

Appendix 1: Poster Abstracts

***Pennella balaenoptera*: The biology of a mesoparasitic copepod on whales**

Diane Alps (1,2), Julianne Kalman Passarelli (2), Erin Falcone (3)

1. California Whales and Wildlife, P.O. Box 1667, San Pedro, CA 90733
2. Cabrillo Marine Aquarium, 3720 Stephen M. White Drive, San Pedro, CA 90731
3. Marine Ecology and Telemetry Research, 2420 Nellita Rd NW, Seabeck, WA 98380

Pennella balaenoptera are mesoparasites found on marine mammals. These crustaceans are among the largest of the parasitic copepods. Information on *P. balaenoptera* is very sparse; there is little knowledge of the life cycle of this species and no knowledge of the presumed intermediate host(s). A literature review compares the marine mammal hosts and the range of these hosts which *P. balaenoptera* has been reported to infect, however presence appears to be highly underreported. Access to complete and intact specimens is challenging due to the pelagic nature of the hosts. Coordination with marine mammal stranding networks has provided reports of several new host species accounts, as well as specimens for examination. Additionally, Eastern North Pacific Mark–Recapture studies of fin whales from 2003 to 2013 have documented presence of *Pennella* on 64% of individual whales recorded. Comparing early (December through May) versus late (June through November) annual parasite scores suggested the same whale is much more likely to have greater numbers of visible parasites later in the year, indicating seasonality. This use of photo identification studies on whales, provides insights on growth and development rates of *P. balaenoptera*.

Submitted By Diane Alps
Email Address diane.alps@gmail.com

Metagenomic analysis of the diet of harbor seal (*Phoca vitulina richardii*, gray 1864) in Mexico

Elizabeth Brassea–Pérez, Asunción Lago–Lestón, Yolanda Schramm–Urrutia, Gisela Heckel–Dziendzielewski , Axayácatl Rocha–Olivares y Clara Galindo–Sánchez

Massive sequencing is a very useful tool for the analysis of predator diets, because it makes it possible to identify those taxa that have low or no detectability by traditional scatological methods. In Mexico, the diet of the harbor seal (*Phoca vitulina richardii*) has been studied based on hard remains, so the importance of invertebrates or cartilaginous fish as a prey is unknown, as they do not leave identifiable remains in feces. Therefore, the aim of this study is to characterize the food habits of the harbor seal in Mexico

through metagenomics, and compare our results with those obtained by analysis of hard remains on the same samples. The samples were collected on Todos Santos Sur, San Jerónimo, Natividad, and San Roque islands, during the moulting season in 2014. Libraries were constructed following the two-step PCR technique; first amplifying the 18S rRNA region using eukaryote specific primers and 16S mtDNA region using primer specific for chordates and cephalopods with the appropriate indexes and adapters for sequencing. Blocking primers were used to avoid the amplification of predator DNA. The libraries were sequenced on a MiSeq (Illumina) instrument, generating 848,411 reads. The quality control and taxonomic assignment of the sequences was performed in silico through bioinformatic tools. The 16S mtDNA gene was the most informative in terms of taxonomic resolution. In the present study, 49 preys were identified, 14 of which were invertebrates, hagfish and elasmobranchs. By comparing the molecular analysis of solid residues with next generation sequencing 16 prey were common to both methods. The most important prey items of harbor seal in the four sites of study were Longfin sanddab (*Citharichthys xanhostigma*) and California lizardfish (*Synodus lucioceps*). The power of next generation DNA sequencing extends the trophic spectrum known for the harbor seal in Mexico. Metagenomics is a new approach for the study of the feeding ecology of key species in a highly productive and changing ecosystem, such as the California Current.

Submitted By Elizabeth Brassea Pérez
Email Address ebrasseap@gmail.com

Occurrence and distribution of Cuvier's Beaked Whales (*Ziphius cavirostris*) at Guadalupe Island, México

Cárdenas-Hinojosa, G. (1,2), Trickey, J. (3), Huerta-Patiño, R. (4), Martínez-Aguilar, S. (4) and E. Brassea-Pérez (2)

1. Coordinación de Investigación y Conservación de Mamíferos, Instituto Nacional de Ecología y Cambio Climático – SEMARNAT. CICESE, Camper # 6, Carretera Ensenada-Tijuana No. 3918, Zona Playitas, C.P. 22860, Ensenada, B.C. México
2. Departamento de Biología de la Conservación, Centro de Investigación Científica y Educación Superior de Ensenada. Carretera Ensenada-Tijuana 3918, Zona Playitas, CP 22860. Ensenada, B. C. México
3. Scripps Institution of Oceanography, University of California, San Diego, 9500 Gilman Dr., La Jolla, CA 92093, USA
4. Programa de Investigación de Mamíferos Marinos. Universidad Autónoma de Baja California Sur. Km. 5.5 Carretera al Sur, Mezquitito, C.P. 23080, La Paz, B.C.S. México

Cuvier's beaked whales (*Ziphius cavirostris*) are widely distributed throughout all the world's oceans. However, information on their local distribution, abundance, and site fidelity remains scarce. In October 2016, we did an expedition to Guadalupe Island (GI), Mexico aboard an 80' sailboat, with the goal to re-start research efforts into the occurrence and distribution of Cuvier's beaked whales at GI. The search effort was conducted in a non-systematic manner and was concentrated in areas where beaked whales have previously been reported. A total of 651.4 km was covered during 71.2 hours of search effort from October 12–26, 2016. A shore-based search effort was also conducted for three hours in one day. We recorded a total of 33 sightings of Cuvier's beaked whales; 29 occurred during sailboat navigations and four were recorded from shore. Although surveys were conducted all along the east coast of the island, and a two-day circumnavigation around the island was also performed, beaked whales were exclusively sighted within Bahía Norte, primarily near First and Twin submarine canyons. We encountered Cuvier's beaked whales from 0.22–4.23 km (mean = 1.78; SD = 0.91; n = 29) from shore. Group size ranged from one to six individuals, with a mean of 2.65 (SD = 1.44, n = 29). Only two of the total sightings included mother and calf pairs. The encounters of Cuvier's beaked whales occurred in waters of sea surface temperature 20–23.5 °C, with a mean of 21.48 °C (SD = 0.97; n = 25). Based on the sailboat effort, the encounter rate near GI was 0.40 groups/hour, and a literature review suggests that this rate is the highest reported for Cuvier's beaked whales thus far. Furthermore, the individuals photographed in 2016 were added to the Cuvier's beaked whale photo-id catalog of GI collected by Cárdenas-Hinojosa et al. (2015), which also contains data from 2006–2009. There were 28 total recaptures, 78.5% of which occurred in 2016. There was only one recapture across different years (2007, 2009), but excluding this recapture, the timing of the other recaptures ranged from within the same day to 28 days (mean = 4). Based on our 2016 expedition data, as well as opportunistic records from previous years, we suggest that GI is an important area for the occurrence of Cuvier's beaked whales in Mexico, and is potentially a breeding/feeding area for this species. However, it is necessary to conduct systematic research with greater spatial and temporal search effort to study site fidelity, habitat use, and movements, in order to determine if the Cuvier's beaked whales of GI are an island-associated resident population, or if these individuals belong to the population present in the Southern California Bight. Both possibilities hold important implications for the knowledge of this species and for conservation actions.

Submitted By
Email Address

Gustavo Cárdenas Hinojosa
gcardenas03@gmail.com

Understanding harbor porpoise trauma cases in northern California through necropsy and dolphin sighting data

Rachawadee Chantra, Claire Simeone, Padraig Duignan, William Keener, Isidore Szczepaniak, Marc Webber, Jonathan Stern, Frances Gulland

Harbor porpoises are commonly observed in and around San Francisco Bay. Bottlenose dolphins have been expanding their range, and were first photographed in San Francisco Bay in 2007. Cases of 'porpicide', in which dolphins attack porpoises, have been recorded with suspected increasing frequency since that time. While there are little data that directly link observed trauma with strandings, better understanding the demographics of the stranding cases, along with dolphin sighting data, may provide additional insight into what is occurring in these cases.

Submitted By
Email Address

Claire Simeone (on behalf of Rachawadee Chantra)
simeonec@tmcc.org

The physical and behavioral effects of enrichment in rehabilitating Eastern Pacific harbor seals (*Phoca vitulina richardii*)

Karli R. Chudeau, B.A. & Nancy G. Caine, Ph.D

The effectiveness of enrichment for improving health and well-being in laboratory, agricultural, and zoo settings has been well-established, but little research has been done on the value of enrichment in facilitating successful reintroduction of rescued animals. Thirty-two Eastern Pacific harbor seal (*Phoca vitulina richardii*) pups were randomly assigned into experimental and control pools during rehabilitation at The Marine Mammal Center in Sausalito, CA. Pups in the experimental group (EP) were exposed to five types of apparatus that elicit species-typical behaviors (e.g. foraging, exploring, diving, etc.). Trials took place three times a day for 30 minutes over the course of three months. Control pups (CP) were housed in standard, unenriched pools. Outcome variables included stereotypical behaviors, fecal glucocorticoid metabolites (FGM), time spent underwater, oxygen storage capacity, and number of days in rehabilitation. Thus far, data analysis indicates that pups in EP displayed significantly fewer ($p=.03$) stereotypical behaviors than pups in CP and that there is a positive relationship ($p=.06$) between stereotypical behaviors and the days it took for pups to independently forage. Additionally, pups in EP spent significantly more ($p < .01$) time interacting with foraging enrichment than with structural enrichment. These results indicate that foraging-based enrichment might improve the developmental rate of rehabilitating seal pups and reduce stereotypical behaviors. This study extends the literature on enrichment to rehabilitation settings, and has implications for improving

the welfare of rehabilitating seal pups, reducing the costs of rehabilitation, and increasing the likelihood of survival of stranded seals that are returned to the ocean.

Submitted By
Email Address

Karli Chudeau
chude001@cougars.csusm.edu

Enhanced Cataloguing of Halogenated Organic Compounds in Marine Mammals of the Southern California Bight Using a Non-targeted Analytical Method

Jennifer M. Cossaboon, Nathan G. Dodder, Susan J. Chivers, David W. Weller, Kerri Danil, Keith A. Maruya, and Eunha Hoh

Due to their long lifespans and large blubber stores, marine mammals are excellent sentinels for monitoring lipophilic, bioaccumulative, and persistent organic contaminants as they become present in marine food webs. Non-targeted analytical methods detect a wide range of both known and previously unidentified contaminants, and therefore provide a more comprehensive assessment of contaminant exposure compared to targeted monitoring. Well-preserved archived samples can be analyzed to evaluate temporal and geographic trends. Therefore, selecting ideal messenger species for contaminant monitoring is a priority for retrospective, current, and future screening efforts. A full inventory of anthropogenic and naturally occurring halogenated organic compounds (HOCs) was generated from five full-depth blubber samples from each of five Southern California Bight (SCB) marine mammal species using comprehensive two-dimensional gas chromatography coupled to time-of-flight light mass spectrometry (GC×GC/TOF-MS) and compared to an existing HOC profile for the common bottlenose dolphin. Cetaceans were found to accumulate substantially more and diverse structural classes than pinnipeds, with an average of 61 HOCs detected in the blubber of the long-beaked common dolphin, short-beaked common dolphin, and Risso's dolphin compared to an average of 15 in the California sea lion and harbor seal. The higher total number of HOCs, including dichlorodiphenyltrichloroethane (DDT) related compounds, polychlorinated biphenyls, and polybrominated diphenyl ethers, in cetacean blubber may be due to differences in prey preferences, life history strategies, and/or enzyme-mediated metabolism. The cetacean non-targeted profiles also contained more halogenated natural products and unknown compounds than those of the pinniped species, further supporting the selection of cetacean species as more effective sentinels for biomonitoring. While the previously analyzed common bottlenose dolphin samples contained > 200 HOCs, indicating that they represent the best sentinel species in the SCB, the limited availability of full-depth blubber samples is prohibitive from an ongoing research perspective. Until research and development of ways to use smaller remotely collected biopsy samples from live animals is completed, long- and short-beaked

common dolphins serve as effective sentinels for the SCB due to readily available sample material. The detection of largely uninvestigated and previously unidentified contaminants reported here aid in the identification of emerging contaminants before they become an ecological threat, allowing researchers and managers to take a proactive approach to environmental monitoring.

Submitted By Jennifer Cossaboon
Email Address jenn.cossaboon@gmail.com

Marine algal toxins and their vectors in southern California cetaceans

Kerri Danil, Michelle Berman, Elizabeth Frame, Antonella Preti, Tod Leighfield, Spencer Fire, Kathi Lefebvre

We present the first synthesis of domoic acid (DA) and saxitoxin (STX) detections in the feces and urine of stranded and bycaught southern California cetaceans, over a 15 year period (2001–2015), along with corresponding stomach content data. DA was detected in 13 out of 19 cetacean species tested and was most often detected in harbor porpoise (*Phocoena phocoena*) (81.8%, n=22) and long-beaked common dolphins (*Delphinus capensis*) (72.7%, n=198). The mean DA concentration for cetaceans off Point Conception was higher ($P < 0.001$) than those off Los Angeles and San Diego counties (17,391 ng/g vs. 678.5 ng/g) and is likely a result of greater productivity and consequentially higher *Pseudo-nitzschia* spp. cell counts in that region. Higher DA levels in *D. capensis* were associated with a greater proportion of northern anchovy (*Engraulis mordax*) in the diet, indicating it is a primary vector of DA. Fifty-three percent of *D. capensis* that died from trauma (e.g. fishery bycatch) tested positive for DA with concentrations ≤ 112.1 ng/g and 49.7 ng/g in feces and urine, respectively. These levels are not considered toxic and suggest that the population is often exposed to low concentrations of DA. STX does not appear to be as pervasive as DA. Out of 120 specimens collected from 9 different species, only 3 *D. capensis* and 1 *B. physalus* tested positive for STX (maximum=7.4 ng/g in feces, 17 ng/g in urine). The relative abundance of Pacific sardine (*Sardinops sagax*) (59%) in the stomachs of these specimens indicate that this fish is likely the primary vector of the detected STX.

Submitted By Kerri Danil
Email Address Kerri.Danil@noaa.gov

Urogenital carcinoma: A common cancer in California sea lions (*Zalophus californianus*) serves as a comparative model for studying viral oncogenesis

Alissa C. Deming, James F. X. Wellehan, Rowan Milner, Galaxia Cortés-Hinojosa and Frances M. D. Gulland

Over the past 30 years, California sea lions (*Zalophus californianus*) have been found to have an extremely high incidence of urogenital carcinoma. This cancer has been strongly associated with a sexually transmitted gammaherpesvirus, Otarine herpesvirus 1 (OtHV1). Formation of a primary tumor occurs in the cervix or penis, followed by aggressive metastasis, resulting in death or stranding of the animal. The purpose of this study is to sequence the genome of OtHV1 and determine if there are any known viral oncogenes that could be responsible for the neoplastic changes. The high incidence of urogenital carcinoma in California sea lions provides a unique opportunity to study naturally occurring cancer in non-laboratory animals; giving insight into viral carcinogenesis in an immune competent host.

Using OtHV1 PCR positive cervical tumor tissue collected during necropsy of a stranded California sea lion with histologically confirmed urogenital carcinoma, next generation sequencing was performed to obtain the full genome of OtHV1. Potentially oncogenic viral genes were identified by comparing the OtHV1 genome with Kaposi sarcoma-associated herpesvirus (KSHV) and Epstein-Barr virus (EBV), two well-studied gammaherpesvirus responsible for virally induced neoplasms in humans. Additionally, the genome of a very similar, but non-oncogenic, gammaherpesvirus found in Northern fur seals (*Callorhinus ursinus*), Otarine herpesvirus 4, was also sequenced to compare the genomes for potential clues in OtHV1 oncogenesis.

Two known viral oncogene homologs were identified in OtHV1, viral B-cell lymphoma 2 gene (vBCL2) and viral Fas-associated death-like interleukin-1 beta-converting enzyme-inhibitory protein (vFLIP). Both viral genes are important host-derived oncogenes found in some gammaherpesviruses known to induce cancer in humans and animals. In KSHV and EBV, these host-derived oncogenes are thought to contribute to impairment of apoptosis, therefore play a vital role in tumorigenesis. In OtHV4, no homolog for vFLIP was found and although there was a vBCL2 homolog identified, it had an indel that may inhibit the function of this gene in OtHV4. These findings significantly strengthen the suspected oncogenic role OtHV1 plays in CSL urogenital carcinoma. Future work to develop a better understanding for the functionality of these genes and the pathophysiology of this disease may help elucidate universal mechanisms of virally induced cancers. This is a significant area of concern for human and animal health, as almost 20% of cancers are associated with oncogenic viruses.

Submitted By
Email Address

Claire Simeone (on behalf of Alissa Deming)
simeonec@tmmc.org

Lessons learned during the 2015 GFS UME with a focus on differentiating otariid species among similar sized pups and yearlings stranding in California.

Moe Flannery (1), Sue Pemberton (1), Denise Greig (1), and Tenaya Norris (2)

1. California Academy of Sciences, San Francisco, California, USA;
2. The Marine Mammal Center, Sausalito, California, USA.

In 2015, the central and southern coasts of California experienced two Unusual Mortality Events (UME). The first began in 2013 with high numbers of California sea lion (*Zalophus californianus*) pups stranding along the coast. Between January and July 2015, the same area of coastline observed 12 times the average number of stranded Guadalupe fur seals (*Arctocephalus townsendi*), a threatened species under the US Endangered Species Act. A typical stranding year in California, between 2005 and 2014, averaged eight (± 4 SD) stranded Guadalupe fur seals of all age classes (range: 1 – 14 per year). In 2015, California stranding organizations responded to 97 stranded Guadalupe fur seals (43 live, 54 dead). The majority of the stranded fur seals ($n=93$) were aged as pups or yearlings with only four individuals considered adults. During these UMEs, the overlapping stranding seasons, the high numbers of individuals, and the smaller than usual body size, made it challenging to identify pup and yearling carcasses to species. We present key characteristics used to identify all four otariid species: California sea lion, Steller sea lion (*Eumetopias jubatus*), northern fur seal (*Callorhinus ursinus*), and Guadalupe fur seal. Additionally, prior to this UME, very little was known about the dispersal of Guadalupe fur seals. The post-release movements of 11 rehabilitated individuals were tracked using satellite transmitters. The estimated locations of these animals, from offshore of northern California to north of Vancouver Island, Canada, provided valuable information about a species whose behavior and occurrence was not well known. Due to the significant range overlap among species supported by satellite telemetry, the use of a key to differentiate species across the west coast of North America will be important as these UMEs continue into subsequent years.

Submitted By
Email Address

Tenaya Norris
norrlist@tmmc.org

Parsing habitat use strategies of sympatric rorqual whales within a fjord system

Eric M. Keen, Janie Wray, James Pilkington, Kim-Ly Thompson, Chris R. Picard

Evaluating the importance of marine areas for highly mobile predators requires parsing the contributions of prey distribution, physical environment, and site loyalty to their strategies of habitat use. To understand the use of British Columbia's Kitimat Fjord System by sympatric humpback (*Megaptera novaeangliae*) and fin whales (*Balaenoptera physalus*), we sampled whale distribution and feeding effort, oceanography, and prey distribution using systematic surveys and focal follows that spanned two summers (2014 & 2015). Habitat features were found to be strongly associated with whale distribution but not with their feeding effort. Models of whale density based only on habitat features generally performed worse than models based upon prey distribution and site loyalty, especially for fin whales. Model comparison suggested that humpback whales were more responsive to prey distribution as well as oceanographic dynamics. Fin whale habitat use appears driven broadly by site fidelity to a select few of the fjord system's waterways, though within those channels they may be tracking down preferred prey conditions. When interpreted within broader contexts, findings such as these can help identify and manage critical habitat for fin whales in Pacific Canada.

Submitted By	Eric Keen
Email Address	ekeen@ucsd.edu

Drones for Whale Research

Iain Kerr, Andrew Rogan, John Graham, Christian Miller.

Ocean Alliance's Drones for Whale Research program was initiated back in 2011 under the premise that technological advancements in the field of consumer drones would lead to a new generation of powerful, flexible, but most importantly inexpensive (and therefore affordable to more researchers globally) tools. As the program has progressed it has become increasingly obvious just how wide a range of research applications these tools have. Whilst we have many ideas for the future, here we present our three most developed programs: SnotBot, EarBot and FLIRBot.

The first program, labelled SnotBot (a name successfully adopted in an effort to boost the communication/education component of the program), aimed to collect respiratory (blow) samples from whales using a drone. Ocean Alliance has focused on the idea that to get a robust understanding of a whale's health, and the impacts of anthropogenic or natural stressors on its health, researchers need to collect physical, biological samples. Current methods of collecting such samples can be expensive, subject to low sampling

rates and invasive towards the animals. SnotBot can collect physical samples at a high sampling rate without the whale knowing we are there.

EarBot is a waterproof drone which lands in the water in some proximity to a group of whales. EarBot is fixed with a hydrophone and a transmitter which beams the acoustic signal received by the hydrophone back to the boat. This offers the non-invasiveness of a fixed acoustic data collection platform with the flexibility of a vessel based platform.

FLIRBot is a drone equipped with a custom attached InfraRed camera. At present, there is a significant dearth of information on what whales do during half their lives: at night. There are already logistical issues which makes whales difficult animals to study: primarily related to their size, habitat, range and diving capabilities. Studying them at night presents even more challenges. FLIRBot, or similar technologies/applications, might help confront some of these challenges.

Submitted By	Dr. Iain Kerr
Email Address	Kerr@whale.org

Understanding Strandings and Mortality of California Sea Lion (*Zalophus californianus*) Pups in San Diego County

Madilyn Pardini

Since 2013 Southern California has been experiencing elevated strandings of California sea lion pups. Understanding what is causing these strandings may help researchers better predict when it will happen again and be better prepared to accommodate the increased numbers in rescue centers. The temporal trends of California sea lion pups are evaluated using data from the last ten years including survival rates. A body condition index was also created to evaluate the general health of the stranded pups. The equation used to calculate the body indices is mass/length. Data was collected from SeaWorld San Diego's rescue center and included numbers of strandings, weight, and length measurements. San Diego County showed a major increase in strandings starting in 2013. This increase may be related to warmer waters offshore San Diego and the subsequent decrease in sardine spawning. Sea lion pups that had higher body condition scores correlated with a lower rate of mortality. Body condition scores can be used to quickly assess the general health of stranded pups. Comparing the data collected by SeaWorld San Diego to wild population data could further strengthen the results and the use of body condition as an indicator of health.

Submitted by
Email address

Madilyn Pardini
madilypardini@sandiego.edu

Reducing U.S. West Coast Whale Entanglements

Lauren Saez, Dan Lawson, Justin Viezbicke, Justin Greenman, Kristin Wilkinson, and Christina Fahy

Large whale entanglement in fishing gear off the U.S. West Coast is a priority for NOAA's National Marine Fisheries Service (NMFS) because of the potential impacts to both whales and fisheries. In response to recent increases in whale entanglements off California, Oregon, and Washington, NMFS West Coast Regional Office is moving forward with multiple initiatives to address this situation and develop solutions that may reduce whale entanglements off the U.S. west coast. Recent initiatives include: participation in the California Dungeness crab whale entanglement working group, trainings to increase the capacity of the whale entanglement response network, outreach meetings with the fishing community, facilitation of research projects related to understanding whale distributions, and identifying avenues for improving fishing gear and practices to minimize the risks of entanglements. The open forum in the public outreach meetings and the California working group has helped foster a successful exchange of information and ideas between various stakeholders that has been largely welcomed and well received. These encouraging results support increasing efforts to engage directly with the fishing industry across the U.S. west coast to address the problem cooperatively. By establishing collaborative relationships where the fishing community can take part in developing ideas to reduce entanglements, we hope to promote a long term successful approach with widespread buy in from the community.

Submitted By
Email Address

Lauren Saez
Lauren.Saez@noaa.gov

Is Marine Mammal Health Declining? Tracking Marine Mammal Health Trends in North America, 1972–2012

Claire A. Simeone, Frances M.D. Gulland, Tenaya Norris, Teresa K. Knowles

Marine mammals are often cited as “sentinels of ocean health” yet accessible, synthesized data on their health changes that could effectively warn of ocean health changes are rare. The objectives of this study were to 1) perform a systematic review of published cases of marine mammal disease to determine spatial and temporal trends in disease from 1972–2012, including changes in regions and taxa affected and specific causes; and 2) compare numbers of published cases of neoplasia with known, hospital–

based neoplasia records to explore the causes of discrepancy between numbers of published cases and true disease trends. Peer-reviewed literature was compiled, and data were collected from The Marine Mammal Center database in Sausalito, California for comparison of numbers of neoplasia cases. Toxicoses from harmful algal blooms appear to be increasing. Viral epidemics are most common along the Atlantic U.S. coastline, while bacterial epidemics, especially leptospirosis, are most common along the Pacific coast. Certain protozoal and fungal zoonoses appear to be emerging, such as *Toxoplasma gondii* in southern sea otters in California, and *Cryptococcus gattii* in cetaceans in the Pacific Northwest. Disease reports were most common from California where pinniped populations are large, but increased effort also occurs. Anthropogenic trauma remains a large threat to marine mammal health, through direct mortality and indirect chronic disease. Neoplasia cases were under-reported from 2003–2012 when compared to true number of cases, and over-reported in several years due to case duplication. Peer-reviewed literature greatly underestimates the true magnitude of disease in marine mammals as it focuses on novel findings, fails to reflect etiology of multifactorial diseases, rarely reports prevalence rather than simple numbers of cases, and is typically presented years after a disease first occurs. Thus literature cannot guide management actions adequately, nor inform indices of ocean health. A real-time, nationally centralized system for reporting marine mammal disease data is needed to be able to understand how marine mammal diseases are changing with ecosystem changes, and before these animals can truly be considered ‘sentinels of ocean health’.

Submitted By Claire A. Simeone
Email Address simeonec@tmmc.org

West Coast Large Whale Entanglements 2015 & 2016

Justin Viezbicke, Dan Lawson, Lauren Saez, Justin Greenman, Kristin Wilkinson

Marine mammal entanglement off the U.S. West Coast has been identified as an issue of concern by the National Marine Fisheries Service (NMFS), specifically for large whales because of the potential impacts, both to the individual and at the stock/population level. Most large whale species found along the U.S. West Coast have been observed either as entangled or with evidence of having been entangled during their lifetime. Between 2000 and 2013, an average of 10 large whale entanglements were reported per year along the U.S. west coast, with humpback (*Megaptera novaeangliae*) and gray (*Eschrichtius robustus*) whales being the species most frequently identified. Starting in 2014 there was an increase noted in entanglement reports with more than 30 and then in 2015, the total number of entangled whales reported was 61 with 49 of those reports confirmed via photo or reliable source and gear was removed from 11 whale. In 2016 the total number of reports was 70 with 48 being confirmed and gear was removed from

10 whales (includes full, partial and self-release). Over the past two years the team identified the following gear types from the entangled whales: Dungeness crab pot, sablefish pot, spiny lobster pot, spot prawn pot, a weather buoy, and gill net. This information aids in understanding the nature of the entanglement and in finding ways to prevent future entanglements. NMFS and the team are working to expand the coverage area across the entire West Coast to improve on the timeliness of responses to all received reports and collaborating with boaters, whale watching groups and fishermen to raise awareness and find methods to reduce future entanglements.

Submitted By	Justin Viezbicke
Email Address	justin.viezbicke@noaa.gov