

SUMMARY REPORT

SOUTHERN CALIFORNIA MARINE MAMMAL WORKSHOP

JANUARY 27 – JANUARY 28, 2017

· NEWPORT BEACH, CA ·



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**PACIFIC LIFE
FOUNDATION**

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Executive Summary

The Pacific Life Foundation, headquartered in Newport Beach, CA, hosted the seventh annual Southern California Marine Mammal Workshop (SCMMW) on January 27, 2017 through January 28, 2017. The workshop is organized by and for professionals in marine mammal science with the end goal that discussion, collaboration and action is occurring in the southern California research community.

The themes of the SCMMW sessions are developed based upon evaluations from the previous year, current trends in marine mammalogy, and with guidance from the Advisory Committee. In 2017 the themes of the sessions were: 1) New Technologies for Marine Mammal Research; 2) Marine Mammal Veterinary Medicine: Current Issues, Ideas, and Research; 3) Conservation Issues in Marine Mammal Science; and 4) Social Media and Communications Hot Topics. All participants in the workshop were strongly encouraged to present posters at the two-hour evening poster session. John Calambokidis gave the lunch keynote addresses sharing his personal story and history within marine mammal science. This report is a general summary of the history of the SCMMW and gives an overview of the 2017 workshop. This report, the workshop program, poster abstracts, and archived summaries of previous workshops can be found at <http://socialmarinemammals.org>

SCMMW General Overview

Traditionally, the marine mammal science community is not given many opportunities to gather as a group and share their knowledge. The Society for Marine Mammalogy has an international meeting every two years; however, as this is an international meeting, the cost and distance is a barrier for many U.S.-based scientists as well as the conference size of thousands of attendees. The need for a regional workshop for marine mammal scientists, purposely kept smaller in numbers, became evident and the Pacific Life Foundation created the platform and continuing support to form the SCMMW.

Pacific Life truly believes in collaboration and upon collaborating new insights can be gained. All attendees are urged to present a poster or are selected as a session speaker, and are encouraged to form partnerships to further their research and outreach. The workshop continues to grow each year, proving the need for the workshop and the vital resource it supplies for the region's scientists. The SCMMW website is a key secondary resource where the "Archive" section features previous year's session themes, summary reports, poster abstract descriptions, and more. In 2014, we added a "Resources" section to the website where links to mentioned publications are posted along with tools from the communications panel members.

2017 Workshop Advisory Group

Each year the Advisory Group shifts in active members due to the content of the workshop. As sessions are newly formed each year, members are chosen to organize and lead each session. We want to thank these Advisory Group members for their hard work preparing the 2017 workshop:

John Calambokidis – Cascadia Research Collective
Sarah Wilson Finstuen – SCMMW Coordinator
Frances Gulland – Marine Mammal Center and U.S. Marine Mammal Commission
Tennyson Oyler – Pacific Life Foundation
John Hildebrand – Scripps Institution of Oceanography
Claire Simeone – The Marine Mammal Center
Dave Weller – Southwest Fisheries Science Center, NMFS, NOAA

New Technologies for Marine Mammal Research

Panel: John Hildebrand (Lead), Scripps Institution of Oceanography
Iain Kerr, Ocean Alliance
Shaili Johri, University of Washington
Ted Cranford, San Diego State University

Objectives

The objectives of the New Technologies for Marine Mammal Research panel are to describe groundbreaking cetacean research. These techniques will include the use of drones, scat sample collection to investigate biome content, and the use of hydrophone arrays. John Hildebrand opens with describing rapidly changing technologies' contribution to the marine science community and the importance of collaboration to maximize data outreach.

Presentations

Iain Kerr describes the work that he started in 1990, in the early days he used a parasail and a helium balloon to get a bird's eye view of whales. He collected over 1,000 biopsies using the whale boom aboard the sailing research vessel *Odyssey* and the greatest success was found by approaching alongside the whale, as opposed to from behind the whale. This impressed on him the importance of discovering an easier way to collect data. His drone, the Snotbot, enabled the next technological improvement. The original gasoline powered helicopter was unwieldy and tainted samples and the battery powered quad-copter enabled simplified and user friendly data collection. Snotshot was an automated blow replicating device he created to

accomplish sea trials of the drone setup. He also found that drone noise cannot be heard underwater, as opposed to boats. His strategy is to come in 12 feet above and 5 feet behind the whales blowhole just before a blow to collect a sample that includes hormone levels and whale DNA. He has found that individual whales within a species have different blowhole shapes and blow sound and this data has the potential to be used in individual identification. He prefers this method of data collection over biopsies for the ability to, with less stress on the animal, repeat the experiment. The next incarnations of this technology include Earbot a waterproof drone, and an infrared camera on the existing Snotbot to do night-time analysis. He is actively collaborating by collecting data and sending it to marine science and educational organizations for compilation. His latest Snotbot is flown by “first person point of view” (POV) and is a purpose-built drone that is small enough to fit into a pants’ pocket. This year in Cape Cod, he will be working with whale disentanglement teams using a drone. In the future, he hopes to create a Sniffbot to sample the air. The potentials are vast, from marine protected area (MPA) monitoring to data collection, all for about \$2000 per drone. Children are fascinated with the topic and the news, social media, and publishers have also taken interest. Out of 258 flights they have only seen seven whale reactions, making this technology less invasive for the whales versus biopsy sampling methods.

Shaili Johri’s discussion focused on non-invasive tactics for monitoring health in wildlife populations. She is interested in ecological effects of pollutants, human interaction, and causation. With strong data, she believes that it will become easier to uphold environmental regulations and prosecute law-breakers. Being non-invasive, scat samples are her preferred data source as they can be used on fragile or endangered species. Samples can determine: health, hormones, toxicity, physiology, and microbiome. The first study she participated in was with the reintroduction of wolves in Northeast Washington state. She found that human interaction due to livestock predation was their largest concern and in her second project she monitored several predatory species over a large area. She used scat identifying canines to investigate carnivore scat samples for five weeks during each season. They covered 3,700km²; collecting 4,000 samples in one year and isolated the DNA to determine the DNA melting temperature, enabling them to identify individual species consumed. They found that coyote is the most abundant species, followed by bobcat in Eastern Washington. These species may be filling the niche that wolves once occupied. She also collected GPS coordinates of scat locations to assemble a picture of wolf and predator interaction. Moving to a new and related topic, she discussed the importance of studying a wide variety of internal biomes to achieve a health assessment immune response. Along these lines howler monkeys in a pristine environment were assessed

in comparison to monkeys in a fragmented or captive environment. She found that the body produces hydrogen sulfide and the gut biome was reduced in fragmented and captive individuals. What Shaili is hoping to uncover are three things; (i) a dietary alteration causing a change in the biome; (ii) can biomes reflect human changes in an environment; (iii) and can scat samples be used to determine individual age? The Shannon–Wiener diversity index is used to calculate the diversity within the biome of a species. This work has translated into her study involving killer whales. They are well known for having lipid toxicity due to bioaccumulation of POP's. She had found a correlation with high chinook salmon abundance and elevated POPs (including PCBs). She also observed a trend in low chinook population with increased calf mortality. Her current hypothesis is that increased POPs are having a negative effect on the killer whale gut biome. They will collect scat samples from orcas using the same methods and trained "Conservation Canines", described in her previous Northeastern Washington study. She feels the impact monitoring needs moving forward are; (i) environmental pollution effect on ecosystems; (ii) increased habitat disturbance; (iii) human–wildlife conflicts; (iv) mechanistic studies for strong regulatory policy; and (v) implications for human and marine health.

Ted Cranford began his research in anatomy and this gave him insight into the head anatomy of odontocetes and mysticetes. Through stranded whale necropsies he discovered that the internal geometry played an important role in acoustics. Hitting a scalability block with the use of standard medical imaging technology to scan large species, he sought permission to scan a sperm whale head with a CAT scanner used for imaging solid fuel rockets at Hill Air Force. Cranford and his colleague, Petr Krysl (UCSD Engineering), teamed up to produced the first accurate maps of anatomic geometry for multiple large whale heads. Since then they have devised techniques to build simulation models based on CT scans that allows them to see how sounds interact with the whale's anatomic geometry. The technique was adapted from models used to investigate the resonant frequencies of bridges and large scale public works projects. He stresses the importance of validating a model and the validation for his research was completed using a live bottlenose dolphin who was trained to create specific vocalizations on demand. They used their model to simulate conditions that could not be used on wild or trained animals. For example, they simulated precise exposure of a Cuvier's beaked whale head to 53–C Navy sonar signals. They found that the Cuvier's beaked whale head could block out much of this signal. In addition, they also found that the anatomic geometry of the beaked whale head could amplify its own sounds and filtering out others, enabling the animal to better hear its own echolocation signal. They also discovered that sounds travels under the lower jaw rather than through it, as previously thought. His current hypothesis is

that the heads of cetaceans are acoustic antennas where sounds enter cetacean heads through multiple channels. The tympanoperiotic complex (TPC) is suspended from the whale's skull and may be one key to low frequency hearing. By conducting vibrational analysis of the TPC, they have uncovered vibratory patterns that vary over its structure. At low frequencies, the TPC shows very little vibration, which is drastically different from the high frequency simulations. It is difficult to create regulations on ocean noise if we do not know how whales hear. Consequently, Cranford and Krysl began focusing on creating models for baleen whales. They scanned an entire minke whale and found that the ears are embedded firmly into the skull, so that skull deformations due to interactions with low frequency sounds are transmitted to the ears. This tells us that the whole skull is involved in the hearing process. By determining the velocity of the stapes, the input to the ear can be closely approximated. Using the results of the model, Cranford and Krysl can create audiograms and visualize the motions associated with various sound sources and directions. They propose that these same techniques can be used to understand the hearing apparatus for other species of mysticetes. Their modeling and simulation results are the first solid evidence for low frequency sensitivity levels in baleen whales.

Passive acoustic monitoring technology is critical to our understanding of marine mammals and is frequently improving. **John Hildebrand** is using multi-sensor acoustical tracking by comparing signals between the sensors to learn where they are in space to each other (timed difference). There are many behavioral aspects for sound production in baleen whales such as contact calls, complex calls (warranting future research), and males creating songs. Male fin whales produce 20 Hz calls, and both sexes may be responsible for producing 40 Hz contact calls. His team have a hydrophone array located near San Clemente Island and data collected from this array provide insight on trajectory, frequency, duration, pattern, and type of call. In collaboration with SWFSC and Dave Weller, gray whale migrations were tracked via video monitoring by a set of cameras at Granite Canyon on San Clemente Island. The visual data can be used to corroborate the hydrophone data illustrating that pulse and moan calls are the main vocalizations produced in the migratory path. The data also shows gray whales are moving in a straight line along the coast and that they maintain the same activity whether it is day or night. In odontocetes a variety of sounds such as clicks, whistles, and burst pulse vocalizations are observed. The "Large Aperture Whistle Array" is used to collect time synchronized and localized vocalizations. The research vessel FLIP is also used to collect simultaneous acoustic and 25m above water visual data. Results have shown that throughout the day common dolphins make

varied sounds: mostly whistles during the day, clicks and whistles early evening, and mostly clicks to navigate obstacles at night. When assembled, the data has enabled John to create visualizations of feeding strategies and night-time behavior.

Discussion

John Hildebrand is pleased with how the vocalization data takes very little analysis time. He expressed that there are changes in blue whale vocalizations over the last 50 years of data collection worldwide. He suspects that it could do with their recovery from whaling. Curiously, the decreased pitch in vocalizations better matches that of background noise. A question directed at Iain queries if the drone must be sterilized after every use and he shared that currently hydrogen peroxide and fresh water is used. Iain describes the importance and challenges of analyzing stress hormones in cetaceans and with three completed expeditions, protocols are still being developed. For example, hormones are sticky and do not release well from plastic petri dishes, he proposed that separate dedicated petri dishes may be used in the future to collect samples.

Marine Mammal Veterinary Medicine: Current Issues, Ideas, and Research

Panel: Jody Westberg, Sea World

Claire Simeone (Lead), The Marine Mammal Center

Lorraine Barbosa, California Wildlife Center

Tenaya Norris, The Marine Mammal Center

Fernando R. Elorriaga-Verplancken, Centro Interdisciplinario de Ciencias Marinas from Instituto Politécnico Nacional (CICIMAR-IPN)

Objectives

This panel discussed issues facing California sea lions and Guadalupe fur seals. Research focused on stranding data are investigated for both species while domoic acid toxicity events continue to plague the California sea lion population. Both species are experiencing an “Unusual Mortality Event” (UME) that has been occurring since 2013. The treatment techniques have expanded and improved for the California sea lion and with the continued collaboration of data and research, we can ensure that these species will benefit from an abundance of documentation and collaboration.

Presentations

Jody Westburg described how the San Diego area is highly populated, providing Sea World with frequent calls regarding seal and sea lion human interaction however, Sea World only responds to live animal stranding in the hope of rehabilitating them

while SWFSC responds to mortalities of pinnipeds and cetaceans. There has been an increase in rescues over the last 10 years and the last three years over 2,000 animals have been rescued in 77 miles of coastline. The observed Unusual Mortality Event (UME) is continuing from 2013 and from 2006–2016 and the weights of intake animals were lower on average from previous years. For pups, weights are a big factor in survival rates, at 12 or less kilos in weight the survival rate is low and on average the weight of rescued pups is 17–18 kilos. The Refugio oil spill in Santa Barbara contained the largest number of impacted pinnipeds on record, over 1,000 animals. For injured animals honey is used and acts as a traditional antibacterial to treat wounds and infections and healing times are reduced by a quarter to half the time. Honey is an excellent treatment option as it costs less than antibiotics and reduces concern over drug resistance. Stranding myopathy is a common concern with cetacean strandings and an adapted life jacket is used to keep the animal stress free, floating upright, and enables physical therapy to commence. Antibiotics are delivered to animals via nebulization in a tent type structure. Stem cell and Platelet Rich Plasma treatment has been found effective in pinniped eye injuries such as corneal edema.

Lorraine Barbosa is a staff veterinarian at the California Wildlife Center where they focus on 27 miles of coastline in Malibu, CA. At the center, a response is counted and consists of any time a volunteer or staff member was dispatched to an animal regardless of if it was brought in for treatment. There have been a higher number of strandings in the last few years, over what is historically normal. This created the need for rehabilitation over what was called a “rescue” in the past. Due to the extreme microclimate of the Santa Monica mountain range, they have made facility improvements including rubber mats, shade structures and in-pen heating. In 2013, there were twice the number of average strandings and in March, three times the average. In 2015, they had four times the average in January and five times in February. In conjunction with other veterinary scientists, Dr. Barbosa wrote a paper on the “Echocardiographic findings in domoic acid exposed California sea lions” and noted that domoic acid is water soluble and the best treatment available is to flush the toxicity from the body. The only available diagnostic method is post-mortem histopathology and necropsy of the hippocampus and heart. Another emerging tool is an echocardiogram performed on sedated sea lions to view ventricular performance and septal wall motion. So far 69 sea lions with suspected domoic acid toxicity have been examined using an echocardiogram along with five captive control animals. Of the 69, 30 individuals died or were euthanized, of those 21 individuals tested positive for domoic acid, 13 of which had lesions in both the brain and heart, and three tested negative for domoic acid. Using this research, they found that they could view the

differences between a damaged and healthy heart. This process is still in use at the California Wildlife Center to determine sea lion's possible success for rehabilitation.

Claire Simone is the conservation medicine veterinarian at The Marine Mammal Center. They oversee 900 km of coastline and have been realizing the same disturbing trend in strandings as the prior speakers noted. They could not narrow down the yearling stranding to one specific cause, there was a disproportionate amount of lungworm burdens in yearlings, gastric ulceration, and corneal ulcers in all ages. Due to the nature of sea lion eye anatomy they are prone to eye lacerations, abrasions, and infection. Poloxamer gel has been used as a delivery method for antibiotics. 22 sea lions were examined and dosed with gel and enrofloxacin while anesthetized. Seven control animals were dosed with oral doxycycline. 19 of the 29 animals died or were euthanized for unrelated reasons; their extent of healing was documented. All the surviving sea lions' superficial eye ulcers healed completely and five out of 16 animals with complicated eye ulcers healed completely as well. This treatment is showing great potential for rehabilitation, intractable patients, severe pain, and oil spill cases.

Tenaya Norris explained how Guadalupe fur seals share similar behavioral and survival patterns to other pinnipeds, with their main breeding site at Guadalupe Island, Mexico. A population estimated at 200,000 existed before they were nearly brought to extinction by hunting and now there are an estimated 20,000 individuals. Upsettingly, the IUCN changed their status in 2015 from "near threatened" to "least concern". Their historical range is known to extend as far north as Washington state. The only previously known data on current distribution and range are the maps created by Etnier in 2002, and Gallo-Reynoso et al. in 2008. In 2015, an Unusual Mortality Event (UME) was declared with 78 Guadalupe fur seals stranding from January 1st to July 13th that year alone. Currently the 2015–2016 events are by–far the largest on record, with the highest months being April through June. In addition to UMEs Tenaya discussed issues with entanglement. In 2015, two out of 98 animals were entangled and in 2016, nine out of 76 stranded animals were entangled. This is significantly higher than any other pinniped species. The Marine Mammal Center has found that 14 of the 25 rescued entangled animals tested positive for domoic acid. Tagged Guadalupe Fur seals that were released pre–UME have traveled further from shore and over greater distances (up to 1000km), with yearlings staying within 300km of the coastline. Post–UME in 2015, the seals stayed much closer to shore and almost all traveled north. In 2016, the seals did not travel as far north and had more variable movements. We have all heard about "the blob" of warm surface waters in the Pacific Ocean off California, but lesser known is the localized surface warming off the coast of Baja California starting in 2014 and strengthening in 2015. The UME is still open and being monitored with satellite tagging and stranding numbers being recorded.

Fernando Elorriaga has been working with the Guadalupe fur seal population in Baja California, Mexico since 2012. The Guadalupe fur seal was thought to be extinct in the early 1900's and currently there are an estimated population of 17,500 individuals on the reserve of Guadalupe Island, which is their primary breeding site and another 2,500 individuals recolonizing on the San Benito archipelago. Per Mexican Law, the Guadalupe fur seal is considered endangered. Meanwhile, the IUCN considers it a species of least concern. On San Benito, there has been a rising trend in births and this seal species has been observed foraging primarily on jumbo squid, hook squid, lantern fish, and small species of flatfish. During the 2013 breeding season, data was collected on their preferred diet. In June through July, hook and jumbo squid are commonly fished and in July through August these species and lantern-fish are caught. The fishing industry may have an impact on the foraging of these seals. Research on the Guadalupe fur seal's preferred diet indicated their trophic level depends on the trophic level of their preferred diet. Due to the Guadalupe Island seal's preference of jumbo squid over market squid, they have now moved them to a higher trophic level in that geographic area. Climate change is also playing an important role in the survival of pinnipeds. His team published, "What was the effect of El Niño on the Guadalupe fur seals from San Benito?" They found that mortalities trended with rising water temperature and these seals were found foraging much further north. The most frequent cause of mortality is found in pups that starved due to mother's not returning from foraging trips. Last November (2016) in Ensenada, a group of research biologists representing several institutions collaborated their research to better understand what is lacking in Guadalupe fur seal monitoring.

Discussion

The attendees' questions focused on the health of the discussed pinnipeds. Claire Simeone explained that the gel can have extended effects on active ulcers, but suggested to use with caution. The pharmaceutical company that The Marine Mammal Center works with has been very corporative with advice in application. Fernando answered the next question about Guadalupe fur seals' record of near extinction and its effect on competition with other pinnipeds causing difficulty with their recovery. He clarified that the pinniped species have different foraging techniques with little competition overlap. He also replied that a healthy recovery figure for the species of 17% increase is appropriate. In recording data, researchers must consider whether stranding become more conspicuous due to their increasing population or if researchers have more eyes in the field. The panel was asked what the effects of ocean acidification are on their prey. Lorraine Barbosa replied that the acidification has far less effects on marine mammals than it does their prey. Fernando added the nutritional

value of the pinniped's prey can decrease, this can reduce productivity in lactating mothers. The panel was asked, have harbor seals not seen the same negative effects? Jody Westburg answered that the UMEs have thankfully not impacted harbor seals. This may be due to their biology and life history which tends to create a one year lag in effects. Tenaya Norris expanded on her comments about alopecia in Guadalupe fur seals. It starts on the back side of their body, in a loss of guard hairs, typically in re-stranded animals. In her experience animals that have been tagged are seen to groom more frequently which could be exacerbating or starting the problem. Fernando added that this could be a consequence of animals being bored or rubbing on objects in captivity.

Conservation Issues in Marine Mammal Science

Panel: Dave Weller (Lead), Southwest Fisheries Science Center, NMFS, NOAA
Barbara Taylor, NOAA Fisheries, Southwest Fisheries Science Center
Lynne Barre, NOAA Fisheries, West Coast Regional Office
John Calambokidis, Cascadia Research Collective

Objectives

The objective of this session was to present a range of conservation concerns for whales, dolphins, and porpoises and outline some of the related challenges scientists and managers are faced with in their efforts to curtail future extinctions.

Presentations

Barbara Taylor presented an array of updates related to vaquita conservation, including: recent science—informed by acoustic monitoring, as well as gillnet removal, illegal fishing, gillnet regulation, CIRVA recommendations, and efforts to take vaquitas into temporary sanctuaries. Acoustic monitoring began in 1997 and was greatly expanded beginning in 2011, with annual summer monitoring within the Vaquita Refuge. The Government of Mexico established the refuge in the hope of achieving a 4% per year increase once commercial fishing was prohibited. Instead, acoustic monitoring revealed an estimated 34% per year decline. The observed decline was coincident with the resurgence of the illegal fishery for totoaba, a large endemic fish that is also endangered. Totoaba are targeted for their swim bladders which can fetch over \$10K each when sold for medicinal purposes in China. Following a series of regulatory notices and consultations, in April of 2015 the President of Mexico announced a 4-part plan that largely followed CIRVA-5 recommendations, and included: (i) implement an emergency two-year gillnet ban throughout the vaquita's distribution; (ii) make major new commitments to enforcement by strengthening the

team of agencies involved and building coordination across them, providing new high-speed patrol boats and drones and committing to a greater overall enforcement presence in the region; (iii) establishing a comprehensive program to compensate fishermen and associated workers (US \$72 million), and; (iv) continue efforts to find alternatives to gillnet use through development of new fishing methods and gear. Acoustic monitoring conducted during the Summers of 2015 and 2016 indicates that the vaquita decline continues at 34% per year. Another problem observed during 2016 is that curvinas (a smaller cousin of the totoaba) are exempted from the gillnet ban—*and totoabas and curvinas have the same spawning season*—making enforcement virtually impossible during the curvina season. Per CIRVA 7 recommendations made in May, efforts to remove illegal gillnets were expanded. During a 15-day period in November 2016 (just prior to totoaba spawning season), SEMARNAT, WWF-Mexico, and Sea Shepherd recorded that 136 pieces of derelict fishing gear were localized, 103 retrieved, and 36 illegal gillnets for totoaba were removed. Unfortunately, there has been no word on extending the two-year gillnet ban which ends in April 2017, virtually no progress on developing alternative fishing gear, and compensation to fishers is reportedly poorly distributed with allegations of corruption. And while a law passed making possession of totoabas punishable by 2–5 years in prison, no arrests have been made despite the rampant occurrence of illegal fishing. The newest recommendation involves bringing vaquitas into sanctuaries to avoid loss of the species, which the government of Mexico has embraced. Dr. Taylor concluded her presentation with an overview of the Vaquita Conservation, Protection and Recovery Group (VaquitaCPR), which grew out of CIRVA’s Steering Group and is known as the Consortium for VaquitaCPR. The Consortium has established both an Expert Advisory Group and an Independent Review Panel, with the overall focus being to capture as many vaquitas as possible through the action of various specialty groups supporting the development of a field program to locate, catch, and house vaquitas. Find and catch efforts are expected to begin in October 2017. Additional information is available at www.nmmf.org/vaquitacpr.html.

Lynne Barre presented on endangered southern resident killer whales, a NOAA Species in the Spotlight. Following a brief ‘Killer Whale 101’, Barre provided an overview of the southern resident killer whale population which covers a wide range extending from Monterey, CA to Southeast Alaska and is made up of three stable family groups known as the J, K, and L pods. Their primary prey is Chinook salmon which they hunt using echolocation. Unique characteristics of these whales include distinct dialects among family groups, and a greeting ceremony. Researchers are able to identify individuals by unique distinguishing characteristics of their dorsal fin and

saddle patches documented in a catalogue maintained by the Center for Whale Research. After a 20% population decline in the late 1990s, NOAA was petitioned to list these southern residents as endangered under the US Endangered Species Act. At that time, three major threats were identified: prey availability, contaminants, and vessels and noise. The population was listed as endangered in 2005, and as of December 2016, is estimated at a total of 78 individuals. A comprehensive recovery plan addressing research, enforcement support, and education was completed in 2008. In 2016, Southern Resident killer whales were identified as one of eight of species under NOAA's purview at greatest risk of extinction. This designation as a "Species in the Spotlight" resulted in the development of a new five-year action plan outlining efforts vital for stabilizing the population, preventing their extinction, and providing a road map for recovery. Key actions identified in the Action Plan include: recovery of critical prey; improved knowledge of health; enforcement of vessel regulations; protection of coastal habitats; and education and outreach. In collaboration with the Vancouver Aquarium, teams are utilizing aerial photos captured via drones to identify where and when the whale's food is limited, how salmon recovery can be prioritized to benefit the whales, as well as to better understand whale health and reproduction. Biopsy samples are used to measure bioaccumulation of contaminants (PCBs, DDTs, PBDEs), which at high levels can cause reproductive and immune problems. Contaminant reduction is being addressed, in part, through collaborations such as the Puget Sound Partnership which includes killer whales, chinook salmon, and water quality as indicators in its Action Agenda to restore Puget Sound by 2020. To further improve knowledge of health and contaminants, next steps include: increased use of drones, conservation canines (to aid in collecting fecal samples and these canines were part of Shaili Johri's presentation in the "New Technologies" session on Friday), and further use of blubber content, stranding data, and breath sampling—with the goal of creating comprehensive medical profiles for individual whales. About enforcement, a lot of effort is directed to education and outreach (bewhalewise.org) as well as evaluation of the regulations using the following measures: biological effectiveness; vessel compliance; enforcement; education and outreach; and economic impact. It was noted that a petition for a Whale Protection Zone was submitted by three NGOs in November 2016 and is open for public comment through April 13, 2017. Additionally, efforts are underway to protect important habitats from anthropogenic threats. 2,560 square miles of critical habitat was designated for inland waters in 2006, and a petition is currently under review for designation of critical coastal habitat. Finally, education and

outreach efforts are conducted largely through partnerships with nonprofits, whale watch operators, naturalists, and sighting networks and utilizing social media, community events, displays, classroom presentations, and citizen science.

John Calambokidis presented an update on the status of humpback whales along the US West Coast from 1986 to 2016. Key data informing this update is drawn from the SPLASH (Structure of Populations, Levels of Abundance, and Status of Humpbacks) study conducted in the mid-2000s, which used eight distinct breeding grounds and seven feeding stocks have been identified. Interestingly, while there was a high degree of stability and loyalty to these geographic areas—there weren't clear one-to-one linkages between the breeding and feeding areas, which creates a bit of a management challenge when the legal framework is taken into consideration. For example, the ESA refers specifically to breeding areas as how you might define distinct population segments—whereas there are particular threats posed by the animals' feeding grounds. One way of mitigating this is by taking a multi-strata approach that combines loyalty to feeding and breeding grounds and envision these units as 'herds' that mix on particular feeding and breeding grounds. Using this approach, the population trend for whales occurring off California and Oregon reveals a gradual increase from 1990 to the late 2000s, followed by a leveling off over the past five years. It was noted that under the newly issued ESA status of humpback whales, fourteen distinct population segments worldwide are recognized which are based on winter breeding areas. Prior to this, humpback whales were considered endangered, as a species. Returning to the population trend estimates, the following (likely) responses to reaching carrying capacity were identified: greater nutritional stress and dependence on prey dynamics especially at the end of seasonal fasts; expansion into more peripheral habitats and feeding time periods; greater time expended feeding and emphasis on feeding over breeding; increased mortality especially where expanded timing, or areas of use, cause greater exposure or vulnerability to other factors. The expansion of range is most dramatically seen in the Southern California Bight, San Francisco Bay, and most significantly (in terms of numbers) in the Salish Sea—a return of humpback whales into inside waters of Washington State and British Columbia, both coming further in and with higher numbers. There has also been a significant increase in reported humpback whale entanglements off California from 1982 to 2016, which is attributable to a combination of: a change in fishing effort, increased humpback whale abundance, increased time spent by whales in feeding grounds, expansion of their range, and shifts in targeted prey. An important contrast was noted that when prey

changes for blue whales, they move; whereas when prey conditions change for humpback, they switch prey. Consequently, a key conclusion to be drawn is the increasing importance of management that emphasizes humpback feeding areas because: most time is spent there; most impacts occur on feeding grounds; and humpback whales are loyal to feeding areas.

David Weller presented an overview of conservation concerns for baleen whales. The talk opened with a reflection on the assumption held by much of the general public that all whales are endangered. This notion is largely attributable to the lingering cultural legacy of the whaling era. While it is still true that some whales or populations are under threat of extinction and need to be saved, others are robust and thriving. The immediate conservation question is determining the units (e.g. species, subspecies, populations, subpopulations, etc.) to conserve. Criteria to consider when determining conservation priorities include: population size (abundance); rates of removals (e.g. human induced mortality); rates of population growth or decline; population structure; nature and severity of threats (individual and population level); and evaluation of whether impacts on individuals are sufficient to affect the population as a whole (birth rate, survival, recruitment, longevity). Threats to whales can largely be classified as either acute/lethal (e.g. whaling, entanglement in fishing gear, ship strikes) or sublethal/chronic (e.g. disturbance, pollution, climate change). For baleen whales, the most significant lethal threat is currently entanglement/entrapment in fishing gear, and in some cases, ship strikes can be of particular concern. Both types of threats may be exacerbated over time by climate change. For example: (1) the reduction of Arctic sea ice may result in more frequent interactions between whales and ships and (2) as fishing grounds shift or expand in response to target species distributions, the likelihood of whale entanglements may increase. A key challenge to 'saving the whales' is to identify and assess the priority units to conserve, and then to identify and mitigate threats that could lead to their extirpation.

Discussion

The discussion period opened with a question from the audience about successful capture and captivity of harbor porpoises. Barbara shared that great strides have been made, primarily in the Baltic, where they have been successful both in taking animals that were entangled or stranded and getting them to survive and later releasing them and tracking them--confirming that they've done well after release. In some cases animals, have even been born in captivity, something they didn't want to happen, and had tried to prevent by separating the males and females with a fence. A

question was asked about the Mexican sentiment toward vaquitas and whether they have as much love for the animal as the U.S. seems to have—and as much buy-in and interest in saving the species. Barbara shared that the scientists and members of the department of the environment have been huge supporters, and there's been support all the way up to the President of Mexico. That said, there are definitely mixed reviews in the local villages, and there are likely a lot of people who, like most people in the world, don't know what a vaquita is. Since it's a naturally shy species that hasn't been well photographed or featured in nature specials—they're largely unknown, which has been a problem in gaining support both within Mexico and globally. The next question pertained to how many animals the VaquitaCPR program anticipates bringing into sanctuaries. Barbara prefaced her response by explaining that the team doesn't even yet know whether they can catch one, or whether it will react like a Dall's porpoise—but that they are preparing to be able to house about ten of them, and by the time they get to that point that may be all that are left. A question was asked about the stability of the southern resident killer whale population given the recent deaths of two individuals. Lynne shared that in 2016 a total of seven whales went missing from the population. Unfortunately, since the animals don't always strand, they aren't always recovered—but there were two that did strand in 2016. L95 was one that stranded and had been satellite tagged, and the conclusion was that the satellite tag attachment site may have been a pathway for a fungal infection. There's an ongoing investigation on Canadian shores that has included consultation by several veterinarians. This case brought a new risk to light and has resulted in the suspension of the satellite tagging program until more is learned. In the coming year, the team will also focus some of its health studies on the fungal infection risk. There is also interest to conduct a broader fungal infection study with porpoises. Ultimately, the loss of L95 has pointed the team in a new direction to direct some of its resources. In December, an adult male stranded with a blunt force trauma and that investigation is also still underway. It's still unclear whether the trauma is attributable to a ship strike. Most recently, J2, one of the matriarchs and oldest whales in the population went missing. While it's not entirely surprising for a whale that is likely in her 80s or 90s to go missing from the population, this is one of the things that the team plans to watch carefully to see what happens as matriarchs do leave, how does that affect the social structure? Post-reproductive females clearly serve some function in this society of southern residents, but it's not yet known how J pod and that matriline will be affected. A question was directed to Barbara about the working relationship with Sea Shepherd. Barbara shared that it came about through a chance meeting and relationship that was eventually forged between the Mexican government and Sea Shepherd, the former being of the mind that they need all the help they can get. Thus far, the results of Sea Shepherd's

engagement in the gear removal program has been outstanding. John added that there are many other examples of researchers collaborating with Sea Shepherd, and that there is a growing pool of successful working relationships. A question was posed to the panel inquiring how they stay positive as career conservation professionals. Lynne shared that she will take time to go into a classroom and participate in an education program called Killer Whale Tales—seeing and hearing the kids engage helps her to recharge. John added that we need to tell more success stories to demonstrate that change can make a difference and that there is reason for hope. Lynne cautioned that unless you're a natural (pragmatic) optimist, you shouldn't be in conservation. If you don't like sad stories, you are in the wrong field—it really is something you should actively counteract. You must recharge your batteries, you must go out in the field and do things that make you feel good, you really should take an active stance at not going down that rabbit hole. The next question related to the difference between the northern and southern resident killer whale populations and whether they face the same threats, and a follow-up question related to the primary threats faced by chinook salmon—the southern residents' primary prey. Lynne responded that there was a similar population dip by both populations in the late 90s, and that while the southern resident population has sort of hovered since that decline, the northern resident population has been climbing. They face similar threats, but to different degrees. As far as pollution and contaminants, they live in somewhat more pristine habitats up in British Columbia—so their contaminant levels are a bit lower. They also have less vessel disturbance and noise. Whale watching does occur but it a little bit more diffuse, not quite as intense or concentrated. Both populations feed on the same runs of chinook, but the northern residents get the first access given the movement of the salmon from north to south. Finally, as far as threats to the chinook salmon, they are encapsulated by the four H's: harvest, hatcheries, hydropower, and habitat. A question was posed whether any outreach has been made to enlist Chinese celebrities to support a campaign to discourage the consumption of totoaba swim bladders in support of vaquita conservation (given the success in a similar campaign against shark finning and the campaigns by WildAid shared at last year's SCMMW)—and what can be done to put some pressure on that market in China. Barbara acknowledged some efforts to enlist this strategy, but also acknowledged that: 1) the market for totoaba swim bladders is still young and taking off; 2) vaquita decline isn't limited strictly to totoabas; and 3) that unlike shark-finning, this case involves a mix of legal and illegal harvest. Another question was posed regarding how the vaquitas will be collected, and seeking clarification on the intended sanctuary location(s). And once captive, will there be a breeding program? Barbara shared that while the idea of a breeding program has been discussed, the team still doesn't know whether it will even be able to catch one

animal. As such, there's a continuing question as to how far down the planning path the team should go in its decision-making. She also shared that visits were made to a series of sites up and down the coast that might be set aside as a sanctuary where the animals could swim wild, but that it will take years to happen. There are many immediate hurdles including the expense, and the concern that it won't happen fast enough to make a difference. Another factor is that every time you take a species into captivity for the first time, you spend a lot of time learning from the animal about what their requirements are. Getting too deep into the planning before there's even been an opportunity to learn from the animal is probably time and money wasted. So, the focus has been on taking the vaquitas out of a habitat where they have a 50% chance of dying every year—getting them out of there, saving them—and then worrying about what's the next step. It's not that the team isn't considering the next step, it's that even doing that first step is a monumental task—to have the facilities both in the water and on land and to be able to care for the animals. It was also mentioned that if the team finds that it is able to catch vaquitas, floating tuna pens need to be constructed rapidly and can reduce some of the risks faced by the captive animals by having them moved around in multiple places. Also, the threat of hurricanes requires the ability to evacuate the animals. Ideally, the animals will be released back into their habitat as soon as possible, but to do that requires assurance that they're not just going to die in a gillnet.

The recovery team has been very clear that its first priority is ensuring a safe, wild habitat for vaquitas—getting the gillnets out, having alternative means of making income for those villages—but it just isn't happening fast enough. A question was asked regarding how the new ESA listing status for humpbacks will change conservation measures going into the next five to ten years. Under the MMPA there is a mechanism in place to form take reduction teams when takes exceed a certain threshold. With the recognition of this unit in Central America it's pretty clear that the entanglements occurring off the West coast exceed that threshold by quite a bit. A benefit to the take reduction team approach is that it creates a structure, brings in the fisheries that are involved in the take, and it has an incredibly short timeline since it requires bringing the take below the threshold within six months. An example was shared from the West coast where an offshore gillnet fishery caused a take reduction team to form, and changes to the gear and combined with the addition of pingers on the nets were successful in reducing the take in the designated time frame. Furthermore, the process requires getting together the managers, the conservationists, the environmental groups, scientists and the fishery people all together which is much more powerful than when each group works in a silo and forms unrealistic views about parts they don't know about. So, that would be one of the main mechanisms that

might be triggered going forward. Lynne added that even outside the formal MMPA take reduction team process, there's a lot of ongoing coordination and some best practices coming out as initial steps to help minimize risks. The significant role of the federal government in information gathering and implementing the protections currently in place was called out as something to be recognized and not taken for granted given the risks faced in coming years with regard to the ability of government scientists to speak out, participate, and take management actions. The audience was encouraged to reflect on what's at stake. The point was also made that cetaceans are international animals and they don't pay attention to country borders—and that the U.S. can have a tremendous influence on policy and practices adopted in other regions.

Keynote Address: John Calambokidis

Objective

John shared his personal biography and a brief history on the beginnings of Cascadia Research Collective. He discussed lessons learned through his career and important personal and organizational goals he had made.

Presentation

John fondly describes the creative pronunciation and interpretations on his last name, which is originally Greek. He was born in Egypt and acquired American citizenship via his mother after the Suez crisis. His youth was spent in Italy until about age 10 when he came to the US. His mother was adventurous and believed in travel as a way of expanding your view of the world was an inspiration to him and cultivated his adventurous spirit. His fascination for biology came from his strong interest in environmentalism and travel. Another interest of John's is finance, which almost became an alternate career path, and played an important role in starting Cascadia Research Collective. His alma matter Evergreen State College provided his bachelor's degree and his first study and publications were measuring the presence of PCB's in harbor seals in the 1970's. From there he was hired to the National Marine Mammal Laboratory and conducted an independent study, where he took mammals in contaminated sites and moved them to cages in pristine sites to measure the de-contamination of PCBs. His findings indicated that individual PCB congeners decreased differently in Mussels in the way similar to half-life curves. Cascadia was formed out of the need to protect local natural areas and seemed a lofty dream at the time. By fortuitous timing four members, including John, started their first contract through Cascadia with the National Marine Mammal Lab in 1979. He also lead 35-day kayak trips into Glacier Bay while bidding for competitive contracts and grants through Cascadia. The overriding theme for Cascadia became "research that serves the

conservation need”. The focus is on endangered species and human impacts on animals and their environment. John believes research for the government and non-profits should be the focus for Cascadia as a way of keeping the interests of the public, and transparency, in the forefront. Over 50% of their current funding comes from the U.S. Navy and to date they have completed over 500 projects, with typically 30 concurrent projects at a time. Cascadia employs 15 to 20 paid personnel, and 5 to 10 interns. Beyond research, Cascadia also responds to strandings and is involved in maintaining a database for tagging and photo ID efforts. One of John’s most enjoyable aspects in the creation of Cascadia is collaboration, especially as technology is advancing. Throughout the process of running an organization, John has always sought to put importance on his family. Including his first “foster child”, a premature seal pup nursed to health by him and his wife. When he considers the changes he has seen across his career, the conception of Cascadia pre-dated computer recording, they relied on punch-cards and creating graphics alone were a challenge; everything was done manually. Prior to GPS and even Loran-C, the small-boat crew could literally be working in the blind when a marine layer rolled in. The opportunity for discovery is what drives him forward. With billions of people on this planet he enjoys the thrill of making a difference in the world. John posed a question, “To what degree is it appropriate to become involved in politics as it relates to the issues we study?” For the public to make informed decisions/action they need non-bias research. He self-reflects on the importance of vetting his funding sources to make sure there are no restrictions on data dissemination and scientists should disclose their funding sources. Bias can be subtle, openly discussing it is the start of creating a culture of trust and disclosure.

Social Media and Communications Hot Topics

Panel: Alisa Schulman-Janiger, American Cetacean Society (ACS), Gray Whale Census
Ted Cheeseman, Happywhale
Dave Bader, Aquarium of the Pacific
Susan Poulton, The Franklin Institute

Objective

The objectives of the Social Media and Communications Hot Topics panel are to describe current communications and outreach methodologies. These topics will include the use of social media to track migrating or entangled whales, Happywhale a widely-used whale tracking citizen science platform, campaigns, actions, and exhibits surrounding the vaquita and a discussion on science communication and what it looks like moving forward in today’s political climate.

Presentations

Alisa Schulman-Janiger works as an educator and researcher operating the Gray Whale Census at Pt. Vicente and ACS. 34th consecutive season tracking and identifying whales at the Visitor Center on the Palos Verdes, CA peninsula. The 100 trained volunteers work sunrise to sunset documenting whales December – May each year, with 14 core volunteers comprising half of the overall volunteer effort. They populate a public education white board that lists the variety of species they see including gray whales, fin whales, minke, blue, and humpback whales, common and bottlenose dolphins, orcas, sperm whales, pacific white-sided dolphins, and false killer whales. They also create and update annually a 10-year data chart of species sightings research on the website www.acs-la.org. The last five years show gray whale southbound migration happening earlier (of those whales that migrate inshore only) with December and January being peak months. Every day they update the groups Facebook page with a photo illustrating the whale sightings and behaviors observed that day. Also on Facebook she posts “Gray Whale Alerts” and “Breaking Scientific News” that shares new behavioral observations, such as the recent offshore killer whale that was nursing her calf while also swimming with a blue shark wrapped around her pectoral flipper. Posting these alerts allows her to communicate with other researchers and whale watch operators who will also look for and identify same whales, which often gives them an idea of migration swim speed, etc...To identify and track movements of individual whales they use Happywhale and the database created by Cascadia Research Collective. Using Happywhale and communicating with Ted Cheeseman allow naturalists on whale watch boats to immediately identify and communicate to guests about the exact whale they are observing. Social media and Happywhale have also allowed them to track and follow up on the status of entangled whales moving along the coastline.

Ted Cheeseman is the founder of Happywhale and a member of his family business, Cheeseman’s Ecology Safaris. Happywhale is a citizen science web platform where the goal is to engage the public in science and have that science benefit from that engagement. Our initial interactions with whales was in the form of harvesting them through whaling. Over the last 60 years there has been a big perspectival shift in our interaction with whales and primarily how we now interact through whale watching, photos and film. Through these mediums people have grown to see them as beautiful animals and a piece of the beautiful marine environment. Encountering whales while whale watching is a premium time to motivate people to learn more, but not the best time to communicate about whale science since people are usually fidgeting with gear, trying not to get seasick, etc...In leading Antarctic expeditions for the past 23 years

Ted has thought a lot about how to communicate science and conservation while in the field while also deepening communication and public engagement in the process of science. One method to connect people to whales is to have them look at them as individuals. Ted shared the example of Migaloo, the all-white albino humpback whale who is now a national “celebrity” in Australia. When Japan proposed resuming whaling of humpback whales people throughout Australia responded a resounding “No, we care about Migaloo and you are not going to kill Migaloo!” The response was personal and emotional since they connected to this whale individually. This observed connection helped spark the creation of Happywhale where people can input photos of whales to help create a photo identification library, where they can identify and learn information about each whale in the web-based database. The bulk of the ID work is done through an automated algorithm that matches the whale photos to known whales in the Cascadia Research database. Within Happywhale there is also a fast feedback loop where people can get alerts and updates on sightings of the individual whale they provided information on. Right now the database is primarily California waters focused but there are forthcoming partnerships with other organizations to go global, such as working with Allied Whale in Antarctica. Last year there was around 100 whale entanglements and now that people “know” these whales there is an increased public interest and the public cares about the outcome.

Dave Bader is the Director of Education and the Aquarium of the Pacific and the Vaquita Public Engagement Coordinator for the Association of Zoos and Aquariums Save Animals from Extinction program (AZA SAFE). Dave began by giving a general overview about the vaquita crisis. The Northern Gulf of California (Sea of Cortez) in Baja, Mexico is a stark and beautiful desert where the totoaba fishery began habitation of this region. Initially totoaba was harvested with spears from shore and taken primarily for their swim bladders and the remainder of the fish discarded. The dried swim bladders were shipped to San Francisco or Los Angeles and then sold and shipped to China. This then legal fishery was active from the turn of the century until 1975, when both the totoaba fish and vaquita porpoise were both listed as endangered species and CITES listed. Since that time an illegal fishery has continued as well as legal fisheries for shrimp in the same region. Shrimp fisherman have primarily used gillnets and thus vaquita are entangled and drown in these nets. For the 30,000 people in this region 80%–90% rely on gillnet fishing for their income. There has been a huge influx of funds to support fisherman to NOT fish and abide by the zero-gillnet fishing ban, although there is still illegal fishing occurring creating huge loss of life for vaquita porpoise. We are now in a situation that if draconian measures (harsh measures) are not taken then the vaquita will go extinct. Most people were not familiar with this species, even those working within the field of zoos and aquariums, until the news of

the vaquita nearing extinction and we need to change that...extinction cannot go unnoticed and it has to be pushed out in front of the public. One of the first strategies in outreach is sharing with your friends via social media (using #4aporpoise to help track total engagement) and personal conversations, you are a valuable resource, and friends don't let friends not know about the vaquita! The AZA SAFE team requested a marketing firm to look at the demographics of the best target audience for conservation, and it is the same population of those that visit zoos and aquariums. A variety of programs were created #4aporpoise such as exhibits, docent led talks, media and public relations coverage such as World Ocean Day (June 8) and International Save the Vaquita Day (July 9), which gave over \$45,000 worth of public outreach coverage from those two days alone reaching 25 million people. For the target demographic, the two best social media outlets are Facebook and YouTube where #4aporpoise is an easy to remember and trackable hashtag. The challenge is providing a way for people to do something once they are engaged. For the vaquita, AZA SAFE decided on promoting sustainable seafood, creating "vaquita-safe" branded seafood, signing petitions to promote the now gillnet ban and raising funds to support the gillnet removal project in Baja. Next steps are for AZA SAFE to work with the marine mammal community to help identify the best use of donated funds moving forward. To support outreach and create fundraising events (such as Margaritas for Vaquitas or Vaquita Parades) there are resources (photos, printable materials, presentations, etc...) on the AZA SAFE website www.aza.org/aza-safe.

Susan Poulton led a discussion on science communication, and social media, beginning with the idea that in the current political climate competition for issue-based conversation is going to be intense and that fundamental human rights are now at stake, so other issues might be perceived as "trivial" and that the climate is constantly changing. She is also now focusing personal work efforts on the issue of trust – the perception of trust in media, scientists, politicians, etc...and attempting to help people answer "who do we trust". At times, we might want to communicate only with our immediate bubble of people (friends, family, colleagues), but you also want to consider breaking out of your "bubble" and communicating to a larger crowd since there now is an urgency for accurate scientific discussions and outreach. These "bubbles" she explained are created by social media based algorithms, showing you specific content your "friends" have viewed, thus pre-determining what you will see based on your current network of contacts, this being the whole point of social media. Sometimes your "bubble" can be your most effective group, such as collaborating to save the vaquita. Science can be activism and there is a need for unification between scientists around core issues to share resources and platforms to get messages out to broader audiences. Scientists and organizations that may have stood on the sidelines

are now being pushed into an advocacy role, don't hold back but also proceed with caution on science activism. Susan shared her recommendations for communicating science by going "back to the basics" such as: (i) one-on-one and face-to-face interactions will now have value far beyond digital outreach; (ii) work with your existing supporters and amplify your messaging; (iii) acquire new supporters, but still work within your local community; (iv) target who you want, and know what you want; (v) be optimistic with actual reach and outreach outcomes in this current climate; (vi) find ways to break through your own "bubble". There are several ways to do this, including, embracing that scientists can be the story. Let your enthusiasm, passion and frustration show through. It's those emotions that are relatable to the public and the lay person and people aren't going to care about things just because you really want them to or think that they should. They will care about the whole story, you and your reactions, the community you work in or at the heart of the conservation issue. Also, follow up with the media and whomever wrote a story to provide them with more background information. They will usually update a story with corrections or additional information. Lastly, Susan shared a little about crowdfunding in that reward-based crowdfunding usually is more successful and that donation-based campaigns on average raise \$5,000.

Discussion

The first question from the group was about the emergence of the use of the term "alternative facts", and how can scientists engage with groups or individuals that subscribe to that thinking? Susan responded with "there are no such thing as alternative facts" and the more we focus on that, the more we are promoting that objective. So, don't adopt that vocabulary, don't repeat it, don't accept it, the best thing is to present your facts "business as usual" and not entertain the notion of "alternative facts". Dave shared that purely sticking to the facts won't address true understanding, you cannot present facts in an emotional argument, as we have seen in climate change discussions or the teaching of evolution. As the expert on your topic you can call out the fact that "alternative facts" being pushed forward are indeed a lie, since you know and research the scientific facts on the issue. Another person asked about the fact their work gets high media exposure on a national level, yet there hasn't been a surge in funding despite the crowd interested in and following their work. Susan discussed that it depends on your goals, but no one really sees funding despite huge followings or successful outreach programs. There can be a rise in support such as citizen science interaction via social media – like Alisa conducts and Ted creating Happywhale and a rise in inspiring people. Dave shared that his goal with #4aporpoise is for people to know that vaquita exist, so "total numbers" of views and their

engagement in conservation campaigns has always been his goal. A question was asked about how to balance your personal versus professional social media accounts and what that looks like. Each of the speakers answered with their social media presence tends to focus on their issue or work. Dave presents all his accounts as Director of Education, Alisa has several whale focused accounts, Susan likes to mix all of her groups on one account so she limits how much personal posting happens and focuses on work related posts and she shared that all Twitter posts (including those deleted) are archived at the Library of Congress and are searchable via a large database. It was shared by a participant about the concern for “real time” sharing of whale locations and sightings, especially in the Pacific Northwest, and how that impacts the animals due to vessel traffic. Alisa responded by stating she practices a balance of giving updates without specific locations for the general Facebook followers versus operators that ongoing have respect for the animals and guidelines, such as whale watch boats, and not posting information on busy boat days. Ted discussed Australia and their “rule” with the white humpback whale called “Migaloo” and how many boats can be in proximity and at what distance they can be within, showcasing how the public are vigilant about protecting Migaloo. He described entanglement issues in our local waters and the potential for a “media mob”, so many details of entangled whales are kept quiet, except from team members working on the response teams. Although details are left out in media updates, he states the importance of exposing whale entanglements for the public to learn about this marine mammal conservation issue.

Concluding Remarks

John Hildebrand gave a few final comments, noting that there is an uncertainty in the air right now in the field of science, conservation, and science communications and what that means for scientists moving forward. But, even with that feeling of being unsure how or when to dive deeper into science communications, remember we are a community and we are there for each other and support each other, don't hesitate to reach out to anyone in this SCMMW community for support.

Workshop Evaluations

The workshop evaluations and the summation of them are an important part of the post conference work. In looking at last year's Summary Report you will see that the suggestions for session themes, speakers, and logistics were considered and implemented at SCMMW 2017. The SCMMW homepage has a tab called “Archive” and from this page you can find each year's program, poster abstracts and final summary reports. Traditionally, the marine mammal science community is not given many

opportunities to gather as a group and share their knowledge. The Society for Marine Mammalogy has an international meeting every two years; however, as this is an international meeting, the cost and distance is a barrier for many U.S.-based scientists as well as the conference size of thousands of attendees. The need for a regional workshop for marine mammal scientists, purposely kept smaller in number of attendees, became evident and the Pacific Life Foundation created the platform and continuing support to form the SCMMW. This year we had 93 attendees and 58 evaluations were returned. Every evaluation thanked Pacific Life and shared that there is a continued need for this important and incredible workshop. Many also stated that the Pacific Life Foundation should be proud of their support provided to the marine mammal community and to ocean conservation. Respondents were highly impressed with John Calambokidis and the sharing of his personal story in the lunch keynote address. Also, many preferred the plenary format on both days of the workshop. The most commonly suggested themes for next year were another session on new technologies and conservation (similar to this year), acoustics and anthropogenic impacts, climate change/ habitat changes, policy and politics in regards to marine mammals, and conservation. Most of the evaluations asked for an annual update on the vaquita, entanglements, and UMEs. Also, many requested to continue to have a session on outreach and social media asking for more tools and strategies for science communication. There were suggestions to do another multidisciplinary session like we did in 2015, where “vaquita” was the topic and people from all disciplines were on the panel (scientists, reserve managers, fishermen, seafood supplier, chef, NGOs).

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