



AMERICAN CETACEAN SOCIETY

Tuned In



to Whales

Conservation, Research & Education

14th International Conference

Newport Beach, California – November 7-9, 2014

Hyatt Regency Newport Beach

CONFERENCE PROGRAM

AMERICAN CETACEAN SOCIETY



National

P.O. Box 1391
San Pedro, CA 90733-1391
310-548-6279
www.acsonline.org

Los Angeles Chapter

President: Diane Alps
www.acs-la.org

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President: Sabena Siddiqui
<http://acssnational.wordpress.com>

The American Cetacean Society (ACS) is the oldest whale conservation group in the world. Founded in 1967, it is a nonprofit, volunteer membership organization with regional U.S. chapters and members in 16 countries.

Our National Headquarters is in San Pedro, California. ACS works to protect whales, dolphins, porpoises, and their habitats through education, conservation and research. We believe the best way to protect cetaceans is by educating the public about these remarkable animals and the problems they face in their increasingly threatened habitats.

ACS seeks to educate through its publications and the development of teaching aids. ACS reports on cetacean research in its publication, *Whalewatcher*. Some ACS Chapters offer grants to support cetacean research by biologists and graduate students.

They're Not Saved Yet!



Wellington Rogers joined the American Cetacean Society in 1979 and served as president of the Orange County Chapter from 2005-2014. Wellington will be presented with a Certificate of Achievement at the Banquet on Saturday night. Congratulations and Thanks to Wellington Rogers for 35 years of dedication to the American Cetacean Society.

A MESSAGE FROM THE PRESIDENT...



It is my great privilege to welcome you to the American Cetacean Society's 14th Biennial International Conference, Tuned In To Whales. The title can mean a number of different things. What does it mean to you?

Tuned In could be a study of the acoustical sounds of whales, from whistles, clicks, songs and deep, sonorous rumbles. It could be the physiology of the cetacean to make those sounds. We will explore sound response and cetacean anatomy on Sunday.

Tuned In could be increasing our knowledge about cetaceans through citizen science and public education.

Tuned In could be finding out what whales are up against for survival and determining what we can do to help them. Tune in to Conservation throughout the weekend.

Tuned In could be a dialogue between what is best for cetaceans and for the people that study them. We will Tune In to Cetaceans in Captivity with a panel discussion exploring both sides of the issue.

We are all here with a common interest - indeed, love - of cetaceans. We have all made a sacrifice of time and money to be here to learn, collaborate and share scientific knowledge about the unique marine mammals that share our planet. When the conference ends and we return to our everyday lives, please hold onto that passion for cetaceans that we all possess.

Back in the 70s, I attended a Whale Symposium at Indiana University, Turn On, Tune In, and Drop Out were the themes of the day. In 2014, we are Tuning In to Whales, and I am honored that you are here for the ride.



Niane Glim

*President
American Cetacean Society*





2014 Conference Committee

Diane Glim

Conference Chair & Program Committee

Diane Alps - Conference, Program Committee & Whale Watch Coordinator

Shari Bookstaff - Silent Auction Coordinator

Uko Gorter - Program Committee Chair & Logo Artist

Cathy Hachigian - Program Guide Editor & Design

Mike Makofske - Publicity & Volunteer Chair

Joy Primrose - Poster Committee

Sandy Rosenberg - Photo Contest Coordinator

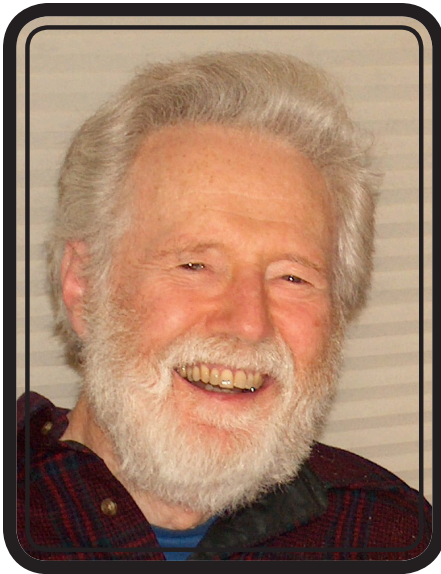
Sabena Siddiqui - Program & Poster Committee

Richard Ternullo - Poster Committee



2014 CONFERENCE DEDICATION

Alan Baldrige



Cetaceans, marine mammals and birds lost a true friend and ally with the passing of Alan Baldrige on May 28, 2014. Alan and soulmate Sheila Baldrige were instrumental with the formation of the Monterey Bay Chapter of the American Cetacean Society in 1980.

With a master's degree in Library Science, Alan and Sheila moved from England to the Monterey Peninsula in 1966, where they both worked in scientific librarian positions throughout their careers - Alan at Stanford University's Hopkins Marine Station and Sheila at Moss Landing Marine Labs. Alan became an expert on the identification, ecology, biology and conservation of local marine mammals, seabirds, and land birds. His passion for, and careful observation of these animals was shared in writing, teaching and organizing efforts on their behalf. In 1980, he co-authored *The Bird Year* about the seasonal habitats and ecology of Monterey's bird life,

and in 1991, *Gray Whales* was published.

During nearly 30 years at Hopkins Marine Station, Alan was a tireless and life-long educator who was generally considered the "go-to" naturalist when government officials or news reporters wanted to know something about things that fly over, swim in or wash up on the shore of Monterey Bay. He inspired countless marine biologists, ornithologists and field birders with his passion for the ecology and conservation of the diversity of wildlife, which took him on numerous travels throughout the world.

Alan remained interested and engaged by nature until the very end of his life. We dedicate the 14th Biennial American Cetacean Conference to his memory and inspiration.



Alan on his 80th birthday celebration July 2013 with Monterey Bay Chapter members.





The American Cetacean Society would like to thank our sponsors, our many wonderful volunteers, the ACS National Board of Directors, the Hyatt Regency Newport Beach Hotel and Sir Speedy for being a big part in making our 14th International Conference a success.

Contributors to the Silent Auction Include - *Sorry if we missed anyone*

Monterey Bay Chapter Gift Basket
San Diego Chapter Gift Basket
San Francisco Chapter Gift Basket
Hyatt Regency Newport Beach
Viva Vaquita
Aquarium of the Bay
Blue Dolphin Alliance
Pacific Nature Tours
San Diego Whale Watch

Hornblower Cruises
Monterey Bay Whale Watch
Birch Aquarium
Wyland
Shari Bookstaff
Jim Nahmens
Tiana Duarte
Scottie Schmidt
Sheri Knox

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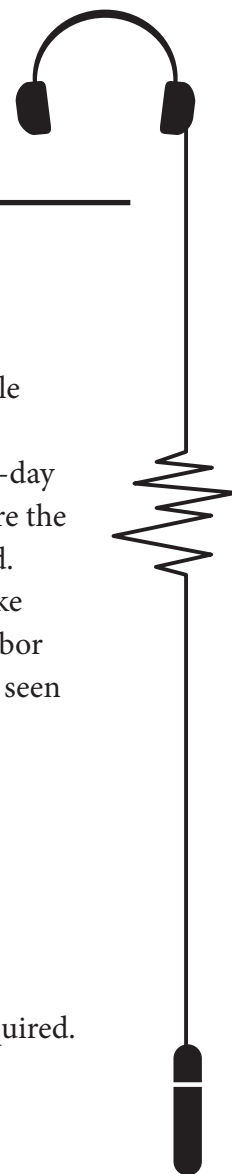


CONFERENCE SCHEDULE

*All Sessions to be held in Plaza I & II

FRIDAY

NOVEMBER 7, 2014



FIELD TRIP

8AM - 4PM All-day Whalewatch / Dana Wharf Whale Watch

We will board the "Dana Pride", owned and operated by Dana Wharf Whale Watching. It will leave out of Dana Point Harbor where we will have the opportunity to explore the offshore waters of Southern California. Our all-day adventure with Dana Wharf Whale Watch will give us the chance to explore the rich biodiversity of the waters between Orange County and Catalina Island. Possible species we might encounter include blue, fin, humpback and minke whales, Risso's, common and bottlenose dolphins. California sea lions, harbor seals, a variety of gull species, brown pelicans and cormorants may also be seen throughout the day.

www.danawharf.com



IN THE PLAZA ARBOR...

A volunteer will be at this location throughout the weekend to assist as required.

REGISTRATION

5:30 - 7:00PM Register, receive your program guide and other goodies.

WELCOME RECEPTION

6:30 - 7:30PM Say "Hi" to old friends and make new ones at the Welcome Reception.

7:30 - 8:30PM A special talk "*A Chance to Participate in Antarctic Whale Science*" will be presented by **Ted Cheeseman and Ari Friedlaender**, Cheeseman's Ecology Safaris
Details on this amazing trip being planned in March 2016 can be found further on in your program.

8:30 - 9:00PM Reception Continues

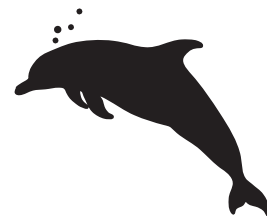


CONFERENCE SCHEDULE

*All Sessions to be held in Plaza I & II

SATURDAY

NOVEMBER 8, 2014



7:00AM **Registration** Desk Open (Plaza Arbor)

8:30AM **Welcoming Remarks** - **Diane Glim**, ACS National President (Plaza I & II)

9:00AM *Whales*

Plenary Speaker: **Ken Balcomb**, Center for Whale Research

10:00AM **Morning Break**

Poster Session (Plaza III)

Exhibitors (Plaza Arbor)

Session I: *Tuned In to Citizen Science & Public Education*

10:30AM *Harbor Porpoises Return to San Francisco Bay*

William (Bill) Keener, Golden Gate Cetacean Research

10:50AM *Bottlenose Dolphins Return to San Francisco Bay*

Marc Webber, Golden Gate Cetacean Research

11:10AM *ACS/LA Gray Whale Census & Behavior Project, Point Vicente 1984-2014*

Alisa Schulman-Janiger, ACS/Los Angeles Chapter

12:00PM **Lunch** (Amphitheater)

Special Session: *Tuned In to Cetaceans In Captivity*, Moderator **Ari Friedlaender**

1:30PM *Beneath the Surface: The Impact of Captivity on the Welfare of Orcas*

Naomi Rose, Animal Welfare Institute

Past, Present and Future of Marine Parks

Judy St. Leger, SeaWorld

Understanding the Role of Marine Mammal Facilities in Today's Conservation Landscape

Kelly Jaakkola, Dolphin Research Center

Dolphins, Ethics and the Business of Captivity

Thomas I. White, Loyola Marymount University

2:30PM **Afternoon Break:** Time for Audience to Submit Questions

3:00PM **Panel Discussion, Moderated Question & Answer Session**

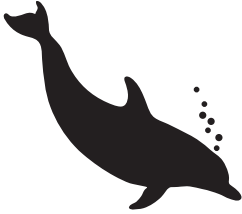
4:30PM **Poster Session** (Plaza III)

Silent Auction (Plaza III)

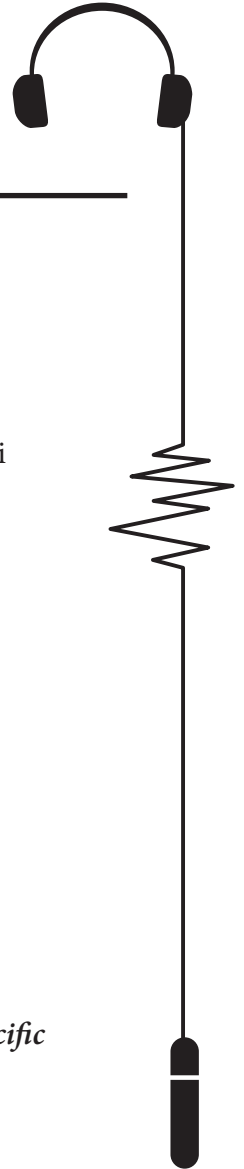
7:00PM **Banquet** (Plaza II) *Pier-2-Pier: Some Reflections on 40 Years of Whale Watching*

Robert (Bob) Pitman, Southwest Fisheries Science Center





CONFERENCE SCHEDULE
*All Sessions to be held in Plaza I & II
SUNDAY
NOVEMBER 9, 2014



7:00AM Registration Desk Open (Plaza Arbor)

8:00AM Student & Scientists Breakfast Meeting (Plaza Arbor)

Session I: Tuned In to Cetacean Anatomy

9:30AM *Carrying a Tune: How Whales Sing Underwater*

Plenary Speaker: **Joy Reidenberg**, Icahn School of Medicine at Mount Sinai

10:30AM *Baleen Whales Hear Best by Bone Conduction*

Ted Cranford, San Diego State University

10:50AM *The Ultimate Mouthful: Lunge-feeding in Rorqual Whales*

Jeremy Goldbogen, Hopkins Marine Station, Stanford University

11:30AM Break

Session II: Tuned In to Conservation

12:00PM *Key Research Questions of Global Importance for Cetacean Conservation*

Chris Parsons, George Mason University

12:20PM *How We All Kill Whales*

Michael Moore, Woods Hole Oceanographic Institution

12:40PM *Hotspots of Cetacean Species Diversity:*

Conservation Implications and an Example from the Oceanic Eastern Tropical Pacific

Lisa Ballance, Southwest Fisheries Science Center

1:15PM Lunch (Amphitheater)

Session III: Tuned In to Sound Response to Navy Sonar in Southern California

2:30PM *Using Satellite Telemetry and Photo-ID to Assess Longer-term Responses to Navy Sonar*

Erin Falcone, Cascadia Research Collective

Southern California Behavioral Response Study (SOCAL-BRS): Overview of a Collaborative Effort to Directly Measure How Navy Sonar May Affect Cetaceans

John Calambokidis, Cascadia Research Collective

Using High-resolution Acoustic and Movement Tags to Measure Behavior and Response to Sound in SOCAL-BRS

Alison Stimpert, Moss Landing Marine Laboratories

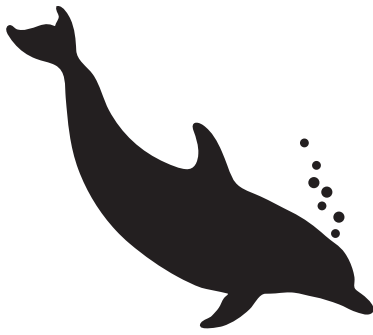
Do Not Disturb: Understanding How Changes in Prey Affect the Behavioral Response of Blue Whales to Anthropogenic Sounds

Ari Friedlaender, Oregon State University

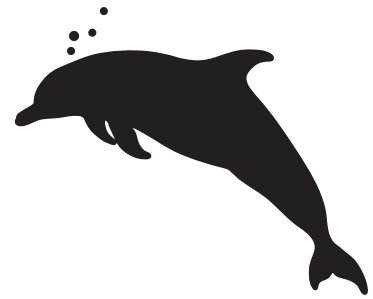
4:15PM Conference Wrap Up and Discussion

4:45PM Closing Remarks





BANQUET GUEST SPEAKER



Robert L. Pitman

Pier-2-Pier: Some Reflections on 40 Years of Whalewatching



I have spent much of the past 40 yrs at sea aboard cetacean research cruises in all the oceans of the world. (My personal goal is to see all of the world's species of cetaceans in their natural habitat; I am currently at 82 of 90.) In this talk I will provide some highlights (and lowlights) of a long career at sea following whales and dolphins, offer insights and musings about these enthralling beasts, and discuss some the technological advances that have made whales and dolphins more accessible to us land forms.

Robert (Bob) is a marine ecologist at NOAA Fisheries' Southwest Fisheries Science Center in La Jolla, California. He dropped out of college in 1974 to participate in an oceanic research cruise from Long Beach, CA, to the tip of Argentina, and never looked back. Since then, he has participated in over 150 research cruises around the world and published dozens of papers on cetaceans, flyingfish, seabirds, and marine turtles. For the last few years he has focused his attention almost entirely on killer whale systematics and ecology, particularly in Antarctica and Western Australia.



SPEAKERS



Ken Balcomb
Lisa Ballance
John Calambokidis
Ted Cheeseman
Ted Cranford
Erin Falcone
Ari Friedlaender
Jeremy Goldbogen
Kelly Jaakkola
William (Bill) Keener
Michael Moore
Chris Parsons
Joy Reidenberg
Naomi Rose
Alisa Schulman-Janiger
Alison Stimpert
Judy St. Leger
Marc Webber
Thomas White

Ken Balcomb *Whales*



Can lessons learned from the war of the whales be applied for human peace? Why is it that the evolution of our societies has proceeded so differently from that of other social species? What guiding principles might we learn from whales and whale research? How does a popular organization (mini-society) like ACS matter?

I'm a researcher, naturalist, storyteller, and philosopher – all in some degree that varies with the immediate circumstances. Most of all, I am a packrat –stuff that I've collected throughout my life, including writings and photographs, is around here somewhere. The trick is in finding it and extracting the essence for little art projects that one half of my brain comes up with episodically.

It took me quite awhile to decide what I wanted to be when I grew up; and before I knew it I was already grown up. I majored in Philosophy in University and then switched to Zoology because of my interest in animals since childhood. The Philosophy stuff got very confusing when you really got into it – lots of great minds coming at things from very different points of view. We humans are all different, and so are all animals as it turns out. We learn from those differences. It is too bad that we argue and fight over them like the squabbling monkeys of our ancestry. The most comprehensive way of learning is through experience, but you can get a little of that vicariously and have a better chance of survival.



Lisa Ballance

Hotspots of Cetacean Species Diversity: Conservation Implications and an Example from the Oceanic Eastern Tropical Pacific



Lisa is the Director of the Marine Mammal and Turtle Research Division at the Southwest Fisheries Science Center, NOAA Fisheries Service, a group of eight programs and some 70 individuals conducting research focused on management and conservation of mammals and turtles globally. Lisa obtained a Bachelor of Science degree from the University of California San Diego, a Master of Science degree from Moss Landing Marine Laboratories, and a doctoral degree from the University of California Los Angeles. She became a marine ecologist with the Southwest Fisheries Science Center in 1996. Her research is focused on cetacean and seabird ecology in oceanic systems, species diversity patterns, and ecosystem-based approaches to management. She has conducted field work in the eastern tropical Pacific, tropical Indian Ocean, and Antarctica, supported by grants from NOAA, the National Science Foundation, National Geographic Society, World Wildlife Fund, and International Fund for Animal Welfare. Lisa is also an Adjunct Professor at the Scripps Institution of Oceanography, where she is Chair of 5 doctorate committees, Research Adviser with the National Academies, and Affiliate Professor at the University of San Diego. She is an editorial board member of *Marine Ornithology*, Past Chair of the Pacific Seabird Group, and recipient of the Department of Commerce Silver and Bronze Medals and NOAA Fisheries Supervisor of the Year awards.

Biodiversity hotspots have received much attention and are increasingly the focus of conservation efforts in marine ecosystems. Data from NOAA cetacean and ecosystem assessment surveys conducted over an 18-year period (1986-2003) in the eastern tropical Pacific (a 20 million km² area) provide an unprecedented look at species diversity hotspots for one third of the world's species of cetaceans in the largest tropical ocean on the planet. Diversity hotspots are clearly evident in three distinct regions. All three correspond with oceanographic variability (the edges of multiple interacting oceanographic features). This has potentially profound implications for the use of diversity hotspots as regions of high conservation priority, for cetaceans, and perhaps for all marine vertebrates in the open ocean.

John Calambokidis

Southern California Behavioral Response Study (SOCAL-BRS): Overview of a Collaborative Effort to Directly Measure How Navy Sonar May Affect Cetaceans



John is a Senior Research Biologist and one of the founders of Cascadia Research Collective, a non-profit research organization formed in 1979 based in Olympia, Washington. He periodically (1991-2013) serves as an Adjunct Faculty at the Evergreen State College teaching a course on marine mammals. His primary interests are the biology of marine mammals and the impacts of humans. He has served as Project Director of over 100 projects. He has authored two books on marine mammals (on blue whales and a guide to marine mammals) as well as more than 150 publications in scientific journals and technical reports. He has conducted studies on a variety of marine mammals in the North Pacific from Central America to Alaska. He serves as Project Manager of the Southern California Behavioral Response Study and has directed long-term research on the status, movements, and underwater behavior of blue, humpback, and gray whales. Some of his recent research has included attaching tags to whales with suction cups to examine their feeding behavior and vocalizations. His work has been covered on shows by National Geographic and others. In 2012 he received the American Cetacean Society's John Heyning Award for Lifetime Achievement in Marine Mammal Science.

The SOCAL-BRS is a collaborative study funded by several US Navy research programs to measure and describe behavioral responses of a wide range of cetaceans to Navy sonar off southern California. The study derived and evolved from several efforts in other parts of the world and took advantage of the diversity of cetaceans off Southern California as well as the experience of researchers working in this region. The study relied on the new development of a relatively small, scaled-down sound source to simulate real Navy sonar, allowing the use of smaller vessels during experiments. More recently, we have worked in direct coordination with actual Navy ships using mid-frequency active sonar (MFAS) during regular training operations but using carefully designed experimental protocols to result in direct measurements of sound exposure and potential behavior response in controlled conditions. Hallmarks of the study have been operating with extreme flexibility to maximize success, by taking advantage of opportunities with different species and weather, and being lead by semi-independent RHIBs conducting scouting, tag deployments, and behavioral observations of animals. Field work from 2010-2014 has resulted in over 150 deployments of suction cup multi-sensor tags on 10 different species and successfully completed more than 80 controlled exposure experiment sequences (including silent controls). The study has gathered an unprecedented amount of data for a study of this type that has been and will continue to be analyzed and published over the course of future years. We have strived to publish results of critical preliminary findings quickly with five publications already in peer reviewed literature (several others in press or review), including those documenting the response of blue and beaked whales to simulated sonar in some cases, but showing a lack of response in other conditions (including with distant uncontrolled real MFAS). The study has included working directly with the Navy, in the context of research funding but also technical expertise in underwater acoustics and sound propagation. Our direct coordination with the Navy has been integral to the project, enabling the unprecedented controlled use of actual Navy MFAS in an experimental manner. In doing so we have also sought to ensure the openness and transparency of the project, maintaining autonomy without restrictions on the presentation, publication, and dissemination of our results.

J. Calambokidis, B. Southall, A. Stimpert, J. Goldbogen, S. DeRuiter, A. Friedlaender, E. Hazen, G. Schorr, E. Falcone, P. Arranz, D. Moretti, A. Douglas, A. Allen, G. Gailey, and P. Tyack



Ted Cheeseman

A Chance to Participate in Antarctic Whale Science



Ted caught the whalewatching bug early, growing up in California, getting seasick in Monterey Bay from the age of a toddler. He was fortunate to join his parents leading wildlife safaris beginning in 1983, and on polar expeditions beginning 1994. After earning a graduate degree in tropical conservation biology from Duke University, Ted was seduced by the glory of polar extremes and returned to California to work with Cheesemans' Ecology Safaris (www.cheesemans.com), the company his parents founded in 1980. Ted now directs Cheesemans' Ecology while pursuing a doctorate in cetacean science. In recent years Ted was deeply involved in the management of Antarctic tourism, serving for five years on the executive committee of the International Association of Antarctic Tour Operators (IAATO), a group working to minimize the environmental impact of Antarctic tourism. In the course of a lifetime of travel and especially in the last two decades of polar expeditions, Ted has seen human impacts create striking changes in ecosystems. Some of these are encouraging, such as the recovery of many great whale populations where they had been hunted near extinction. But as human impacts become ever stronger in the places Ted loves most, Ted tries to use nature expeditions as an avenue for turning travelers on to science and the value of wild lands and seas. When not on expedition, Ted entertains himself with kite surfing, rock climbing, backcountry skiing, and spending time with his wife and 17 year old daughter.

Ted Cheeseman and Ari Friedlaender have created an opportunity for ACS members to participate in Antarctic cetacean science during a March 2016 in-depth expedition to the Antarctic Peninsula. The expedition will include marine mammalogists Ari, Ted, John Calambokidis, Dan Costa, Dave Johnston, Andy Read and Brandon Southall along with ACS leaders Bernardo and Diane Alps. This evening Ted and Ari will discuss the state of Antarctic cetacean science, their own work, what it is like visiting and working in Antarctica, and how ACS members can participate in the science and experience of this voyage. The expedition is both longer and more in-depth than the typical Antarctic cruise, traveling at peak season for whale abundance and at a perfect time for incredible landscape photography.

Ted Cranford *Baleen Whales Hear Best by Bone Conduction*



Ted's research focuses on the functional morphology of biosonar in toothed whales and, more recently, hearing in baleen whales. The hallmark of his research is question-driven innovation, combining modern technology with traditional anatomic tools to develop new methods that allow investigation of the structure-function complex in marine organisms. These research innovations have led to significant discoveries. One seemingly insurmountable hurdle was to collect anatomic data from the broad size spectrum of marine mammals. The solution: Use an industrial CT scanner that is normally used for rocket motors to scan large cetaceans heads and whole bodies, one such specimen weighed more than half a ton. This size-independent scanning capability is unique and has provided answers to questions that were previously intractable. The most important innovation implemented by Dr. Cranford and Dr. Petr Krysl (UCSD), is the application of engineering principles and analysis tools to simulate how ambient sounds interact with the anatomy of marine organisms. These "finite element modeling" tools have led to a new understanding for how whales hear. Dr. Cranford has published more than 30 peer reviewed papers, including 10 major papers. One of them, in the *Journal of Morphology*, is the most cited paper in that journal since 1996. Dr. Cranford excels at explaining complicated material to diverse audiences and received the Excellence in Science Communication Award from the Society for Marine Mammalogy in 2009.

Sound reception mechanisms in baleen whales are essentially unknown but their vocalization frequencies overlap with anthropogenic sound sources. Pelagic baleenopterids may reach 30 meters in length and produce low-frequency sounds in the range of 10-200 Hz.

Our computerized finite element modeling toolkit allowed us to visualize what occurs when sounds interact with the anatomic geometry of a fin whale's head. In addition, the toolkit provides a means to generate synthetic audiograms for the whale by applying finite element modeling tools to X-ray computed tomography (CT) scans. Simulations reveal two mechanisms that excite both bony ear complexes.

Our previous work using the toolkit indicates that the anatomic geometry of the cetacean head acts in complex ways to both filter out and amplify sounds according to frequency, incident amplitude, angle of incidence, and tissue geometry.

The din of man-made ocean noise has risen steadily over the last half century. In the fin whale, we found that the predominant mechanism for low-frequency sound reception and sensitivity is through bone conduction, as the skull interacts with incident sound waves. Consequently, there are significant implications for assessing mysticete exposure levels to anthropogenic sounds.

This work informs Navy compliance standards by providing estimates of hearing sensitivity and directionality in mysticetes and odontocetes. Our results also provide valuable data for U.S. regulatory agencies and concerned large-scale industrial users of the ocean environment. This study transforms our understanding of baleen whale sound reception and provides a means to predict auditory sensitivity across a broad spectrum of frequencies.

Ted W. Cranford and Petr Krysl



Erin Falcone *Using Satellite Telemetry and Photo-ID to Assess Longer-term Responses to Navy Sonar*



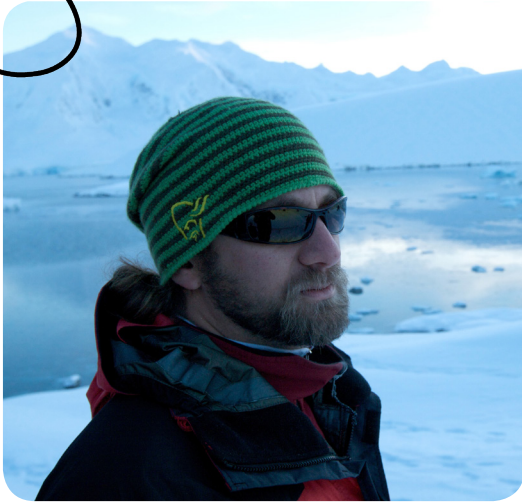
Erin has worked as a research biologist with Cascadia Research Collective in Olympia, WA since 2003. She has studied a variety of cetacean species at locations from Central America to the Aleutian Islands, mostly using small-vessels to collect photo-ID data and deploy satellite tags. When not on the water, she specializes in data management, and currently supports photo-ID catalogs for six species along the US West Coast, though her primary research focus is on the behavior and population dynamics of fin whales and Cuvier's beaked whales in Southern California. She also serves as the data manager for the SPLASH North Pacific humpback whale study, and is a principle investigator for ongoing cetacean studies at the Southern California Offshore Range naval training area.

Understanding the impacts of sonar on marine mammals is a multi-faceted problem, which requires knowledge of both short- and long-term behavioral disruptions, as well as the potential for cumulative impacts on affected populations. Cuvier's beaked whales and fin whales occur regularly in areas of frequent sonar use in the Southern California Bight (SCB), but have not been well-studied in the region. We use a combination of photo-ID and satellite telemetry to first describe population size and structure, distribution and habitat use, and basic diving parameters (such as dive depth and duration, surfacing duration, and foraging rates) for these two species, and then to assess changes in these parameters related to sonar exposure during actual naval operations. Both methods are suggesting that smaller, localized populations of these two species exist in the SCB, which means that any impacts may be disproportionately affecting a smaller number of individuals within current management units. We attempt to characterize and quantify these impacts on three levels: 1. The tagged individual: we assess changes in the movements and diving behavior of each tagged whale during concurrent sonar operations where we can obtain detailed knowledge of the ship's operations. 2. All tagged whales: we look for correlations in the behavior of multiple tagged individuals over large scales when we know ships were active in the region, but have little detail on the nature of the operation. 3. The local population: we can assess larger scale or longer term changes in the demographic parameters of these populations, such as in population size or calving rates, both over time and relative to other studied populations that are not subject to regular sonar exposure. All these methods have inherent limitations and take time to yield results, but in combination can provide a robust view of the impact sonar use may be having on key populations in the SCB.

Gregory S. Schorr, Erin A. Falcone,
David M. Moretti, Russel D. Andrews

Ari S. Friedlaender

Do Not Disturb: Understanding How Changes in Prey Affect the Behavioral Response of Blue Whales to Anthropogenic Sounds



Ari is an Associate Professor in the Marine Mammal Institute at Oregon State University and an Associate Researcher at Southall Environmental Associates in Aptos, California. Ari received his degrees from Bates College, UNC Wilmington, and Duke University. Ari's research focuses on using telemetry and visualization tools to better understand the foraging ecology of marine mammals. Specifically, Ari and his colleagues use multi-sensor recording tags to understand how the underwater movements and behaviors of marine mammals are affected by environment features including prey and climate change. Ari has worked on a wide range of species and habitats from small cetaceans to large baleen whales from the tropics to the poles. Currently Ari has active long-term research programs in Antarctica, California, Alaska, and Cape Cod. Having made over research 20 trips to Antarctica, Ari is currently a principle investigator for one of the longest-running active ecological studies, the Palmer Long-Term Ecological Research Program supported by the National Science Foundation. In this effort, Ari and his colleagues are seeking to understand how the impacts of rapid climate change affect the ecology and behavior of cetaceans in this fragile environment. As part of the Southern California Behavioral Response Program, Ari is leading an effort to incor-

As the largest animals on the planet, blue whales have enormous energetic demands that are met by feeding on dense patches of krill. Because they require vast quantities of food, it is critical for these whales to optimize their foraging behavior to be as efficient as possible. Blue whale feeding behavior has been shown to be affected by anthropogenic sounds, including simulated navy sonar, as part of the Southern California Behavioral Response Study (SoCal BRS). To date, however, behavioral response studies have not accounted for changes in the distribution and abundance of prey when measuring animal disturbance. This is a critical information gap as prey significantly impacts the foraging behavior of blue whales (and other diving animals). In this study, we present data on the behavioral responses of deep-feeding blue whales to sound with the addition of quantitative estimates of prey availability. Our results indicate that (1) several prey metrics affect the feeding behavior of blue whales, and (2) when accounting for changes in prey availability, 5x more variability in the behavioral response of blue whales is explained. This information is critical for understanding the instantaneous and long-term impacts of exposure to human sounds for blue whales, as well as other marine mammal species.

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John Calambokidis, Jeremy A. Goldbogen,
Alison K. Stimpert and Brandon L. Southall

porate information on the distribution and abundance of prey into the metrics used to determine the responses of baleen whales to anthropogenic sound. Ari also has a keen interest and passion for education and promoting the broader impacts of cetacean research. Ari routinely lectures on his experiences and exhibits his photographic work in galleries and books. In March 2016 Ari will lead the ACS-supported marine mammal trip to Antarctica with Cheesman Ecological Safaris.



Jeremy Goldbogen

The Ultimate Mouthful: Lunge-feeding in Rorqual Whales



Jeremy is a comparative physiologist who studies the integrative biology of marine organisms. He started his research career studying the biomechanics of locomotion in hummingbirds and Antarctic sea butterflies (pteropods) as an undergraduate student at the University of Texas at Austin. Jeremy then completed a M.Sc. degree in marine biology from the Scripps Institution of Oceanography at the University of California - San Diego. He later moved on to earn his Ph.D. from the University of British Columbia in Vancouver, Canada, with a thesis titled “Mechanics and energetics of rorqual lunge feeding”. He returned to Scripps as a postdoctoral researcher for one year before joining the Cascadia Research Collective in Olympia, WA for two years. He is now Assistant Professor of Biology at Stanford University, located at the Hopkins Marine Station in Pacific Grove, CA.

Some of the largest baleen whales—such as blue whales, fin whales and humpbacks—fall into a family called rorquals that use an unusual method of feeding. These whales feed on aggregations of zooplankton and fish by lunging with their mouths open wide to tremendous gape angles to force huge volumes of water and prey into their expandable oral cavities. This extreme lunge feeding strategy is facilitated by some of the most bizarre anatomical adaptations, many of which are completely unique among mammals. This talk will present anatomical and behavioral data that help us understand how the largest vertebrates ever subsist on the smallest food.

Kelly Jaakkola

Understanding the Role of Marine Mammal Facilities in Today's Conservation Landscape



Kelly is a cognitive psychologist, marine mammal scientist, and Director of Research for the Dolphin Research Center in Grassy Key, Florida. She earned her Master's degree in Psychology from Emory University, where she began her career studying cognition in chimpanzees and human children, and received her Ph.D. in Cognitive Science from MIT. Her research focuses on dolphin cognition and communication, with past work including studies on number concepts, object permanence, imitation, and language/communication in dolphins, chimpanzees, and human children.

Dr. Jaakkola's research has been published in numerous international scientific journals and book chapters, and her work on dolphin cognition has received worldwide press coverage in the form of newspaper and magazine articles, and television. She has taught courses on human and animal cognition at Brandeis University, Boston College, and MIT, and currently serves on the editorial board for the *Journal of Comparative Psychology*, as well as on the research committee of the Alliance of Marine Mammal Parks and Aquariums.

It is universally acknowledged that the biggest threat to marine mammals today are human beings -- whether directly through harassment and killing, or indirectly through the many human practices that impact the environment in which they live (e.g., over-fishing, pollution, and so forth). And because humans are the problem, it is imperative that we look for ways for humans to bring about the needed solutions. Marine mammal parks and aquariums perform two critical roles in this endeavor. First, they provide the opportunity for research and expertise with marine mammals in a way that is impossible to achieve in the wild. The knowledge gained from these facilities helps scientists correctly interpret studies of wild behavior, and directly informs conservation and rescue efforts. Second, these facilities provide a forum for the general public to directly experience marine mammals, learn about the challenges they face in the wild, and make the emotional connections necessary to inspire conservation-mindedness. Of course, from an ethical standpoint, any such benefits to research, education, and conservation -- no matter how great -- must also be carefully weighed against any potential cost to the animals that might be brought about by housing them in such facilities. To that end, I will discuss current data on animal training practices, behavior, and life expectancy in marine mammal facilities, in order to better inform the debate surrounding these issues.



William (Bill) Keener *Harbor Porpoises Return to San Francisco Bay*



William co-founded the non-profit Golden Gate Cetacean Research in 2010 to focus scientific research on the porpoises, dolphins and whales in San Francisco Bay and along the Northern California coast. Current projects include photo-identifying harbor porpoises, and describing their social behaviors, in San Francisco Bay, as well as documenting the continued northern range extension of coastal bottlenose dolphins by compiling a photo-ID catalog. His work with marine mammals began in 1977 at The Marine Mammal Center in Marin County, California, a facility dedicated to the rehabilitation of sick and injured pinnipeds. From 1980-1982, he served as Executive Director of the Center. During this same time period, as a boat-based field observer, he recorded marine mammals and seabirds in support of Cordell Bank's status as a National Marine Sanctuary. He helped conduct baseline population surveys of harbor porpoises in the Gulf of the Farallones National Marine Sanctuary for Cascadia Research Collective from 1987-1989. As a naturalist for Oceanic Society Expeditions, he led trips to the Farallon Islands, the Baja breeding lagoons of the gray whale, and into the remote Amazon to search for freshwater river dolphins.

Harbor porpoises (*Phocoena phocoena*) returned to use of San Francisco Bay after a habitat abandonment of approximately 65 years. Our efforts focused on the photo-identification of individuals, reproductive timing, behavioral observations, as well as porpoise counts. Photo-ID has not been successful with harbor porpoises in other locations because of their small size, timidity and lack of prominent markings. However, using the Golden Gate Bridge as a platform, we have been able to catalog 600 animals, recognizable from scars and pigmentation patterns. Of these, approximately 20% have been resighted. The shortest interval between first and last sighting is 1 day, and the longest interval is 1485 days. By tracking known females over time we may be able to determine their birth rate, previously possible only through examination of carcasses. Mating is difficult to observe in free-ranging cetaceans, but we observed sexual behavior, including intromission, heretofore unseen in wild harbor porpoises. Since April 2010 we photographed 100 events that appeared to be mating behavior (primarily attempted copulations). Three years of observations, from 2011-2013, reveal the porpoises occur daily, year-round in SF Bay, with a total count of 4843 porpoises, of which 20% were calves. The average number of porpoises sighted per survey was 34.35 +/- 29.75, ranging from a low count of 1 to a high count of 175.

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Michael Moore *How We All Kill Whales*



Michael grew up in England. He has a veterinary degree from the University of Cambridge in the UK. His first veterinary job was as an IWC observer on an Icelandic whale catcher. He has a PhD from the Woods Hole Oceanographic Institution (WHOI) and Massachusetts Institute of Technology. His thesis topic was the use of bottom fish as sentinels of sewer carcinogens. He has been based at WHOI in Woods Hole, Massachusetts, USA since 1986 where he is now the Director of the WHOI Marine Mammal Center. His research encompasses the forensic analysis of marine mammal mortalities, especially in regard to the accurate diagnosis of perceived human impacts and the prevalence of zoonotic agents, the interaction of natural and man-made impacts on fish and marine mammal stocks, development of systems to enhance medical intervention with large whales, and the pathophysiology of marine mammal diving. He works closely with the Right Whale Consortium, curating and contributing to the right whale necropsy database. He has recently undertaken a series of projects related to better understanding how diving mammals manage gas under pressure. He currently provides veterinary support to the Marine Mammal Rescue and Research Division of the International Fund for Animal Welfare, supporting their work with live and dead stranded marine mammals on Cape Cod. He is also involved with wildlife conservation in the sub-Antarctic island of South Georgia, where there is a major rodent eradication program underway to restore a variety of bird species.

Today there is enormous popular interest in marine mammals. Western media tend to dwell on the ongoing debate about commercial whaling by Japan, Norway and Iceland. There is, however, relative silence as to how the shipping and fishing industries of many if not all maritime countries are also catching and sometimes killing whales, albeit unintentionally. Thus, western countries have, through the development and increase in fishing and shipping in continental shelf waters, essentially resumed whaling as vessel speeds and fishing gear strength have increased in recent decades. The ways in which these animals die, especially in fixed fishing gear that they become entangled in and swim off with, would raise substantial concern with consumers of seafood were they to be aware of what they were enabling.



Chris Parsons *Key Research Questions of Global Importance for Cetacean Conservation*



Chris has been involved in whale and dolphin research for over two decades and has been involved in research projects in every continent except Antarctica. Dr. Parsons is an Associate Professor at George Mason University as well as the undergraduate coordinator for their environmental science program. He's a member of the scientific committee of the International Whaling Commission (IWC) in which he is co-chair of the Environmental Concerns sub-committee. He has been involved in organizing the past three International Marine Conservation Congress (IMCC) (the world's largest academic marine conservation conference) and was the program chair for the most recent International Congress on Conservation Biology. he is currently the Conference Chair and a Governor of the Society for Conservation Biology (SCB) and a past-president of the SCB Marine Section. In addition, Dr. Parsons has published over 100 peer-reviewed scientific papers and has written a textbook on marine mammal biology & conservation. He's also writer for the popular marine science blog Southern Fried Science (www.southernfried-science.com) and Tweets about marine science, conservation and animal issues on Twitter as @Craken_MacCraic.

Limited resources and increasing environmental concerns have prompted calls to identify critical questions that most need to be answered to advance conservation and prioritize scientific research. Cetaceans are keystone, indicator species, but also high profile, charismatic, flagship species that capture public and media attention as well as political interest and thus a dedicated workshop was held at the conference of the Society for Marine Mammalogy (December 2013, New Zealand) to develop a list of research questions that urgently needed to be addressed, because a cetacean conservation was currently being hindered by a lack of data on, or answers for, these questions. This presentation summarizes 15 themes and component questions prioritized during this workshop. We hope this list will encourage cetacean conservation-orientated research and help agencies and policy makers to prioritize funding and future activities. This will ultimately remove some of the current obstacles to science-based cetacean conservation.

Joy S. Reidenberg *Carrying a Tune: How Whales Sing Underwater*



Joy is a Professor at the Icahn School of Medicine at Mount Sinai, NY. She earned a B.A. from Cornell University (1983), and an M.Phil. and Ph.D. from Mount Sinai's

Graduate Program in Biomedical Sciences (1985 & 1988). Dr. Reidenberg has also held appointments as Guest Investigator at Woods Hole Oceanographic Institution, and Associate Scientist at the National Museum of Natural History (Smithsonian Institution).

Dr. Reidenberg studies comparative anatomy in animals ranging from insects to humans, but her particular fascination is cetaceans. Recent work focuses on adaptations to environmental extremes, including underwater sound production and pressure mitigation during diving. Studying such “natural experiments” helps uncover basic biomechanical relationships that affect all animals, including humans. She hopes to mimic these adaptations to develop protective/preventive technologies or new medical treatments for injuries and diseases. Dr. Reidenberg's work was funded by: Office of Naval Research, Department of Defense, National Oceanic Partnership Program, and National Oceanic and Atmospheric Administration.

Her research and scientific expertise has been featured in many science and educational television documentaries that have aired both nationally and internationally. Dr. Reidenberg is the comparative anatomist for *Inside Nature's Giants* (BAFTA award winning documentary series on anatomy of large animals, including fin and sperm whales). She just completed a new documentary series called *Sex in the Wild* (PBS) and *Born in the Wild* (Channel 4, UK) including an episode on dolphins. Dr. Reidenberg has been featured in interviews in *New York Times - Science Times*, *Nature*, and *O the Oprah Magazine*.

Education is a passion for Dr. Reidenberg. She teaches medical and graduate students, surgeons, allied health and movement professionals. Her energies and creativity have earned many awards, including the highest national prize in her field (Basmajian Award) by the American Association of Anatomists for excellence in teaching and research.

It's a challenge to make sounds underwater, particularly for cetaceans. As they evolved from land mammals, whales carry with them the evolutionary vestiges of a terrestrial mode of communication: pneumatic vibrations. However, air is a precious commodity under water. A fixed quantity of air limits the type and duration of sounds that can be made. Changes in density cause transmission loss between the vibrating sound source and the medium of propagation. Varying depths also affect sound production through changes in air volumes of the respiratory tract. Odontocetes and mysticetes have developed different solutions to these problems. Odontocetes evolved nasal vibration and transmission pathways, while mysticetes evolved laryngeal adaptations. This talk will focus on the mysticete adaptations used to overcome these challenges. These include: tracheal ridges, valve-like cushions in the laryngeal lumen, vocal folds reinforced with cartilage and oriented parallel to airflow, an expandable and compressible laryngeal sac, and flexible throat tissues. Tracheal ridges may reduce flow noise, buttress the walls, and cause directional airflow. Valve-like cushions appear to allow vibration dampening and pressure differentials between isolated chambers. The repositioned vocal folds may enable dual airflow streams, and the cartilages add bulk and strength to the vibrating elements. The laryngeal sac likely allows air recycling, transmission of vibrations (along with the flexible throat pleats), and pressure regulation. These anatomical adaptations allow mysticetes to generate and propagate underwater sounds, while adjusting for pressure changes during diving.

Naomi A. Rose *Beneath the Surface: The Impact of Captivity on the Welfare of Orcas*



Naomi is the marine mammal scientist for the Animal Welfare Institute in Washington, DC. She works on several campaigns and coalitions addressing problems associated with cetacean live capture, trade, and captivity, both in the U.S. and abroad. She 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 30 scientific papers and authored numerous articles for animal protection publications, as well as chapters in several books. She lectures annually at three universities and speaks at and participates 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. Her work was featured in the recent non-fiction book *Death at SeaWorld: Shamu and the Dark Side of Killer Whales in Captivity*, by David Kirby. 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 wild orcas. She has worked in the marine mammal advocacy field for over 20 years.

Orcas are among the most intelligent, socially complex, long-lived, largest and wide-ranging predators in the animal kingdom. These attributes make them singularly unsuited to a life in captivity. After 50 years of public display, the evidence is mounting that their welfare suffers in confinement, whether they are born in captivity or wild-caught. In captivity, orcas' survival is lower; their teeth are damaged; their behavior is aberrant; and they are more aggressive to people and each other. It is time to transition away from having them perform for audiences, calling it "education," and develop more innovative and progressive ways to teach the public about their conservation needs. It is also time to retire the current captives, to sanctuaries where they can live in more natural circumstances and have more choice and control over their lives.

Alisa Schulman-Janiger

*ACS/LA Gray Whale Census and Behavior
Project Point Vicente, CA: 1984-2014*



Alisa has been the director and coordinator of the shore-based ACS/LA Gray Whale Census and Behavior Project since 1984, which is based at Point Vicente and staffed by trained citizen scientist volunteers. She has served on ACS/LA's Board of Directors since 1983. She is an instructor for the Cabrillo Whalewatch program (co-sponsored by ACS/LA), teaching content back-

ground to budding whalewatch naturalists. Alisa has been photo-identifying California killer whales for 31 seasons, archiving their sightings and studying their distribution, natural history, and behavior; this evolved into the California Killer Whale Project. She is the co-author of the 1997 NOAA Technical Memorandum called "Killer Whales of California and Western Mexico: A Catalog of Photo-Identified Individuals", and is working on this catalog's update. She spends several weeks annually in Monterey Bay doing killer whale research. She is an on-board naturalist on boats in southern California and Monterey Bay. She has also worked as on-board naturalist in Baja California and Alaska, naturalist and staff scientist while researching humpback whales in Massachusetts, and field researcher on harbor porpoise, humpback whales, and killer whales with the National Marine Mammal Lab in Alaska. Alisa taught marine biology for 21 years in San Pedro High School's Marine Science Magnet, and on LAUSD's boats for the 10 preceding years. She has a Bachelor's of Science degree in Zoology (emphasizing marine biology), and a life science teaching credential. Alisa has authored and co-authored papers on killer whales, gray whales, and humpback whales, and has presented talks and posters at the following organizations: the Society for Marine Mammalogy, the American Cetacean Society, the Southern California Marine Mammal Workshop, and the International Orca Symposium and Workshop. Her work with killer whales and gray whales has been featured on PBS, National Geographic, and the BBC.

For the past 31 seasons, trained citizen scientist volunteers have conducted the shore-based full-season Gray Whale Census and Behavior Project, sponsored by the Los Angeles Chapter of the American Cetacean Society (ACS/LA), at or near Point Vicente, California. Gray whales and other cetaceans are counted from shore 7 days a week for nearly 6 months, averaging almost 12 hours per day. Southbound counts have ranged from 301-1,301 per season, including 3-106 newborn calves; the percentage of southbound calves sighted (number of calves/total southbound whales) has varied from 0.5%-8.9% of southbound migrants. Northbound counts have ranged from 521-3,412 per season, including 11-260 newborn calves; the percentage of newborn calves sighted (number of calves/total number of northbound whales) has varied from 0.9%-22.9% of northbound migrants. The highest northbound calf count (and percentage) occurred in our 2011-2012 season. The northbound migration of cow/calf pairs generally peaks during the last half of April; this peak typically occurs 4-6 weeks after the earlier migration peak that primarily consisted of whales with no calves. Trends in the past three seasons include an earlier southbound migration with record December counts, higher southbound and northbound counts, and higher northbound calf counts. Other marine mammal species documented include common dolphin, bottlenose dolphin, Pacific white-sided dolphin, Risso's dolphin, killer whale, pilot whale, false killer whale, northern right whale dolphin, sperm whale, Dall's porpoise, beaked whale, fin whale, blue whale, humpback whale, minke whale, California sea lion, Steller sea lion, harbor seals, and California sea otter.

Judy St. Leger *Past, Present and Future of Marine Parks*



Judy is one of a team of 16 veterinarians working for SeaWorld Parks and Entertainment. Judy has been with the company for 15 years and is currently the Vice President in charge of Science and Research. She has advanced training in veterinary pathology and oversees pathology investigations for stranded and collection marine mammals, turtles, fish and birds. Dr. St. Leger is committed to educating the next generation of wildlife professionals. She runs an annual workshop on marine species pathology for the CL Davis Foundation and serves on student graduate committees in the U.S. and abroad. She is a past scientific advisor for the Oiled Wildlife Care Network and is a current scientific advisor for the Morris Animal Foundation. Her efforts have seen her as a co-author on more than 50 peer-reviewed publications dealing with wildlife pathology and conservation. Judy facilitates and oversees research projects related to the SeaWorld collection, data and staff. She is on the board of the SeaWorld-Busch Gardens Conservation Fund and is responsible for assisting in the granting of more than \$1 million annually to help wildlife around the globe.

The first U.S. marine park opened its doors just over 75 years ago. At that time, the American public knew little of the ocean environment. Over those 75 years, a lot has changed – both with the American public and with marine parks. There remain critical roles for display aquariums in today’s society. Rescue and rehabilitation programs run by SeaWorld and similar parks have helped tens of thousands of injured, ill, and orphaned will marine species such as sea lions, seals, sea otters, dolphins, pelicans, ducks, penguins, and many species of sea turtles. Aquariums allow universities to study these species to better understand their biology and physiology. Marine parks give children and families a chance to see and learn about marine species in ways that would otherwise be impractical. With environmental concerns like global warming, ocean acidification, and over fishing, the role of the public aquarium remains essential. As nature deficit disorder and expanding human alienation from the greater world continues, SeaWorld and related parks encourage an interest in animals not seen in our day to day lives. The role of zoos and aquariums is changing with the times. That role has proved important in the past and will be pivotal in the future.

Alison Stimpert

Using High-Resolution Acoustic and Movement Tags to Measure Behavior and Response to Sound in SOCAL-BRS



Alison is a Visiting Scholar in the Vertebrate Ecology Lab at Moss Landing Marine Laboratories in Moss Landing, CA. She uses non-invasive sound and movement tags to study the acoustic behavior of many cetacean species, including several populations of humpback whales around the world, as well as fin whales, blue whales, beaked whales, and Risso's dolphins in Southern California.

The behavior of wild cetaceans can be quite complex and variable. Sound production, diving behavior, foraging, and horizontal movement can change for many reasons, sometimes rapidly and sometimes on different time scales. Within the SOCAL-BRS project, the most central data collection method to quantify cetacean baseline behavior and potential response to sound exposure involves the use of high-resolution acoustic and movement tags. Tags attach via suction cups to animal subjects of controlled exposure experiments (CEEs) using military mid-frequency sonar signals and other sounds. This talk will include a description of the suite of sensors used in these tags (primarily DTAGs), as well as an explanation of analysis methods – how these tags allow us to describe in high-resolution detail the acoustic and movement behavior of animals, their exposure to sound, and to distinguish potential changes in behavior. Results from CEEs to date from beaked whales and blue whales will also be discussed. As observed in other studies with related species, Cuvier's and Baird's beaked whales in our experiments appear to be particularly sensitive to acoustic exposure in some conditions relative to other marine mammals. The responses of more low-frequency oriented blue whales to mid-frequency sonar signals in some conditions is also an important result. However, variability in the probability of response in this species suggests that the behavioral context of exposure may be as or even more important than other conventional metrics of exposure such as received sound level (volume).

Stimpert, A.K., Southall B.L., Calambokidis, J., Goldbogen, J.A., DeRuiter, S.L., Friedlaender, A.S., Hazen, E.L., Schorr, G., Falcone, E.A., Arranz, P., Tyack, P.



Mark Webber Bottlenose Dolphins Return to San Francisco Bay



Marc is the Deputy Refuge Manager of the four million acre Alaska Maritime National Wildlife Refuge for the U.S. Fish and Wildlife Service. The

refuge is home to more than 60% of North America's breeding seabirds, and provides habitat for numerous pinniped species including an endangered population of Steller sea lions, and threatened populations of polar bears, and northern sea otters. He is an Adjunct Instructor in Biology at the Kachemak Bay Campus of the University of Alaska in Homer, and is a member of the Alaska Marine Mammal Stranding Network. He worked extensively with stranded marine mammals at The Marine Mammal Center in Marin County from 1976-1992, studied small cetaceans including harbor porpoises, bottlenose and dusky dolphins, and pinnipeds, including Hawaiian monk seals, Pacific walrus, California sea lions, and Northern fur seals. He has also lead natural history expeditions in Antarctica, the Arctic and Baja California and worked as an observer for the National Marine Fisheries Service on cetacean survey cruises in the Eastern Tropical Pacific. Marc is a co-author of "Marine Mammals of the World: A Comprehensive Guide to their Identification (Academic Press, 2008). In 2010 Marc co-founded Golden Gate Cetacean Research, a non-profit organization, to focus scientific research on the porpoises, dolphins and whales in San Francisco Bay and along the Northern California coast.

Coastal bottlenose dolphins (*Tursiops truncatus*) have not been part of San Francisco Bay's marine fauna in recent history. Their presumed northern range limit of Pt. Conception was surpassed during the 1982-83 El Niño, when they became established in Monterey Bay. They have continued to move north along the coast to SF Bay (37° 49' N), where they now occur regularly, and we have compiled approximately 200 local sightings. Since 2010, our shore-based research efforts in SF Bay and nearby coastal waters resulted in photo-identification of 41 uniquely marked individuals. These dolphins, together with the portion of unmarked individuals observed, comprise about 10% of the estimated California coastal stock. Preliminary comparisons with other photo-ID catalogs show that 93% of these dolphins have been matched to other study areas, including Monterey Bay, Santa Barbara, Santa Monica Bay, Orange County, San Diego, and Ensenada, Mexico. The longest travel distance observed was by "Smootch," a dolphin seen off Ensenada in 2000 and in Bodega Bay, California in 2012. This represents a longshore movement record of approximately 1000 km, confirming previous research suggesting high mobility of the stock. The dolphins are encroaching on harbor porpoise habitat, with lethal results as evidenced by porpoise strandings. Our photographs indicate dolphin aggression results in occasional non-lethal injuries, as well. Other ecological effects of the northward range extension include access to new resources. For example, in SF Bay we witnessed predation on chinook salmon, previously unreported as prey for this stock.

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Thomas I. White

Dolphins, Ethics and the Business of Captivity



Thomas is the Conrad N. Hilton Professor in Business Ethics and Director of the Center for Ethics and Business at Loyola Marymount University in Los Angeles,

California. Professor White received his doctorate in philosophy from Columbia University and taught at Upsala College and Rider University in New Jersey, before moving to California in 1994.

Professor White is the author of six books (Right and Wrong, Discovering Philosophy, Business Ethics, Men and Women at Work, In Defense of Dolphins: The New Moral Frontier and Socrates Comes to Wall Street) and numerous articles on topics ranging from sixteenth-century Renaissance humanism to business ethics and environmental ethics.

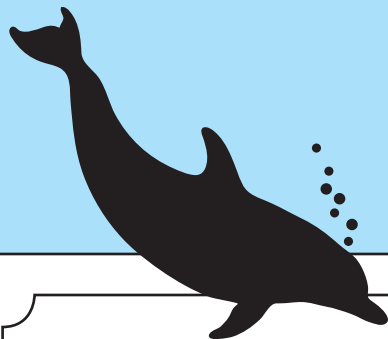
His primary research currently focuses on the philosophical implications - especially the ethical implications - of the scientific research on cetaceans. His book *In Defense of Dolphins: The New Moral Frontier* (Blackwell, 2007) argues that dolphins should be considered “nonhuman persons” and addresses the ethical issues connected with human/dolphin interaction: the deaths and injuries of dolphins in connection with the human fishing industry and the captivity of dolphins in the entertainment industry. He is currently working on a book that extends the analysis of *In Defense of Dolphins* to orcas and the larger whales.

Professor White is a Fellow of the Oxford Centre for Animal Ethics, served as U.S. Ambassador for the United Nations’ Year of the Dolphin program and is one of the authors of the “Declaration of Rights for Cetaceans: Whales and Dolphins.” He is also a Scientific Advisor to the Wild Dolphin Project, the research organization supporting Dr. Denise Herzing’s long-term study of a community of Atlantic spotted dolphins in the Bahamas.

Unlike many ethical issues, the answer to the question, “Is it ethically acceptable to use captive dolphins in entertainment facilities?” lies in empirical facts. In this case, what can scientific research reveal to us about the conditions these cetaceans need in order to thrive and flourish? Accordingly, the basic questions in this debate are: “What conditions do dolphins need in order to achieve maximum, healthy growth and development?” and “Do facilities in the entertainment industry provide these conditions?”

This ethical issue is complicated by the fact that these facilities are businesses and, therefore, have competing obligations. At the same time that these companies have a duty to maximize profit, they also have a responsibility to prevent harm and to promote the welfare of everyone involved—humans and cetaceans alike. These obligations are difficult to manage even in the best conditions. When a business is embroiled in controversy and is operating on a business model that is not viable over the long term, the ethical tensions are dramatically increased. Given the variety of factors in play, such situations typically produce conditions that make it difficult to get the kind of scientific clarity we all would like to see in order to achieve the best solution.

This presentation begins with a short explanation of the empirical basis of ethics and the central role of the concept of “flourishing.” It then explores the conditions that dolphins (as self-aware, intellectually and emotionally sophisticated beings) would need in order to flourish. And it concludes with a brief discussion of some corporate and financial factors that could be blurring the picture.



POSTERS

1. ***Angler Perceptions of Marine Mammal Depredation and Marine Policy in Southern California***, Taylor C. Cook^{1*}, Kira James¹ and Maddalena Bearzi¹
2. ***Characterizing Bottlenose Dolphin (*Tursiops truncatus*) Breath Sounds***, Samantha Emmert^{1,2*}, Julie van der Hoop², Yara Bernaldo de Quiros², Andreas Fahlman³, Randall Wells⁴, Julie Rocho⁵, Micah Brodsky⁶ and Michael Moore²
3. ***Effects of Ocean Recreational Users on Coastal Bottlenose Dolphins (*Tursiops truncatus*) in the Santa Monica Bay, California***, *Amber Fandel¹, Maddalena Bearzi¹ and *Taylor C. Cook¹
4. ***Trends in the Levels of Mercury and Selenium in Sperm Whales in Various Waters***, Luke Fraccaro*, Michael Belanger and Dr. Carin Wittnic
5. ***Estimating the Sequestration and Redistribution of Energy from the San Francisco Bay by a Returning Marine Predator the Harbor Porpoise, *Phocoena phocoena****, Cara Gallagher* and Jonathan Stern
6. ***An Evaluation of Potential Management Options for the Indo-Pacific Bottlenose Dolphin (*Tursiops aduncus*) Population in Kizimkazi, Zanzibar***, Rebecca A. Hamilton^{1*} and Omar A. Amir²
7. ***Expectation, Reactions, Behavior Change? Whale Watch Passengers: Before, During and After the Trip***, *Steven Paine, Cynde McInnis and KC Bloom
8. ***mtDNA Heteroplasmy and the Origins of a New Maternal Lineage in Humpback Whales of Southeastern Alaska***, S Pierszalowski^{1*}, D Steel¹, C Gabriele², J Straley³, J Neilson², J Cedarleaf³, P Vanselow² and CS Baker¹
9. ***Estimation of the Common Dolphin (*Delphinus delphis*) Mortality-at-Age From Strandings of a Threatened Population By Bycatch***, Camilo Saavedra^{1*}, Daniel Howell², Santiago Cerviño¹, Graham J. Pierce^{3,4}, Fiona Read^{3,5} and M. Begoña Santos¹
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14. ***Group Behavioral Response to Food Availability in Southern Resident Killer Whales (*Orcinus orca*) at Lime Kiln State Park***, Michael Weiss^{1*}, Monika Wieland, Cindy Hansen², and Robert Otis³

Angler Perceptions of Marine Mammal Depredation and Marine Policy in Southern California

Taylor C. Cook^{1*}, Kira James¹
and Maddalena Bearzi¹

California sea lions (*Zalophus californianus*) off the coast of Southern California are known to depredate from both commercial and recreational fishing activities. Their increasing population has intensified the potential for conflict between sea lions and anglers, likely requiring changes to current legislation. The recreational fishing community in Southern California is a valuable source for information and potential solutions to fisheries management issues. This study utilized interviews with recreational anglers and commercial passenger fishing vessel (CPFV) crews in Southern California to gather data on: a) the occurrence and impact of sea lion depredation on local fishing, b) whether dolphins affect fishing and how anglers perceive sea lions compared to dolphins, c) angler awareness and opinions on current legislation, and d) the conflict between fishing and conservation efforts. Results show that surveyed CPFV operators and private boaters had the most conflict with sea lions compared to anglers on other platforms. Participating CPFV operators were in support of a culling program for sea lions, unlike recreational anglers. Dolphins were not reported as a major culprit of depredation. Anglers also reported that fish catch is declining, yet were unsatisfied with the effectiveness of current legislation designed to increase fish stocks. These data will provide a better understanding of marine mammal depredation in Southern California and its effect on recreational anglers in order to aid future mitigation efforts. Additionally, these results provide stakeholder feedback on local Marine Protected Areas and other fisheries management legislation, and build a foundation for future conservation and education programs.

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Characterizing Bottlenose Dolphin (*Tursiops truncatus*) Breath Sounds

Samantha Emmert^{1,2*}, Julie van der Hoop², Yara Bernaldo de Quiros², Andreas Fahlman³, Randall Wells⁴, Julie Rocho⁵, Micah Brodsky⁶ and Michael Moore²

Respiratory sounds have been studied to better understand the health and energetics of humans, horses, and other organisms. Bottlenose dolphin breath sounds measured at the blowhole have not been described. We describe breath sounds of bottlenose dolphins in the wild and under human care at different activity levels, recorded with a DTAG, a suction-cup attached acoustic recording tag. Results suggest that dolphin inspirations are longer than expirations, and have greater centroid frequencies. Breath sounds recorded from dolphins laying on the padded deck of a veterinary examination boat had longer duration and lower centroid frequencies than those recorded while the dolphins were swimming or floating. The baseline parameters of breath sounds recorded in this study may be useful to future studies of free-swimming dolphin energetics, as a pneumotachometer was simultaneously used to measure the flow rate and gas composition of the breaths recorded while floating and on the deck of the boat. Additionally, these measured parameters could enhance our understanding of dolphin respiratory health.

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Effects of Ocean Recreational Users on Coastal Bottlenose Dolphins (*Tursiops truncatus*) in the Santa Monica Bay, California

*Amber Fandel¹, Maddalena Bearzi¹ and *Taylor C. Cook¹

Coastal bottlenose dolphins (*Tursiops truncatus*) have been observed in proximity to swimmers, kayakers, stand-up paddle boarders and surfers along near-shore corridors in the Santa Monica Bay, California. From 1997 to 2012, a total of 220 coastal boat-based focal follows of dolphin schools were conducted in this area to determine a) the type and proximity of encounters between ocean recreational users and coastal dolphins, and b) the effects of these encounters on bottlenose dolphins' behavior. The majority of encounters involved dolphins and surfers (77.93%, n= 145 encounters), and overall, neutral reactions were observed in response to these encounters (61.93%, n=176 behavioral responses). Interactions between bottlenose dolphins and recreational users were recorded only once, and changes in dolphin behavior were observed more frequently when recreational users were at distances of less than three meters from a school. Although the current impact of human activities on coastal bottlenose dolphins' behavior does not appear to be significant in the Santa Monica Bay, there is a need to: 1) adopt a precautionary approach in view of the increasing presence of ocean recreational users along this coastline, and 2) regularly monitor these encounters to determine potential changes in the type and proximity of encounters, as well as changes in dolphin behavioral responses.

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Trends in the Levels of Mercury and Selenium in Sperm Whales in Various Waters

Luke Fraccaro*, Michael Belanger and Dr. Carin Wittnic

The contaminant mercury is of particular environmental concern due to its toxicity, ability to bio-accumulate in various tissues, and bio-magnification within marine food chains. Selenium can detoxify organic mercury but alone can also have toxic effects. The sperm whale is high trophic predator and are highly migratory with an extensive range. A literature review comparing maximum levels ($\mu\text{g/g}$ dry weight (dw)) found in this species from either European or North American waters revealed significant geographic variability even across differing time periods. For example between 1995-1997, mercury levels reported for sperm whales in the Mediterranean Sea were higher than those found in the southern North Sea by as much as $217 \mu\text{g/g}$ dw in liver, $36 \mu\text{g/g}$ dw in kidney and $23 \mu\text{g/g}$ dw in muscle. Selenium levels were also higher by $86 \mu\text{g/g}$ dw in liver, $10 \mu\text{g/g}$ dw in kidney and $14 \mu\text{g/g}$ dw in muscle. This resulted in mercury/selenium ratios ranging from 2-4 showing that selenium is not neutralizing the mercury sperm whales are exposed to in either area. Then studies conducted 10 years later, showed sperm whales from the Mediterranean Sea also had four times higher skin mercury and two and a half times higher selenium levels than those from the mid-Atlantic, confirming sperm whales from that region continue to have a geographic organ specific risk from mercury and selenium contamination.

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*Estimating the Sequestration and Redistribution of Energy from the San Francisco Bay by a Returning Marine Predator the Harbor Porpoise, *Phocoena phocoena**

Cara Gallagher* and Jonathan Stern

Harbor porpoise (*Phocoena phocoena*) were known to frequent San Francisco Bay (SFB) historically, but WWII activities in the 1940s pushed them back into the coastal waters outside of the Golden Gate. *Phocoena* remained absent from SFB for over 65 years, until 2008, when the porpoises made a comeback. They are currently entering the bay on a daily basis and in increasing numbers. Golden Gate Cetacean Research (GGCR) has monitored the reintroduction of harbor porpoise into SFB and, using photo identification, the population has been estimated at around 600 individuals. Since these animals are still spending the majority of their lives outside of the bay, and are more likely to defecate and expire in coastal waters, the majority of the energy obtained within the bay is lost to the coast. I am currently constructing a bioenergetic model in attempts to quantify *Phocoena* sequestration and redistribution of material and energy in the context of production of SFB. Using a range of swimming speeds gathered from land-based theodolite tracks of harbor porpoise, I am attempting to estimate energy and biomass requirements. In addition to the model, samples of harbor porpoise blubber, resident and coastal anchovies (*Engraulis mordax*), and bay and coastal plankton will be obtained in order to produce fatty acid signatures. These will then be compared in order to attempt to establish the ratio of bay to coastal harbor porpoise diet. This ratio will then be used in conjunction with the energetic requirements in order to estimate the biomass removed from SFB by harbor porpoise. This will provide information on the top-down effects on SFB, information that is missing from the complete picture of energy flow and nutrient cycling in San Francisco Bay.

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*An Evaluation of Potential Management Options for the Indo-Pacific Bottlenose Dolphin (*Tursiops aduncus*) Population in Kizimkazi, Zanzibar*

Rebecca A. Hamilton^{1*} and Omar A. Amir²

To evaluate suggested management options for the local Indo-Pacific bottlenose dolphin population of Kizimkazi, Zanzibar, a short-term study was conducted that coupled ecological field observations during dolphin-tourist interactions with interviews of local stakeholders. To understand the impacts of swim-with tours on habitat usage of the dolphins, GPS data on movement and distribution were collected. From tourist boats, observations were also made regarding captain adherence to tourism interaction guidelines. Locals representing the dolphin tour boat captains, tour companies, and government branches were interviewed in order to determine the issues of the industry, the roles of government departments and NGOs, and potential improvements. It was discovered that dolphin distribution, as well as group size and behavior, have changed in comparison with the most recent previous population and distribution study (Stensland et al., 2006), possibly due to enduring dolphin tourism. From both observations and interview responses, it was noticed that violation of the interaction guidelines is commonly practiced because boat captains lack knowledge of these rules, even after attending multiple training seminars. Despite this, government departments have had no direct involvement in conserving the population. Of all management options analyzed, those considered most suitable include: government cooperation with locals to lower dolphin bycatch, setting a minimum cost per tour, and enforcing updated interaction guidelines. These proposals are expected to be most successful in addressing the complex of ecological, political, and social factors involved. Any options pursued, however, should focus on full communication and cooperation with locals for long-term success.

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***Expectation, Reactions, Behavior Change?
Whale Watch Passengers:
Before, During and After the Trip***

*Steven Paine, Cynde McInnis and KC Bloom

When people go whale watching, they often have a reaction—emotional, intellectual, behavioral, spiritual. As naturalists, we hope that sometimes they are inspired to change a behavior to help protect the whales and the oceans. Very little follow-up data has been done with whale watch passengers. A survey conducted in 2013 and 2014 aboard Cape Ann Whale Watch in Gloucester, MA has tried to define some of these expectations and responses that people have. Over 300 passengers filled out a survey before boarding the boat, right before arriving back to the dock, and 4-6 weeks after their whale watch. Whale behavior and naturalist discussions were also noted to try to see how that might influence the passengers' responses. Demographic information, previous whale watch experience, and motivation for coming were collected. Environmentally friendly behaviors were asked about before, after (asking intent) and at the follow up with interesting results. Informational questions were asked to see how much learning and retention was occurring. We look forward to continuing the survey over time to collect more data, but these are our preliminary results.

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KC Bloom (Salem State University)

***mtDNA Heteroplasmy and the Origins of a
New Maternal Lineage in Humpback Whales
of Southeastern Alaska***

S Pierszalowski^{1*}, D Steel¹, C Gabriele², J Straley³,
J Neilson², J Cedarleaf³, P Vanselow² and CS Baker¹

Here we report on a newly arising mitochondrial (mt) DNA haplotype in the North Pacific humpback whale (*Megaptera novaeangliae*) and the number of individuals with heteroplasmy for the parental and derived mt genome. We discovered two individuals (mother #1812 and her calf, born in 2010) with a previously unreported haplotype (referred to as A8) while assembling a large collaborative database of DNA profiles (mtDNA control region, microsatellite genotypes and sex) and photo-identification records for individually identified whales from southeastern Alaska (SEAK). The A8 haplotype differs by one base pair from a common haplotype referred to as A-. To investigate the origins of the A8 haplotype, we reviewed $n = 1089$ electropherograms of $n = 710$ individuals with A- haplotypes from both the SEAK database and the ocean-wide program, SPLASH. From this review, we found 20 individuals with clear evidence of heteroplasmy for A-/A8 haplotypes. Of these, $n = 15$ were sampled in SEAK, $n = 4$ were sampled on the Hawaiian breeding ground (the primary migratory destination for whales from SEAK) and $n = 1$ was sampled in the Northern Gulf of Alaska. We used genotype exclusion and likelihood to identify one of the heteroplasmic females, #196, as the likely mother of the A8 cow and grandmother of the A8 calf, establishing the inheritance and germ line fixation of the new haplotype from the parental heteroplasmy. We provide evidence that the 20 A-/A8 and 2 A8 individuals likely represent descendants from a recent, common maternal ancestor, based on estimates of pairwise relatedness from microsatellite genotypes. The mutation leading to the A-/A8 heteroplasmy and the fixation of the A8 haplotype represent an increase in mtDNA diversity for the North Pacific humpback whale from 28 to 29 haplotypes and provides an opportunity to document the population dynamics and regional fidelity of a newly arising maternal lineage.

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Estimation of the Common Dolphin (*Delphinus delphis*) Mortality-at-Age From Strandings of a Threatened Population By Bycatch

Camilo Saavedra^{1*}, Daniel Howell²,
Santiago Cerviño¹, Graham J. Pierce^{3,4},
Fiona Read^{3,5} and M. Begoña Santos¹

The short-beaked common dolphin (*Delphinus delphis*) is the most abundant small cetacean in the north eastern Atlantic and in some regions of its range, bycatch mortality is considered to be unsustainable. To help inform conservation measures and allow the quantification of the impact of bycatch, population models are needed to explore how the population will react under different scenarios. In order to build a population model for common dolphins, mortality-at-age curves derived from stranding data were constructed, using a Siler model fitted to the total observed dataset. Due to the paucity of data for the youngest age classes, a separate model was fit to a subset of the data that did not include the youngest age classes. Finally, a Heligman-Pollard model was fitted to the second subset of data as well, taking into account the proportion of by-caught dolphins in the sample. The survivorship curves for the Siler models reported that a median of 30% [28-39%] of the females achieve maturity when we used the total observed data set but only the 18% [17-22%] if we remove the youngest ages. The Heligman-Pollard model showed a more realistic shape since by-catch mortality was taken into account. For both model results, the removal of the first age classes could bias downwards the total mortality estimate. Our results show an effective growth of 0.912 which indicate a population decline, likely the result of unsustainable by-catch rates.

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Diel Cycles in Los Cabos Acoustic Environments: Are Humpback Whales and Boats on Different Schedules?

Kerri D. Seger* and Aaron M. Thode

Humpback whale song is a widely known acoustic behavior in the marine ecosystem (Payne & McVay, 1971). Its biological function is still debated, but one postulation is that male humpback whale song serves in nighttime aural territory defense or mating advertisement when visual cues are not possible (Au et al., 2000). Song occurs on a diel cycle in at least three breeding grounds (the West Indies, Australia, and Hawai'i) whereby peak sound levels occur near midnight and troughs occur soon after sunrise (Au et al., 2000; McCauley et al., 1996). This poster presents evidence that a similar diel cycle exists in a fourth feeding ground: Los Cabos, Mexico. It was here that during the 2013 and 2014 humpback whale breeding seasons, bottom-mounted recorders collected acoustic data for eight weeks at three sites. As theorized, preliminary analysis of ambient noise between 100-1000 Hz was dominated by humpback whale song. Depending upon the recording site and year, the amount of acoustic energy that song introduced to the overall soundscape fluctuated between 7 to 16 dB re 1 uPa when sampled in one-hour increments. This presentation will first parameterize the diel cycle off Los Cabos and compare it to other breeding grounds. Second, it will compare diel cycles in humpback whale song across sites with differing levels of tourism-driven boat traffic. Understanding whether anthropogenic noise shifts the humpback whale song diel cycle is especially pertinent to the Los Cabos area because it is within the boundaries of a proposed marine sanctuary.

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***The Solution to Pollution is Dilution?:
A Case Study on Pollutants and their
Geographic Patterns***

*Melanie Smith

Sperm whales (*Physeter macrocephalus*) are considered sentinels of ocean health and given their distribution, allow for sampling across many regions of the globe. This review was conducted to determine whether oceanic inorganic pollutant concentrations have geographic patterns, which would allow for targeted mitigation efforts. Leveraging the abundance of research conducted on the data compiled during the voyage of the Odyssey, concentrations of lead, mercury, chromium, and nanoparticles found in sperm whale skin biopsies were compared on a geographic basis. Sperm whales in the Mediterranean Sea and waters around Australia contained the highest regional mean concentrations of mercury with statistically significant differences between all sampled regions ($P < 0.0001$). The Pacific and Atlantic Oceans contained the highest mean concentrations of lead, with the highest levels around Papua New Guinea, Australia, and the Sea of Cortez, with statistically significant variation among regions of the globe ($P < 0.0001$). Regions sampled near the Islands of Kiribati and the Seychelles contained the highest levels of chromium, with statistically significant differences in chromium levels by region ($P < 0.0001$). Regions sampled in the waters near the Seychelles, Sri Lanka, the Maldives, the Galapagos Islands, the Islands of Kiribati, Papua New Guinea, and Mauritius contained the highest levels of nanoparticles, with statistically significant variation among regions of the globe ($P < 0.0001$). These findings suggest oceanic currents and industrial hotspots appear to play a dominant role in the location of increased inorganic pollutant concentrations, indicating localized mitigation efforts would have significant impacts to cetacean, ocean, and human health.

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***Selective Attention by Beluga Whales
to Mirror Image Video***

Laura Stevens* and Michael Noonan

There is increasing evidence that many species of animal show selective attention to conspecifics that mirror their own movements. That is, both human and many non-human animals are more attracted to members of their own species whose movements and body postures match their own. The present study investigated this phenomenon in captive beluga whales (*Delphinapterus leucas*) at Marineland of Canada (Niagara Falls, Ontario). Utilizing a live-action-video paradigm, life-sized moving images were projected on a screen outside a rectangular viewing window, such that the whales could look through the window at the equivalent of a mirror image of themselves. On other days, as control conditions, the whales were presented either with anti-mirror moving projections, or replay of the same whales' movements previously recorded on other days. The amount of time the whales spent at the viewing window, apparently looking at the projected images, was the dependent variable. The findings suggest that the whales were in fact interested in, and attentive to, the moving images of themselves. The results are discussed in the context of other mirror-image studies in cetaceans, and with respect to the possible role that motion matching mimicry can play in promoting social cohesion in this species.

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Analysis of the Artisanal Fisheries' Fishing Effort Dynamics in San Felipe as a Bycatch Modeling Tool for the Vaquita (*Phocoena sinus*)

*María Fernanda Urrutia-Osorio¹ and Armando Jaramillo-Legorreta²

The vaquita is the most critically endangered cetacean species in the world; it is a small porpoise endemic to the northern Gulf of California, Mexico. As fishing effort increased greatly, over half of the species population was lost in 11 years. Gillnets for shrimp cause very high rates of by catch, thus incidental mortality is the principal threat for vaquita survival. We estimated the current fishing effort in the Upper Gulf of California in order to estimate vaquita by catch mortality. Fishing activities carried out by artisanal fishermen in the Port of San Felipe were monitored from September 15th to December 14th of 2013 and from October 17th to the 21th in El Golfo de Santa Clara. Information on the number of pangas fishing was collected daily. Since every boat gets out and back once per day, we consider the number of trips as our measure of fishing effort. A total of 5,505 trips were observed during the sample period. Using Bayesian analysis, we estimated the fishing effort for the days that were not monitored to cover the entire shrimp season. A total of 50,692 trips were estimated using the Markov Chain Monte Carlo. We estimated the mortality rate per trip using the fishing effort estimation and available demographic information of the vaquita population. The mortality rate of the vaquita resulted in 3.15×10^{-6} trips⁻¹. By 2014, the estimate of current vaquita abundance is 97 individuals; with the amount of fishing trips estimated per day, we estimated 24 vaquitas caught on artisanal nets for the 2013-2014 period. With this amount of fishing effort and lack of enforcement, unless drastic action is taken, the vaquita will be lost.

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Group Behavioral Response to Food Availability in Southern Resident Killer Whales (*Orcinus orca*) at Lime Kiln State Park

Michael Weiss^{1*}, Monika Wieland, Cindy Hansen², and Robert Otis³

The Southern Resident community of killer whales (*Orcinus orca*) in the Salish Sea of Washington and British Columbia is the only population of killer whales currently listed as endangered under the ESA. In the summer months, these whales feed almost exclusively on Chinook, or king, salmon. As killer whales are highly social animals, it is important to understand how changing salmon levels affect their group behavior. Using the Chinook catch per unit effort (CPUE) at the Albion test fishery in the Fraser River to estimate daily Chinook abundance in the area, we analyzed the whales' behavior at Lime Kiln State Park on San Juan Island from 1994 to 2013 in comparison to Chinook numbers in the area. It was determined that when the Albion catch was below the mean of 1.43 CPUE, the killer whales at Lime Kiln were significantly more spread out ($p < 0.001$), were in smaller groups ($p < 0.001$), and exhibited surface percussive activities less frequently both on an individual ($p = 0.02$) and group basis ($p < 0.001$). Our findings suggest that Southern Residents in the Salish Sea respond to food scarcity by traveling in smaller, more spread out groups, and by reducing their surface activity. This may provide a starting point to understanding how Chinook abundance influences Southern Resident social behavior, which is key to planning for the population's recovery.

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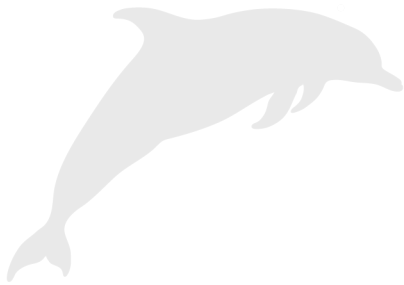
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In March of 2016, longtime pioneer of Antarctic expeditions Cheesemans' Ecology Safaris will collaborate with the American Cetacean Society to offer an in-depth exploration of the marine mammals of the Antarctic Peninsula. Expedition leader Ted Cheeseman and whale biologist Ari Friedlander together conceived this expedition as an exciting opportunity to share science, education and exploration of one of the most whale rich stretches of water in the world, at peak whale watching season.

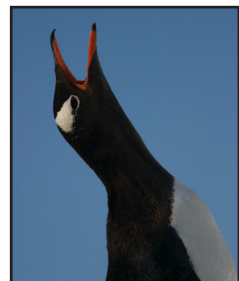


At the feet of the stunning mountains of the Antarctic Peninsula, krill congregate in uncountable numbers, drawing great congregations of whales into seasonal feeding binges on a scale found few other places on the planet.

Together we will help conduct data for long-term ecological research projects including photo-ID of individual whales that will be linked to breeding populations around the world, and focal follows of individual whales to link behavior to environmental conditions. The team will also be collecting acoustic data on social sounds produced by humpback, minke, and killer whales to share with passengers. Attempts will be made to deploy video-recording multi-sensor suction cup tags to whales throughout the trip so that we can see below the surface and understand how these giant animals view and take advantage of their unique environment



This expedition provides opportunities to travel alongside marine biologists including ACS scientists, to whale watch from ship and from zodiacs, to learn photographic techniques from professional photographers, and to land at wildlife rich and historically significant sites on the Antarctic continent and outlying islands.





Ted and Ari designed the itinerary to maximize marine mammal encounters, diverging from the norm of Antarctic cruises in keeping with the Cheesemans' Ecology philosophy of offering the most in-depth expeditions possible.



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A portion of the proceeds benefits the American Cetacean Society.

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All photos by Doug and Ted Cheeseman





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The American Cetacean Society would like to give our heartfelt THANKS to Tony Bernot and the Multimedia Communications Department at Kaiser Permanente for, once again, providing outstanding audio/visual equipment and services for our conference. This very generous donation has made it possible for us to have a quality media experience.

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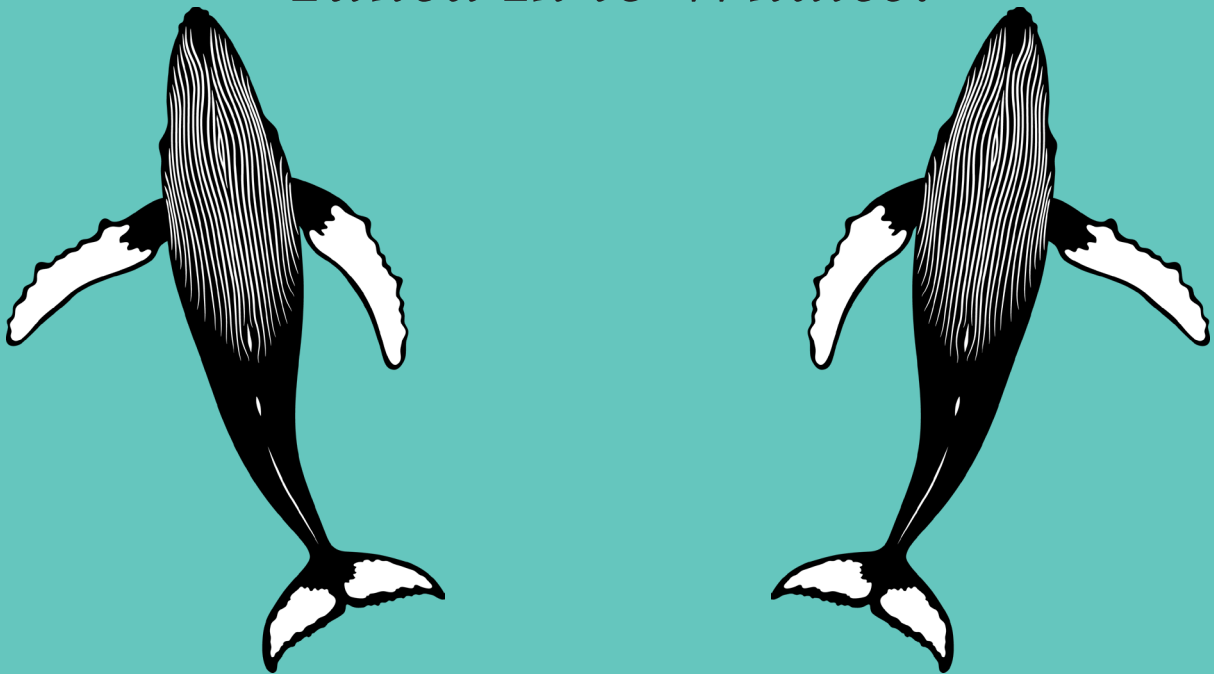




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