingly, I rediscovered by accident a Norwegian colleague, Reidar Smedsrud, from my early years on whale catchers in South Africa (1973). He was the first mate then and was still active and in his late 80s at the Sandefjord Whaling Museum, but of course no longer whaling.

In demonstrating that age at sexual maturity can be interpolated from the pattern of Growth Layer Groups[vii] (GLGs) in the ear plug of fin and sei whales, I was able to show that sexual maturation had declined in some stocks in the southern hemisphere and that this appeared to be correlated with exploitation. The results of these studies were not greeted with belief but plain scepticism by the world of whale biologists, some of whom thought that this was a fabrication that would allow the Japanese whalers at that time to claim that this would release more food for the smaller minke whales which also indicated a decline in age at maturation and faster growth. At that time, it seemed to me that science and politics were inextricably mixed up and that anything that might indicate an advantage for whaling would be discredited. Further studies I undertook on other stocks of southern fin and sei whales (made possible through cooperation of the Japanese who made all their samples I required available) indicated differences in the dynamic response of stocks – linked to population size and exploitation history. Investigation of published literature showed that terrestrial mammals respond in a dynamic way to exploitation– more food and space can mean faster growth and sexual maturation. Why would whales be different? Reproductive rates also appeared to be changing. Despite the early doubts about this population dynamics work, the studies provided a sound foundation for a valuable tool in the "transition phase" for use in population biology and understanding dynamics of population parameters.

These studies led directly to several in-depth studies of the bioenergetics of large whale species; firstly in the southern oceans [viii] [ix] [x] [xi] [xii] [xiii], and later on in the late 1970s and early 1980s on large whales off Iceland, which I will discuss later. If there were changes in age, growth and reproductive parameters, there had to be a firm basis in energetics to support the findings. By the time I had made some theoretical estimations drawing on as much as was known at the time for the southern hemisphere, whaling for fin and sei whales had largely dwindled or stopped. However, there was whaling taking place in Iceland where it would be possible to access samples I needed and to take samples and measurements.

By 1977, the Whale Research Unit had been relocated to Cambridge, to merge with the former Seal Research Unit from Lowestoft, to form the new Sea Mammal Research Unit under the National Environment Research Council. We shared premises with the British Antarctic Survey and shared the same director, Richard Laws. My research in Iceland began from this period commencing in 1978 and aimed at calculating energy consumption and utilisation in fin and sei whales. This research which was mainly based on information, samples, and data collected from commercial catches (it was one of the first to focus on this subject in large cetaceans), and began long before modern technology was developed sufficiently to help monitor living animals. The efforts included weighing complete animals in parts and, even with several teams of flensers to help fulltime with the task, the work took many hours, sometimes extending through more than one or two changes of shifts of workers (each team took an 8 hour shift). However, this work was only possible through the support and cooperation of Kristjan Loftsson at Hvalur h.f. and the flensing foremen and the flensers. The work resulted in a wealth of data on body fat condition[xiv], lipid composition[xv], body tissue chemical composition, dietary intake, energy density, and anatomical measurements[xvi] which together with oceanographic information on plankton density and distribution, water temperature and salinity, as well as factory oil production figures, produced a picture of how whales made a living in the surrounding waters and where they stored the energy consumed and how they utilised it[xvii].

One of the most surprising results from this study in Iceland was in studying fat storage dynamics in fin whales. I undertook a field season in 1978 at Hvalfjordur and did not return or complete my samplings until 1981. During the break I had my first child. It was then, after analysing the data, that I discovered that monitoring fattening during the feeding season was much more complicated than previously thought.

There were also huge inter-year variations in food availability affecting the amount of fat storage and this, in turn, affected reproduction in the female[xviii]. This taught me how important it is to always consider the big picture and the ecosystem where our study animal lives. The environment can affect an animal in so many ways and mammals have an innate flexibility to respond to changing circumstances in their biological parameters[xix].

Studies on free-living sociable bottlenose dolphins in the wild off the British coast, started in 1977, almost seemed not to feel work, it was so exciting and such fun! However, I think this was the first time anyone seriously tried to monitor such individuals over a long period. It certainly required energy and a love of being in water and underwater in the cold for long periods! There were a number of papers my colleagues and I produced in the late 1970s and in the 1980s. This certainly stimulated a lot of new and fascinating work worldwide on this topic[xx] [xxi] [xxii].

Following the Icelandic studies, I undertook similar studies on smaller and smaller cetaceans- from long-finned pilot whales to porpoises. During the period of the early 1990s, I was involved with fellow researchers in the Faroe Islands in a large comprehensive study of the pilot whaling there. Results of the studies were published in an IWC Special Volume in 1995[xxiii]. During my time working in Denmark (1996-2003), I also became involved in running two EC-funded projects to mitigate by-catch of harbour porpoises in the gillnet fisheries, which resulted in the first operational and effective use of acoustic pingers as deterrents. The porpoise work also involved hands-on research on individuals held in Kerteminde, Denmark and monitoring their growth, feeding, fattening, and behaviour over several years from a young age from 1997. This really was pioneering work with colleagues in Denmark and was very challenging and exciting[xxiv]. One of the two original animals is still alive and well and has even reproduced; the male died just a few years ago at an age of nearly 21 years. My studies of bioenergetics in cetaceans are brought together in a review paper that emphasised the different life strategies of species[xxv].

Most of my research has centered on cetaceans, but in the last 20 years, I have included many other species including carnivores - seals and polar bears. I have always tried to maintain a broad interest in many aspects of marine mammal research and the main areas I have worked in include age determination, population dynamics, growth and reproductive physiology, diving behaviour and physiology, energy budgets and fat storage and utilisation, sociable dolphin behaviour, and conservation and management. I have been involved in many studies that focus on validation of age determination where it is important to be able to interpret age in years precisely from GLGs in ear plugs and teeth. Examples of ear plug age validation include sei whales[xxvi] and recently, humpback whales[xxvii]. However, validation of age from teeth has been very important in grey[xxviii] and harp[xxix] seals, polar bears[xxx], long-finned pilot whales[xxxi], porpoises[xxxii], and belugas[xxxiii].

Over the years, my research has involved me in fieldwork such as boat surveys in the Indian Ocean, US east coast, Greenland, Norway, Indonesia; sample collection from strandings in the UK, Denmark, and from commercial catches at whaling stations in South Africa, Iceland and out at the subsistence "grindedrap" in the Faroe Islands, endless laboratory work in many places in the world, working with porpoises in dolphinaria, and swimming with dolphins during rescue work, tagging programmes and monitoring sociable dolphins.

I have worked in government labs in England, US, Japan, Norway and Denmark and for international organisations such as ASCOBANS and NAMMCO where science, management, and politics merge. I have also taught marine mammal biology courses fulltime in universities and have had numerous students over the years. Since January 2003, I have run my own consultancy firm, Age Dynamics, based in Denmark, focusing on age determination in marine mammals, providing age data for laboratories worldwide, and running technical workshops for students wishing to learn aging methods. Although retired from fulltime employment now, I am still active in Age Dynamics and as a consultant.

Some of the obstacles I experienced were at the start of my career. I should perhaps mention that at the time I first started working in the UK, women were only paid 85% the salary of men, regardless of qualifications. However, this was abolished as discriminatory in my first year of working (1968). Often the first question I was asked at job interviews was: "Okay, so you are married. When do you plan on having your

Christina Lockyer Cont.

first child?" (At that time there were no rules about maternity leave or payment and women were regarded as not taking a job seriously). Indeed, I never really encountered problems in having children during my working life and, in the days of Icelandic fieldwork, I took them with me. During a sabbatical, funded jointly by NOAA and the Icelandic Marine Research Institute, the entire family relocated to San Diego for 2 years. I also recall that in general, women were banned from research vessels in the UK when I first began my career. When this was brought into question, because this rule excluded several specialists needed onboard, the director of research at the institute where I was then based at the time, who organised the cruises, made sure he got two women technicians onboard who were known not to like each other. There were predictably problems and he was then able to use this as an example of why women onboard were problematic and should be excluded from cruises. Fortunately for me during this period, this rule never affected me. When I went onboard for surveys, it was always a commercial whale catcher and not in the UK! Of course, young people starting out in this field today will be amazed at hearing this!

Other problems that have arisen over the years often involve conflicts of interest between government policy and scientific advice. In the whaling arena, I have experienced being a member of the Scientific Committee of the International Whaling Commission (IWC) with a membership of less than 20 – and being the only female member – to now, with a membership of sometimes a few hundreds representing approximately 89 governments, where women are more commonplace. Even after a period of nearly 50 years, although governments and politicians may now publicly appear to pay more attention to scientific advice, important environmentally related matters, indigenous matters, and decisions that involve financial input, often get side-lined if the facts are unpalatable. I have even seen the attitude to whaling swing from one extreme to the other; neither extreme being based on scientific advice.

Following nearly 35 years of research, my time spent working as leader of the Secretariats for two international organisations with quite different goals - initially ASCOBANS (1990-1996) and later NAMMCO (2005-2015), gave me important insights into the interplay of politics, ethnic traditions, science, and public opinion. This also brought into focus the importance of objectivity, listening to the facts and considering the status quo when making recommendations and providing advice. Science, traditional knowledge, the environment/ecosystem, human safety, humane hunting practices, as well as politics are all factors in whaling, hunting, and marine mammal exploitation and conservation.

I personally have always tried to be objective, thorough, and sound in method and rational in my thinking. If I have something important to say, I will say it even if it is not in step with other thinking. Dialogue amongst diverse thinkers is important for understanding situations and how they arise and may also help in finding a compromise and solutions. We cannot dismiss beliefs and practices just because they do not fit our expectations.

Marine mammals are, for the most part, inaccessible because of the environment they live in and are often of huge size that is quite daunting. I consider that the early researchers in the field of marine mammalogy were usually very determined, practical, and rather singular-minded individuals who often had challenging goals but had imaginative use of resources to get their answers. Many of them were also brave!

Left: Christina swimming with Beaky, a sociable bottlenose dolphin off the south coast of England in 1975. Right: Christina participating in a sperm whale study tracking whales using VHF tags off Andenes in northern Norway in 2005.
Photos courtesy of Christina Lockyer.

Page 86: Left: The bisected and polished ear plug core from a fin whale, showing the Growth Layer Groups (GLG) - with markers - corresponding to annual growth and thus age.
Photo courtesy of the Icelandic Marine Research Institute.
Right: Christina at the Icelandic whaling station Hvalur HF, measuring blubber in a sperm whale, July 1981.
Photo courtesy of Christina Lockyer.

Today, it has become comparatively easy to enter this field, find some project to work on with specialist support from academia, and even to find funding possibilities. The scope of work aspects now feasible has broadened incredibly with the development of technology - enabling researchers to monitor and observe their subject remotely, relatively safely, and accurately.

My impression is that over the last 50 plus years, the tendency is for more women to come into the marine mammal field - to the extent that occasionally, women outnumber men. Women seemed to be a rarity in the early days. Marine mammal research has become increasingly a global topic, rather than being limited to nations interested in whaling and sealing.

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The Laboratoire d'Anatomie Comparée in Paris. No portrait of Friant could be found. We only have her signature superimposed here. *Photo: Gallica/BNF, MNHN.*

FIRST SURFACINGS: THE EARLY WOMEN PIONEERS

UKO GORTER

When I was asked to write an article about the first women pioneers who contributed to the study of whales, also known as 'cetology', I gladly took on the task given my keen obsession regarding the history of this branch of zoology. However, it took quite some sleuthing to find the needed information.

The term 'cetology' was first coined by the French naturalist Pierre Joseph Bonnaterre (1752-1804) in his *Tableau Encyclopédique et Méthodique des Trois Règnes de la Nature, Cétologie*, in 1789. Noting the similar terms already in existence for ornithology and ichthyology. It is also the title of a chapter in Moby Dick (1851), the famous novel by Herman Melville, who takes the reader momentarily away from the whaling narrative into a dizzying but wonderful philosophical discourse of the science of whales in the pre-Darwin era.

For centuries, the field of cetology (not unlike the cast of characters in *Moby Dick*, including the whale) has been dominated by men. Starting with Aristotle (384-322 BC), it was a branch of zoology that was made up by philosophers, compilers, naturalists, ship-surgeons, systemizers, museum directors, and anatomists, all the way through the nineteenth century. Many of their names are still commemorated in the scientific or common names of cetaceans, like Cuvier, Gray, Gervais, Hector, True, and Dall, to name a few. All men.

Although there are examples of women in science throughout history, these have been far fewer than men. For many centuries women were excluded from formal education and scientific institutions. The role of the female gender in society was mainly defined in the seventeenth and eighteenth centuries. It wasn't until the late 1800s when we see the emergence of women's colleges that we finally find more women breaking through. Most notably, of course, was Marie Curie. Now, what about the first women who have made their mark in cetology?

Madeleine Friant (1897- 19??)

The first names that came to my mind were those of Barbara Lawrence and Melba C. Caldwell. However, I felt there might possibly be others I overlooked, and so I consulted friends and colleagues. It was our ACS friend and Scientific Advisor, Tom Jefferson, who introduced me to the works by a certain Madeleine Friant. To be

Bill Schevill and Barbara Lawrence examining a bottlenose dolphin. *Photo: courtesy of the New Bedford Whaling Museum.*

honest, I had never heard of her name and it launched me into an immediate quest to find out more about her life and work.

Sure enough, a quick Google search yielded a number of papers and publications dating anywhere from the 1930s to the early 1970s. A more thorough search through the *Bibliothèque Nationale de France* (BNF), and by directly contacting the *Bibliothèque du Muséum National d'Histoire Naturelle* in Paris, I was able to find a bit more information. Most helpful was a biographical note by Philippe Jaussaud and Édouard-Raoul Brygoo in *Du Jardin au Muséum en 516 Biographies*, published in 2004.

Surprisingly, very little is known about Madeleine Friant. We know she was a French comparative anatomist and paleontologist. A few sources list her year of birth as 1897. However, no date of death could be found. Nor could any photo of her be located when I contacted the museum in Paris or searched French databases.

Madeleine passed a medic diploma in 1912, and served as a nurse for the French Red Cross during the First World War. She graduated with a Bachelor of Arts degree and obtained a Bachelor of Science degree in 1921. She then followed a medical course in Strassbourg, crowned by the defense of her doctoral thesis in 1927. Young Madeleine took on the function of a medical inspector for the schools in the Moselle region. Shortly thereafter, Madeleine became an intern at the *Laboratoire d'Anatomie Comparée* in Paris under the directorship of Raoul Anthony.

A Rockefeller Foundation Scholar, Madeleine would also teach lessons in zoological anthropology at the *Ecole d'Anthropologie* in Paris from 1931 to 1942.

Working very closely together with director Anthony, Madeleine specialized in the dentition of both modern and fossil mammals (including humans), but also conducted research on the mammalian neocortex. Anthony and Friant embraced the Neo-Lamarckian theory, which advanced the notion that acquired characteristics are inherited.

Friant made significant contributions regarding the determination, storage, and cataloging of the collections at the *Laboratoire d'Anatomie Comparée*.

After Raoul Anthony's death in 1941, Friant would take on the position of Associate Director and briefly headed the department, but the full directorship seemed to have eluded her. One quote in

Uko Gorter Cont.

the biographical note by Jaussaud and Brygoo is quite telling:

> *"Elle laissa le souvenir d'une femme énergique, douée d'un fort caractère qui lui aliéna souvent les sympathies de ses collègues." (She left the memory of an energetic woman, endowed with a strong character, which often alienated the sympathies of her colleagues.).*

Understanding that her colleagues were all male, this quote perfectly encapsulates the prevailing attitude towards women in science at that time. Unfortunately, these views still have a foothold in some circles today.

Friant's contributions with respect to cetaceans and marine mammals in general, date back to about the late 1930s. Most of her publications on the comparative anatomy of the cetacean brain were conducted after World War II. In total she published more than 100 articles, many as first or sole author. Her most recent papers were dated from the early 1970s. After which the trail goes cold and no further trace of what happened to Madeleine Friant towards the end of her life could be found.

Barbara Lawrence (Schevill) (1909-1997)

Unlike Friant, far more is known about Barbara Lawrence, who with her husband William (Bill) E. Schevill, were pioneers in the field of bioacoustics related to cetaceans.

Barbara Lawrence was born in Boston in 1909. She received her education at Winsor School and Vassar College, where she graduated in 1931.

Barbara's parents died during her sophomore year in college, and together with her older sister took on the difficult task of bringing up her three other younger siblings.

Soon after her graduation, Barbara took the opportunity to volunteer at the Harvard Museum of Comparative Zoology (MCZ). Before long she worked closely together with Dr. Thomas Barbour, the Director of the Museum, and Dr. Glover Allen, the Curator of Mammals. Both men encouraged and supported Barbara in furthering her own research and to organize an expedition to the Philippines and Indonesia to study and collect bats for the museum in 1936-1937.

She married William (Bill) Schevill in 1938, but kept her maiden name in her professional life. At that time Bill Schevill was librarian at the museum and Assistant Curator of Invertebrate Paleontology.

Driving back from their honeymoon, they encountered two pygmy sperm whales stranded dead on a beach in Virginia. They brought back the specimens for the museum. Perhaps this event foreshadowed their future interest in cetacean research.

After the death of Dr. Glover Allen in 1942, Barbara became Associate and Acting Curator of Mammals. In 1952 she would be appointed as Curator of Mammals at the MCZ, a position she held until her retirement in 1976.

Barbara Lawrence closely assisted her husband in the pioneering studies on echolocation in whales and dolphins. Together they produced the first-ever sound recordings of whales. These recordings were made of beluga whales in the lower Saguenay River in Quebec, Canada, in 1948 and 1949.

Barbara and Bill would expand their investigative work to include the auditory response in bottlenose dolphins. These studies were conducted with captive dolphins at Marineland of Florida in St. Augustine, Florida. This facility was first called Marine Studios, as it was solely conceived as an underwater film studio in 1938 to safely film sharks, dolphins, and other marine life. However, it unexpectedly attracted lots of public interest. Marine Studios opened its doors and later changed its name. There was also an immediate scientific interest in studying dolphins in this controlled setting.

Barbara and Bill would go on to publish a number of papers on their acoustic work, as well as important anatomical research into the dolphin's nasal structures in the 1950s. Many of their original whale and dolphin recordings were eventually made available as a phonograph record produced by Bill Schevill and his close collaborator, Bill Watkins, in 1962.

In the obituary of Barbara Lawrence, written by M. Rutzmoser in the Journal of Mammalogy in 1999, Barbara is portrayed as both a modest and proud person. However, the following quote struck as me as a bit off:

> *"Although her contributions to the understanding of cetacean morphology were significant, she preferred to pass along the credit and recognition to Mr. Schevill in this his chosen field of research, a policy which no doubt contributed to a long and happy marriage".*

I would like to think their mutual affection and respect would have weathered any feeling of perceived jealousy in taking credit.

Barbara Lawrence clearly deserves her place in the pantheon of cetologists.

Captive Studies

As I mentioned, the early marine parks established in the 1930s provided a unique and important opportunity to learn about dolphins. The captive setting facilitated a controlled environment in which to conduct research that did not yet exist in the wild. Viewing windows gave an unobstructed glimpse of their behavior underwater.

Seen through today's lens, this may no longer be palatable with modern readers, but these captive studies are an inescapable and inextricable part of the history of cetology.

After the success of Marineland of Florida, a second facility named Marineland of the Pacific would open in Palos Verdes, California, in 1954. It was here that Ken Norris got his start in the world of marine mammal science as Curator and subsequently facilitating and working with visiting scientists, including many women.

During this time we see more women come on to the scene. They are part of husband and wife research teams, much like Lawrence and Schevill.

Melba C. Caldwell (1921-1991) worked closely with her husband David Keller Caldwell (1928-1990). Melba received a M.A. in zoology from the University of California at Los Angeles. After her stint as fishery research biologist with the U.S. Bureau of Commercial Fisheries, Melba joined the Allan Hancock Foundation of the University of Southern California as staff research associate. Melba Caldwell became an assistant curator and director of research at Marineland of Florida, working together with the then Curator and Director, Forrest G. Wood.

Melba would go on to become research associate in the Communications Sciences Laboratory at the University of Florida.

Melba and her husband David performed groundbreaking behavioral and acoustic research that helped our understanding of individual recognition in dolphins. The Caldwell's discovered that dolphins have individual "signature whistles".

Around that same time, Margaret C. Tavolga (1921-1991) and her husband, William N. Tavolga (1922-2017) were also attracted to the research possibilities created by Marineland of Florida. Margaret's career was committed to a life of teaching. She was professor at Fairleigh Dickinson University in New Jersey. Her husband, Bill, was a pioneer in the field of sensory biology of aquatic animals and marine bioacoustics. Lacking a hydrophone in the early days, he fashioned an ordinary microphone with a condom (one makes-do). The Tavolgas, in particular Margaret, published important papers on epimeletic (care-giving) behavior in bottlenose dolphins.

The Caldwells and the Tavolgas pioneering behavioral studies showed that dolphins were easily trained and capable to perform complex behaviors. Others would soon show interest in this 'mind in the water', and cetology took a bizarre and dark turn.

Top: Melba and David Caldwell at Marineland of Florida. *Credit: Nat Fain/Marineland of Florida.*
Bottom: Margaret Tavolga.
Photo: W.L Au, in Hearing by Whales and Dolphins. Springer, 2000.

Page 90: Barbara Lawrence listening to dolphin vocalizations at Marineland of Florida.
Photos courtesy of the New Bedford Whaling Museum.

Top: Margaret Howe with 'Peter.'
Photo by John Lovatt.
Bottom: Karen Pryor.
Photo courtesy of T. Golson.

The Girl Who Talks to Flipper

Another 'Margaret' would now enter the stage, a young girl with no formal education in biology or zoology. Margaret Howe (1941-) was working at a hotel on Saint Thomas (U.S. Virgin Islands) and learned about a research lab on the island that kept dolphins. Her curiosity piqued, she made her way down to the secluded facility on the shore of Nazareth Bay, to see this place for herself. Before long she would be invited to partake as a volunteer in the most unusual and controversial research in the history of cetology.

The laboratory, known as the Communications Research Institute (CRI), was run by none other than John C. Lilly, a neuroscientist with an interest in the brain and cognitive abilities of the dolphin. Lilly was also interested in the possible communication with extraterrestrial life. Why not start with dolphins?

Lilly obtained three dolphins from Marineland of Florida through the Director Forrest G. Wood. Both NASA and U.S. Navy showed much interest in Lilly's project and poured millions of dollars in his new facility.

In 1964, Margaret Howe would start training sessions with a bottlenose dolphin named Peter, in the hope to teach him to speak English. As perceived progress seemed encouraging, Margaret initiated a 'chronic interaction', and proposed to live with Peter 24 hours a day. Lilly was enthusiastic about the idea, and the upstairs laboratory was flooded knee-deep to accommodate the dolphin and Margaret. A special elevator was built to move Peter from the existing dolphin pool below to the upstairs living quarters. About nine months later, progress seemed wanting. Lilly lost interest and focus, as a hallucinogenic drug named LSD made its entry in the scientific world. While Margaret refused to take part in any experiments with drugs, Lilly would administer it to himself while testing his state of mind in an isolation tank. Soon he would also administer LSD to some of the dolphins in the hope that they would open up in their communication abilities. Meanwhile Peter the dolphin would lose focus too, as the young boisterous male bottlenose dolphin would show sexual urges. Margaret would eventually relieve his needs through manual stimulation to keep the work going. Word slowly got out to the scientific community, including the Tavolgas, who wrote a scathing review of Lilly's new book "Man and Dolphin".

Lilly's project would gradually be defunded and rejected by scientists. His reputation diminished, Lilly would increasingly immerse himself in the mystical realm, and become a hippie cult figure of sorts. Margaret left the laboratory but remained on the island to start a family.

It would be well beyond the scope of this article to expand on this saga, only to suggest reading the chapter titled "Shots across the bow" in D. Graham Burnett's phenomenal work *The Sounding of the Whale; Science and Cetaceans in the Twentieth Century*, where you can read all the lurid details.

From Captive Studies to the Open Ocean

As all this unfolded, a young woman named Karen Pryor (1932-) endeavored with her, then husband, Taylor "Tap" Pryor, to build an oceanarium in Hawaii. Tap, who was studying sharks, dreamed of a research facility modeled after Marine Studios in Florida and Marineland of the Pacific. They brought in Ken Norris as both an advisor and research collaborator. Soon dolphins were caught for both research and display. When it came down to find a dolphin trainer, Ken suggested that Karen could do this. He recognized in Karen a bright observant talent, and so she started her career as 'porpoise' trainer in 1964 at Sea Life Park.

Karen graduated from Cornell University (NY) and University of Hawaii. Known as a 'big picture thinker', she quickly understood that dolphins were adaptive and able to be creative in developing novel behaviors. These training sessions included bottlenose dolphins, Hawaiian spinner dolphins, and rough-toothed dolphins.

While the research and training were at first confined within the walls of a tank, interest in swimming behavior and speed of dolphins by the US Navy, initiated the first attempts to use a trained dolphin in the open ocean. Karen was firmly convinced of the importance of complementary simultaneous studies of dolphins in both captive settings as well as the studies in the wild. This was specifically demonstrated during her studies to investigate the dolphin behavior around purse-seine fishery for tuna in the 1970s.

No doubt the studies by the Caldwells, the Tavolgas, and yes, even the bizarre work by Lilly and his volunteer assistant, Margaret, influenced and initiated legitimate scientific work into cetacean communication, cognition and behavior.

The pioneering work by Karen Pryor, encouraged by Ken Norris, set the stage for studying dolphins in the wild.

As we enter the 1970s, many more amazing women would enter the field of cetology and proudly follow in the footsteps of the first pioneers, Madeleine Friant and Barbara Lawrence. You can read some of their stories in this special issue.

ACKNOWLEDGMENTS

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My research was not exhaustive, and it is possible I may have overlooked other women from this early period, particularly in the former Soviet Union. If you have more information, I would like to hear from you (uko@ukogorter.com).

The Caldwells examining a bottlenose dolphin. *Photo: Marineland of Florida.*

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AUTHOR BIOGRAPHIES

JO MARIE ACEBES

Jom is currently a Senior Museum Researcher at the Zoology Division of the National Museum of the Philippines. She is also the Founder and Principal Investigator of a non-profit organization called BALYENA.ORG, with a mission to support the conservation of whales and dolphins and their natural habitats in the Philippines. She has a Bachelor of Science in Biology from the Ateneo de Manila University, a Doctor of Veterinary Medicine from the University of the Philippines at Los Baños, a Master of Science in Biodiversity, Conservation and Management from the University of Oxford and a PhD in Marine Environmental History from Murdoch University, Perth. Her interests range from marine mammal population biology and conservation, cetacean-human interactions, biodiversity conservation, wildlife medicine, to historical and current fisheries for large marine vertebrates. Her current projects include "Conservation of the Babuyan Marine Corridor: the only breeding ground of humpback whales in the Philippines" and "In Search of Bughaw, the lone blue whale in the Bohol Sea, Philippines." She started out with a dream of studying mountain gorillas as a wildlife veterinarian in Africa but serendipitously ended up starting the study of humpback whales in the northern Philippines under WWF-Philippines. She has since continued the humpback whale project under BALYENA.ORG which is currently the longest-running, continuous cetacean research in the Philippines. She is also leading the blue whale project in the Bohol Sea. From over a decade of working in the field of conservation, she has expanded her work beyond whales and has been looking into the interaction of humans and their environment, particularly people and the sea. Jom is also a National Geographic Explorer; member of the IUCN Marine Mammal Protected Areas Task Force and a member of the Philippine Aquatic Red List Committee – Subcommittee on Cetaceans.

LISA BALLANCE

Dr. Lisa T. Ballance is the relatively new (since October 2019) Director of the Marine Mammal Institute and Endowed Chair for Marine Mammal Research at Oregon State University. She comes to OSU from NOAA (National Oceanic and Atmospheric Administration), where she spent 30 years conducting research on cetaceans and seabirds around the world, including the tropical Pacific and Indian Oceans, Antarctica, the Bering Sea, and the Mekong River in Cambodia. She holds a Ph.D. in marine ecology, an M.S. in marine science, and a B.S. in biology. Her significant positions with NOAA include: Director of NOAA's Marine Mammal and Turtle Research Division in La Jolla, CA, providing scientific leadership and oversight of a division consisting of 70 scientists with a $9M annual budget; and Chief Scientist of NOAA's Eastern Tropical Pacific Dolphin and Ecosystem Assessment Surveys which provided the scientific basis for the "Dolphin Safe" label found on tuna cans in supermarkets all over this country. She has published over 114 peer-reviewed papers, working papers, and technical reports, given invited scientific presentations at scientific conferences, universities, public lectures, and congressional briefings, and been awarded research funding from a wide variety of sources including National Science Foundation, U.S. Navy, and Bureau of Ocean Energy Management. In her role as professor, she teaches and advises graduate students and post-doctorates, and serves on a variety of academic steering committees and working groups. She is recipient of the Department of Commerce Bronze and Silver Medals, NOAA Fisheries' Supervisor of the Year, and was recently featured on the cover of the Association for Women in Science.

UKO GORTER

Born in Arnhem, Holland, Uko Gorter ended a seventeen-year career as a professional ballet dancer in 1997. Following in his father's footsteps, he subsequently pursued his lifelong dream of becoming an illustrator. Uko enrolled in the School of Visual Concepts and the School of Realist Art, both in Seattle, WA.

His interest in nature led him to become a natural history illustrator. Specializing in marine mammal illustration, Uko Gorter has traveled extensively to observe whales, dolphins, and other marine mammals in their natural environment. Uko's work has appeared in scientific journals, museums, interpretive signs, and many books. The culmination of this work was illustrating all marine mammal species for the second edition of "Marine Mammals of the World: A Comprehensive Guide to Their Identification", authored by Thomas Jefferson, Marc Webber, and Robert Pitman (Elsevier Press, 2015). More recently his work was featured in the "Anatomy of Dolphins; Insights into Body Structure and Function (Cozzi et al., 2017), and the Encyclopedia of Whales, Dolphins, and Porpoises (Erich Hoyt. 2017).

Uko joined the American Cetacean Society in 2002, and is the current president of the American Cetacean Society. Uko lives with his wife in Kirkland, Washington.

DENISE HERZING

Dr. Denise Herzing, Founder and Research Director of the Wild Dolphin Project, has completed 35 years of her long-term study of the Atlantic spotted dolphins inhabiting Bahamian waters. She received her B.S. in Marine Zoology; her M.A. in Behavioral Biology; and her Ph.D. in Behavioral Biology/ Environmental Studies. She is an Affiliate Assistant Professor in Biological Sciences at Florida Atlantic University, Boca Raton, Florida. Dr. Herzing is a 2008 Guggenheim Fellow, a fellow with the Explorers Club, a scientific advisor for the Lifeboat Foundation and the American Cetacean Society, and on the board of Schoolyard Films. In addition to many scientific articles (wilddolphinproject.org/research/library), she is the coeditor of Dolphin Communication and Cognition, author of "Dolphin Diaries: My 25 years with Spotted Dolphins in the Bahamas" and "The Wild Dolphin Project (2002)".

Coverage of her work with the spotted dolphins has appeared in National Geographic Magazine 1992 and 2015, BBC Wildlife, Ocean Realm and Sonar magazines and featured on Nature, Discovery, PBS, ABC, BBC, NHK, PBS, and TED2013 ted.com/talks/denise_herzing Dr. Herzing has spoken at the Society for Marine Mammalogy, European Cetacean Society, International Fund for Animal Welfare, the Explorers Club, TED2013, Boston Museum of Science, American Cetacean Society and others.

ELLEN HINES

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Dr. Ellen Hines, the Associate Director of the Estuary & Ocean Science Center, is a Professor in Geography at San Francisco State University. Her research addresses population and community ecology of threatened and endangered species in local conservation efforts and regional scale coastal and marine management science. Her emphasis is on the evolution of consistent standards of field methods and monitoring techniques, and the creation of educational materials to be applied to community-based conservation planning. Dr. Hines has extensive experience in GIS and remote sensing for marine and coastal spatial planning. She has conducted marine mammal research in Thailand, Vietnam, Cambodia, Myanmar and Belize since 1999, and is starting to work with scientists in South America. Dr. Hines has been researching dugongs and coastal dolphins and porpoises along the eastern Gulf of Thailand since 2003. She is committed to collaborating with developing country scientists to solve conservation problems threatening marine mammals and is on the Expert Panel of the International Whaling Commission Bycatch Mitigation Initiative. In California, Dr. Hines works closely with the National Marine Sanctuaries and local scientists outside and within San Francisco Bay to model habitat and human uses for marine mammals and seabirds. With her students, she works to create risk assessments for anthropogenic threats such as shipping collisions, marine megafaunal bycatch and the effects of sea level rise on pinnipeds, sea otters, and birds in coastal estuaries.

CHRISTINA LOCKYER

Christina Lockyer (née Grzegorzewska) is British and was educated in England at the University of East Anglia where she gained her B.Sc. (Hons) Biology in 1968, her M.Phil. in Zoology at the University of London in 1972, and her higher doctorate Sc.D. in Zoology at the University of East Anglia in 1989. She stepped into office as General Secretary of the North Atlantic Marine Mammal Commission (NAMMCO), based in Tromsø in Norway, on 1st March 2005 and was employed there until 1st March 2015 when she officially retired. Formerly she has been employed as a scientist by the Natural Environment Research Council in the United Kingdom between 1968 and 1996, and since 1977 as a principal scientist at their Sea Mammal Research Unit, originally based in Cambridge, England. From April 1996 until January 2003, she was employed as a senior scientist at the Department of Marine Ecology and Aquaculture at the Danish Institute for Fisheries Research, Charlottenlund in Denmark, after which she launched her own biological consultancy firm Age Dynamics, in Lyngby, Denmark, investigating and teaching age determination methods and life history in marine mammals. Her research encompasses population biology, behaviour and ecosystem energetics of large and small whales, and she has an extensive scientific publications record. She has regularly been involved in advisory committees to the International Whaling Commission (IWC) since the early 1970s, ICES and the Agreement on Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) of which she was Secretary between 1992 and 1996. Between 1989 and 1991, she was elected President of the worldwide Society for Marine Mammalogy. She was elected Chairman of the European Cetacean Society between 1997 and 2003. Currently, she continues to run international practical courses on marine mammal biology in universities and research institutions, in conjunction with Age Dynamics, and acts as occasional scientific consultant to the European Commission and various international organisations and institutions.

JANET MANN

Janet Mann has been studying wild bottlenose dolphins for 32 years –mostly in Australia (the Shark Bay Dolphin Research Project), but in 2015, she initiated a study of the bottlenose dolphins literally in her backyard – and the Potomac-Chesapeake Dolphin Project was born. She is a leading expert on marine mammals and a professor of biology at Georgetown University. Since 2015, her team has identified over 1200 individual dolphins in the Potomac River. Both long-term studies focus on conservation of dolphins and their habitat through research.

Janet Mann has written and edited 2 books "Deep Thinkers: Inside the minds of whales, dolphins, and porpoises" (2017) and "Cetacean Societies" (2000). She has also authored over 120 scientific publications and received numerous grants, fellowships and awards. Mann has been funded by the National Science Foundation for 25 years. Her work has also been covered extensively by over two dozen documentary film teams, including the BBC and National Geographic Society. From 2013-2017 she served as the inaugural Vice Provost for Research at Georgetown University.

LORI MARINO

Lori Marino, PhD, is founder and President of the Whale Sanctuary Project as well as founder and Executive Director of The Kimmela Center for Animal Advocacy, which focuses on scholar-advocacy in the domain of animal protection.

Lori is a neuroscientist and expert in animal behavior and intelligence, formerly on the faculty of Emory University and is internationally known for her work on the evolution of the brain and intelligence in dolphins and whales (as well as primates and farmed animals). She has published over 140 peer-reviewed scientific papers, book chapters, and magazine articles on marine mammal biology and cognition, comparative brain anatomy, self-awareness in nonhuman animals, human-nonhuman animal relationships, and the evolution of intelligence. She also conducts research and publishes in a variety of areas related to marine mammal captivity such as dolphin assisted therapy and the educational claims of the zoo and aquarium industry.

Lori appears regularly in films and television programs, including the 2013 documentary *Blackfish* about killer whale captivity, Unlocking the Cage, the 2016 documentary on the Nonhuman Rights Project, and Long Gone Wild , the 2019 documentary about the global capture and trade in wild orcas and belugas.

YOKO MITANI

Yoko Mitani is a marine mammalogist and has a Bachelor and Master of Agriculture from Kyoto University, and received a PhD. from the Graduate University for Advanced Studies, Japan where she conducted research focusing on foraging behavior or Weddell seals in Antarctica using bio-logging techniques. As a postdoctoral fellow at the National Institute of Polar Research, Tokyo Institute of Technology, and Texas A&M University, she collaborated with her international colleagues in several field surveys of marine mammals; northern elephant seals in California, sea otters in Alaska, and northern fur seals in Russia. Since she got a position in Hokkaido University in 2008, she established field research in Hokkaido, northern Japan. Her research focuses on monitoring marine mammal interactions with marine environments, and seeks how to mitigate conflicts between marine mammals and human activities such as fisheries.

SALLY MIZROCH

Sally Mizroch worked at the Alaska Fisheries Science Center in Seattle, Washington from January 1977 until she retired in May 2016, when she founded Blue Sea Research. She was a member of the U.S. delegation to the International Whaling Commission's (IWC) Scientific Committee from 1980-1988 and has attended the past three IWC meetings as an invited participant.

In 1986, she developed the humpback whale matching system and started the centralized North Pacific humpback whale flukes photo database. She has conducted fieldwork throughout the North Pacific and she has participated in international scientific conferences throughout the world. In 2011, 2012 and 2014, she spent 2-months at sea each summer surveying remote areas of the North Pacific on a Japanese research ship as part of the Pacific Ocean Whales and Ecosystem Research (POWER) program.

In recent years, Sally (in collaboration with Dale Rice) has been writing comprehensive and complex papers on killer whales and on the distribution and movements of large whales in the North Pacific. Their papers on fin whale and sperm whales have been published and their paper on North Pacific sei whales is in final stages of revision. They also have a draft paper in progress on distribution and movements of North Pacific humpback whales.

She has used both whaling and photo-identification data to estimate vital rates of many cetacean species and populations over the course of her long career. She is particularly interested in large mammal population dynamics and reproductive biology and enjoys fostering large-scale collaborative research.

LOUISA PONNAMPALAM

Dr. Louisa Ponnampalam is the Executive Director and Co-Founder of The MareCet Research Organization in Malaysia, a NGO she co-founded. Her career today is testament that childhood dreams can come true with hard work and perseverance. Louisa has contributed to cetacean research in Thailand, Oman, Vietnam and Myanmar, but has focused most on developing marine mammal science in Malaysia. One of Louisa's main career goals is to raise the profile of marine mammals in Malaysia, and to build local research and conservation capacity for these animals and their fragile marine environment. In her own words, "If I can reduce the number of people asking me in disbelief whether Malaysia has dolphins, then I would have done something right in my career's lifetime". Louisa was awarded the Pew Fellowship in Marine Conservation in 2014, the first Malaysian to be presented with this prestigious international award and the only female recipient for that year. Additionally, her efforts were recognized by her country when she was awarded the National Youth Premier Award 2014 (Special Category) in 2014 by the Malaysian government. She presently serves as a member of the IUCN Species Survival Commission's Cetacean and Sirenia Specialist Groups and is a Research Associate at the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak. In 2017, she was a finalist of the Study UK Alumni Awards (Professional Category) and was listed as one of "30 Under-40 Most Inspiring Young, Inspiring and Successful Malaysians" by the Malaysian Business Magazine. In 2018 she made the shortlist for the inaugural Women of the Future South East Asia Awards. Louisa currently co-supervises 4 postgraduate students and is mentor to various colleagues in the Southeast Asian region. In her free time, she enjoys travelling and learning about the various cultures around the world.

NAOMI ROSE

Naomi Rose is the marine mammal scientist for the Animal Welfare Institute in Washington, DC. She campaigns against cetacean live capture, trade, and captivity and has been a member of the International Whaling Commission (IWC) Scientific Committee since 2000, where she participates in the subcommittees on environmental concerns and whale watching. She has authored or co-authored over 45 scientific papers and articles for animal protection publications, as well as chapters in several books. She has participated in various conferences, workshops, meetings, and task forces at the international, national and state level. She has testified before the U.S. Congress four times, at the Canadian Parliament, and at several state legislative and regulatory hearings. Her work was featured in the 2012 non-fiction book *Death at SeaWorld: Shamu and the Dark Side of Killer Whales in Captivity*, by David Kirby, and she gave a TedX Talk in Bend, Oregon in April 2015 on captive orca welfare. She received a Ph.D. in biology from the University of California at Santa Cruz in 1992, where her dissertation examined the social dynamics of free-ranging orcas. She has worked in the marine mammal advocacy field for over 25 years.

ALISA SHULMAN-JANIGER

Alisa Schulman-Janiger is a Research Associate with the Natural History Museum of Los Angeles County, and is a marine biologist, whale researcher, and educator. She has been Director/Coordinator of the full-season shore-based ACS/LA Gray Whale Census and Behavior Project (which she founded) since 1984: spotting, tracking, and recording that migration from Point Vicente Interpretive Center with citizen scientists she trained. Alisa has been photo-identifying California killer whales, archiving sightings and studying distribution, natural history, and behavior for 40 years. She coauthored the NOAA Technical Memorandum "Killer Whales of California and Western Mexico: A Catalog of Photo-Identified Individuals", and co-founded the non-profit California Killer Whale Project. She is an instructor for Cabrillo Whalewatch Program, training whale watch naturalists. She is a naturalist on boats in southern California and Monterey Bay, has been a researcher and naturalist in Baja California, Alaska, and Massachusetts, and a NOAA staff scientist and Marine Mammal Observer on cruises from Alaska to California. She is on NOAA's Stranding Response Team and Large Whale Entanglement Response Team. Alisa previously taught marine biology, advanced marine science, and biology in San Pedro High School's Marine Science Magnet for over 20 years, and was head marine biologist/educator on LAUSD's Sea Education Afloat Program boats (K-college) for 10 years. She has a Bachelor's of Science degree in Zoology (emphasis in marine biology), and a life science teaching credential.

SABENA SIDDIQUI

Sabena Siddiqui founded the American Cetacean Society Student Coalition (ACSSC), she has served as the student chair and as a national board member of the ACS for nine years. Her efforts on the ACS board include serving as the IWC representative for ACS and leading the organization's efforts to broaden the scope of cetacean conservation and science outreach beyond the typical ethnic and socioeconomic groups. As ACS student chair, she helps recruit new student leaders by providing mentorship and guidance of current student leaders in campuses across the country. Sabena is currently conducting humpback whale behavior and bioacoustics research for her master's degree at the University of Hawaii-Hilo. Previously she worked on a humpback whale acoustics project with the passive acoustics research group at NOAA-NEFSC in

AUTHOR BIOGRAPHIES

Woods Hole, MA. She has contributed as an intern for various research projects exploring manatee cognition, dolphin communication, and cetacean distribution. Sabena has also worked as a survey biologist on the North Atlantic Right Whale Cruise through NOAA.

MRIDULA SRINIVASAN

Mridula Srinivasan is a marine ecologist and currently, Chief, Protected Species Science Branch at NOAA's National Marine Fisheries Service, Office of Science and Technology. She has a Ph.D. in Wildlife and Fisheries Science from Texas A & M University, a MS in Environmental Management from Florida Tech, a B.Sc. and M.SC in Zoology/Molecular Biology from the University of Delhi, India. Her research interests are focused on different facets of behavioral ecology, and more specifically, on predator-prey interactions, predation risk effects, climate and oceanographic effects on species distributions. She is also actively involved in international training and capacity building in marine mammal education, research, and stranding response, especially in India. She serves as the Education Committee Chair for the Society for Marine Mammalogy and is passionate about ocean literacy and mentoring the next generation of marine scientists.

ALISON STIMPERT

Alison Stimpert completed her PhD in Zoology at the University of Hawai`i at Mānoa and the Hawai`i Institute of Marine Biology. She studied humpback whale foraging ecology in Antarctica as part of an F.V. Hunt Postdoctoral Fellowship through the Acoustical Society of America, and then went on to study the effects of anthropogenic noise on cetaceans as a National Research Council Research Associate at the Naval Postgraduate School in Monterey, CA. She is currently a member of the Research Faculty in Bioacoustics and Vertebrate Ecology at Moss Landing Marine Laboratories in Moss Landing, CA. Her research investigates the acoustic (sound production) and movement (fine-scale kinematic patterns) behavior of animals (particularly fish and cetaceans) as well as characterizing soundscapes in a variety of marine habitats. She is particularly interested in how individual animal behavior can be used to answer questions relating to conservation and effects of anthropogenic activities.

KATE STAFFORD

Dr. Kate Stafford's research focuses on using passive acoustic monitoring to examine migratory movements, geographic variation and physical drivers of marine mammals, particularly large whales. She has worked all over the world from the tropics to the poles, and is fortunate enough to have seen (and recorded) blue whales in every ocean in which they occur. Kate's current research focuses on the acoustic behavior of bowhead whales and the changing acoustic environment of the Arctic and how changes, from sea ice declines to increasing industrial human use, may be influencing subarctic and Arctic marine mammals. She is a founding member of the Scholarly Union for Bio-Physical Arctic Researchers. Kate is currently a Senior Principal Oceanographer at the Applied Physics Lab and affiliate Associate Professor in the School of Oceanography at the University of Washington in Seattle. She has degrees in French Literature and Biology from the University of California at Santa Cruz and Wildlife Science (MS) and Oceanography (PhD) from Oregon State University. Before going to graduate school, she lived as a Fulbright scholar for a year in Paris studying Medieval French Literature. Kate's research has been featured, among others, in Wild Blue: a Natural History of the World's Largest Animal by Dan Bortolotti, the New York Times Scientist at Work blog, The Planet magazine, and in Highlights for Children magazine. She has collaborated with artists around the world, providing sounds for multimedia art exhibits.

BARBARA TAYLOR

Dr. Barbara Taylor has been researching marine mammals for over 30 years. She led the marine mammal genetics group at the Southwest Fisheries Science Center in La Jolla, California for 15 years and now is a senior scientist. The group identifies units to conserve using genetic data and has promoted developing guidelines and standards to facilitate naming new taxa of cetaceans using primarily genetic data. She also specializes in estimating risk of extinction and has worked with some of the most endangered species. She chairs the Conservation Committee of the Society for Marine Mammalogy, and serves as the Listing Authority for the Cetacean Specialist Group of the International Union for the Conservation of Nature (IUCN). In 2016 she was awarded the Society for Conservation Biology's LaRoe award for her outstanding career achievements in translating conservation science into real-world conservation efforts. She was chief scientist together with Dr. Lorenzo Rojas-Bracho on all vaquita surveys. She is a member of vaquita recovery team, the steering committee for the acoustic monitoring project, and led the search effort for the attempt to take vaquitas into captivity. She co-chaired a workshop on Ex-Situ Options for Cetacean Conservation in 2018 and chaired a 2019 workshop to develop a One Plan Approach for Yangtze finless porpoise.

SOFIE VAN PARIJS

Dr. Sofie Van Parijs has worked on passive acoustic research from the poles to the Tropics for over 20 years. She has undergraduate and master's degrees from Cambridge University and a PhD from Aberdeen University in the UK. She worked as a postdoctoral scientist at the Norwegian Polar Institute, James Cook University in Australia and Cornell University before moving to NOAA's Northeast Fisheries Science Center in Woods Hole in 2006. At NMFS she is the program leader for the passive acoustic research program within the Protected Species Branch which consists of postdoctoral scientists, PhD students, research analysts and summer interns. She has published over 95 papers in international journals and represents NMFS in a wide range of fora within the US and internationally. Her expertise in marine bio-acoustics has addressed questions on behavioral ecology, distribution, abundance, long term monitoring, mitigation and effects of ocean noise on marine mammals. This has given her extensive experience collecting data with archival, real time autonomous vehicles and towed arrays.

EXPLORING THE WORLD OF WOMEN IN MARINE MAMMAL SCIENCE AND STEM

THE WOMEN IN MARINE MAMMAL SCIENCE INITIATIVE (WIMMS)

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In 2017, we formed the Women in Marine Mammal Science (or WIMMS) initiative, to establish a global community of marine mammal scientists committed to identifying and addressing the unique barriers to women in the field of marine mammal science.

Women are underrepresented in career, and especially leadership, positions within the field of marine mammal science. In addition to challenges encountered by women seeking higher positions in STEM more broadly, women face unique barriers to success when advancing their careers in marine mammal science (e.g., income inequality, imposter syndrome, stereotype threats and implicit bias). Despite this, women comprise a majority of the membership in scientific societies focused on marine mammalogy. The drivers of the disparity between membership and career advancement are complex and are not well-understood. Achieving gender equity in marine mammal science will require us to identify the barriers to success faced by women and develop strategies that individuals and institutions can implement to actively support the advancement and retention of women from diverse backgrounds in this field.

We organized a workshop in association with the Biennial Conference on the Biology of Marine Mammals held in Halifax, Canada in 2017. The workshop brought together early-career women and leaders in our field from around the world to share their views, lived experiences, and advice for advancement in our field. Prior to the workshop, we circulated an online survey designed to identify the barriers to success faced by women and to present strategies that individuals and institutions can implement to break these barriers down (the report is available on the website). Over 650 people responded to the survey. Since then the initiative has built on the ideas generated by our workshop and from workshops conducted by other groups. We are actively engaging with the broader community through social media platforms. With our twitter account @womeninmmsci we highlight the achievements of women in the field through weekly #WIMMSWednesday features, and on Facebook, we established a closed group to serve as a forum for discussion, networking, and mentorship to support the advancement of women in our field. The community grows daily and we welcome you to join it.

Erin Ashe, Amanda Bradford, Maria Constanza Marchesi, Natalie Mastick, Frances Robertson, and Mridula Srinivasan

You care about whales, dolphins, and porpoises. We're here to protect them, but we can't do it without your help.

The American Cetacean Society is proud to present this issue of Whalewatcher, dedicated to the women of cetology, and is grateful to guest editor, Sabena Siddiqui and the authors and photo contributors who made this one-of-a-kind publication possible.

Uniquely written by scientists for the lay community, Whalewatcher is just one of the many benefits you'll enjoy as an ACS member– from local chapter meetings and action alerts, and issues of Spyhopper, our quarterly e-newsletter, your support of ACS puts you at the epicenter of our efforts to protect the future of cetaceans. The best benefit of all, however, is knowing that your investment in the American Cetacean Society is making a meaningful difference in the lives of whales, dolphins, and porpoises everywhere.

To activate or renew your ACS membership today or to make a donation, visit us at:
acsonline.org

When you join or donate to ACS today, you'll help us achieve lasting results for cetaceans and the healthy habitats upon which they depend. Thank you for becoming a member!

On behalf of whales, dolphins, and porpoises,

President, ACS National Board of Directors

AMERICAN CETACEAN SOCIETY

Very curious Bigg's transient killer whales closely approach my boat off of Palos Verdes in December 2013, not far from the Gray Whale Census; they had recently killed a common dolphin. *Photo by Alisa Schulman-Janiger.*








AMERICAN CETACEAN SOCIETY

The mission of the American Cetacean Society is to protect whales, dolphins, porpoises, and their habitats through public education, research grants, and conservation actions.

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