

# MARINE MAMMAL & TURTLE DIVISION, SWFSC BIWEEKLY REPORT ON FIELDWORK, PUBLICATIONS, RESEARCH RESULTS, AND EVENTS

8 December 2023

## I. Fieldwork:

*Central California Collaborative Passive Acoustic Survey, Morro Bay, CA, 4-12 November 2023*

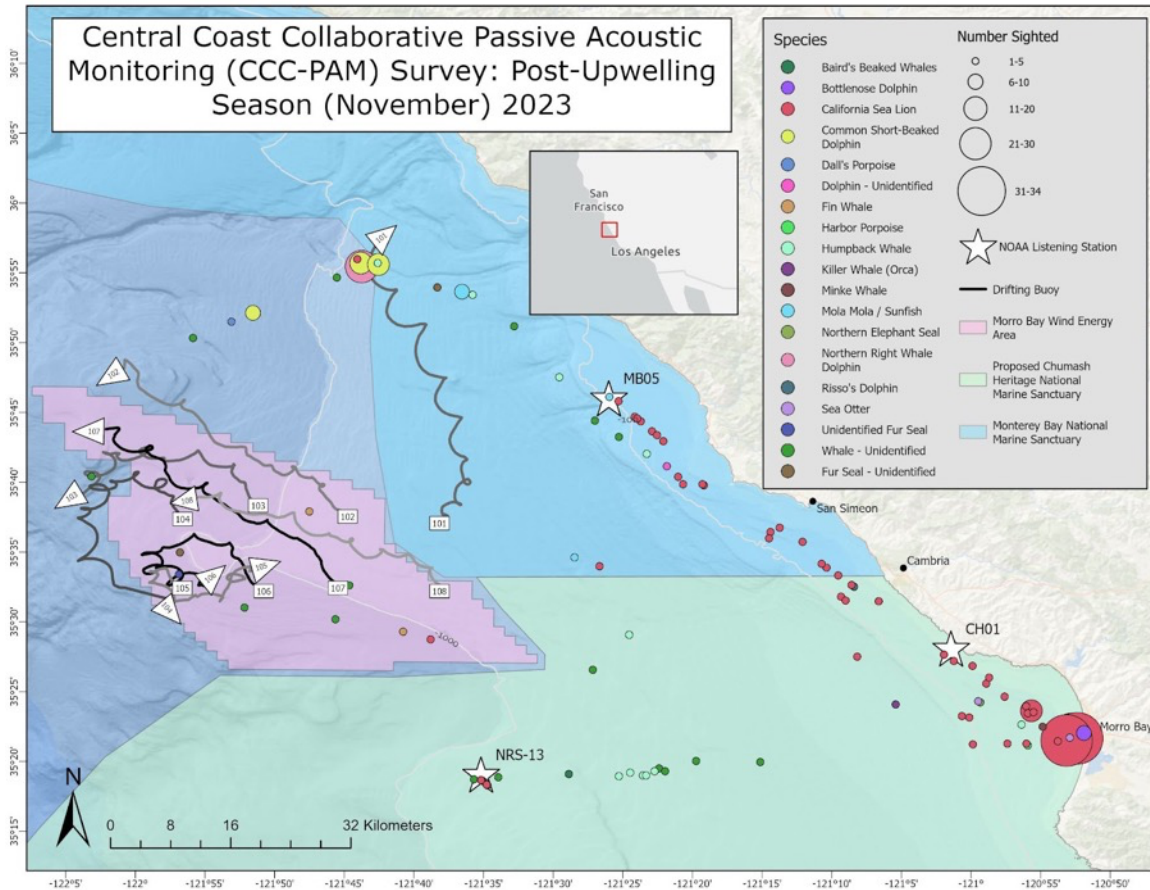
– The Southwest Acoustic Ecology Lab (SAEL) completed the Central California Collaborative “CCC” passive acoustic survey around the Morro Bay wind energy area. This collaborative trip is the third survey of 2023 and the final data collection phase for the [ADRIFT in the California Current Project](#), to be completed in spring 2024. The field effort included deploying eight (8) passive acoustic drifting buoys, servicing five (5) moored acoustic monitoring stations for National Marine Sanctuaries and NOAA Noise Reference Stations, conducting visual marine mammal and bird surveys, and deploying a baited remote underwater video system (BRUV) in collaboration with Cal Poly students. This fieldwork was a collaborative effort by NOAA’s SWFSC, NMFS, NMS, and PMEL, and it included researchers and students from NOAA, BOEM, Cal Poly, SFSU, UCSD, and Mt. Edgecumbe High School. The research completed during this survey will assist the planning and management of offshore wind energy development and the proposed Chumash Heritage National Marine Sanctuary. Contact [Anne Simonis](#) or [Shannon Rankin](#) for more information.



The ADRIFT team with their eight successfully recovered acoustic drifting buoys. Credit: Anne Simonis



Spyhopping killer whale. Credit NOAA Fisheries, Permit #22306



**Map summarizing the acoustic deployments and marine mammal sighting details from the CCC Passive Acoustic Survey. Credit: Marina Bozinovic**

*Green Turtle Ecological Research in Southern California, 30 November 2023* – The SWFSC marine turtle research team closed out the 2023 San Diego Bay Green Turtle Survey in strong form with 6 turtles captured and released, four of which were equipped with Argos-linked GPS satellite transmitters, one of which also was equipped with a detachable turtle-borne video camera (see photos below). For the 2023 season, the team tallied 60 captures of green turtles in the Bay, including 29 new turtles and 31 recaptured turtles, with recaptured individuals being first captured as far back as 1990. For this field day, turtles ranged in size from 65.4 to 86.3 cm in straight carapace length, and 42.0 to 97 kg in body weight. Three of the turtles were first-time captures, whereas two were initially captured in 2019 and June 2023. The remaining individual was a ‘SeaWorld Turtle’ that had hatched in captivity at SeaWorld San Diego and was released in 2019 into waters offshore San Diego (it had been confirmed that both parents were east Pacific green turtles). The four satellite transmitters brought the season total to nine total transmitter deployments, and the shell-mounted video camera (CATS system, Australia) deployment was the 5th of 2023. Looking ahead, the 2024 Survey will launch April 2024, and coincide with the inaugural San Diego Bay Uncrewed Aerial System (UAS) Survey led by Tomo Eguchi, Trevor Joyce, and the Cetacean Health and Life History Program’s entire UAS team. Contact [Jeff Seminoff](#) for additional information.



Clockwise from top left: 1) UCSD Senior MMTD Intern Olivia Gibbs conducting blood preparation for later isotope and hormone analysis; 2) NRC Postdoc Andrew Maurer (left) and MMTD intern Cameron Mullaney (right) with green turtle equipped with both a turtle-borne video camera and an Argos-linked GPS satellite transmitter. The camera was programmed to pop off within 36 hours of deployment; 3) NRC Postdoc Andrew Maurer with the recently recovered video camera system, recovered in south central San Diego Bay on 2 December 2023; 4) Sea turtle researchers from NMFS and the U.S. Navy aboard R/V *Mydas Touch* landing a small green turtle recently captured in the team's turtle entanglement net placed in San Diego Bay; and 5) A juvenile green turtle captured in San Diego Bay on 30 November 2023. Notice the large turtle barnacles (*Chelonibia testudinaria*) that are commonly found on turtles in oceanic waters, and indicative of a 'recent recruit' from the oceanic environment into San Diego Bay.

## II. Manuscripts accepted for publication:

Raverty, S., Duignan, P., Greig, D., Huggins, J., Burek Huntington, K., Garner, M., Calambokidis, J., Cottrell, P., **Danil, K.**, D'Alessandro, D., Duffield, D., Flannery, M., Gulland, F., Halaska, B., King, C., Lambourn, D., Lehnhart, T., Urban-Ramirez, J., Rowles, T., Rice, J., Savage, K., Wilkinson, K. & Fauquier, D. (In press). Gray whale (*Eschrichtius robustus*) post-mortem findings from December 2018 through 2021 during the Unusual Mortality Event in the Eastern North Pacific. PLOS ONE.

*Abstract* – Beginning in December 2018, increased numbers of gray whale (*Eschrichtius robustus*) strandings were reported along the west coast of Mexico, the United States, and Canada, prompting declaration of a gray whale Unusual Mortality Event (UME) by the United States National Marine Fisheries Service. Although stranding numbers declined in 2020 and 2021 from a peak in 2019, the UME is still ongoing as of spring 2023. Between

17 December 2018 and December 2021, 503 animals stranded along the west coast of North America, with 226 strandings in Mexico, 71 in California, 12 in Oregon, 56 in Washington, 21 in British Columbia, and 117 in Alaska. These strandings included 187 males, 167 females, and 149 whales of undetermined sex; and 193 adults, 194 subadults, 40 calves, 1 fetus, and 75 whales of undetermined age class. We report on 61 of the 503 carcasses (12%) that had external and internal gross necropsy and/or histopathology data: of these 61 whales, findings that contributed to death were identified in 33 (54%). Sixteen of the 61 (26%) were severely emaciated. Gross lesions of blunt force trauma consistent with vessel strike were identified in 11 of the 61 animals (18%), only two of which were emaciated. Two whales (3%) had evidence of active entanglements and one whale died from entrapment. Signs of killer whale (*Orcinus orca*) interaction were documented in 19 of the 61 animals; five were judged to be from recent interactions and three (5%) could be determined as likely to have contributed to mortality. A specific cause of death could not be identified in 28 of 61 whales (46%). Additionally, logistical challenges and the advanced state of decomposition of most examined carcasses precluded detection of potential infectious or toxic causes of morbidity or mortality. Up to 2016, the eastern North Pacific population of gray whales had generally been increasing since the cessation of historic whaling and a prior UME in 1999-2000. However, recent abundance and calf production estimates have declined, a trend that overlaps the current UME. The relative contributions of carrying capacity, environmental change, prey shifts, and infectious, toxic, and other processes to the increased gray whale mortalities have not yet been resolved. Nevertheless, the marked temporal increase in strandings for the 1999-2000 and current UME, including findings of malnutrition in some of the whales, along with low calf production, likely represents consequences of complex and dynamic ecological interactions in the ocean impacting the eastern North Pacific gray whale population.

### III. Papers published:

Wallace, B.P., Posnik, Z.A., Hurley, B.J. DiMatteo, A.D., Bandimere, A., Rodriguez, I., Maxwell, S.M. Meyer, L., Brenner, H., Jensen, M.P., **LaCasella, E.**, Shamblin, B.M., Abreu-Grobois, F.A., **Stewart, K.R.**, **Dutton, P.H.**, Barrios-Garrido, H., Dalleau, M., Dell'amico, F., Eckert, K.L., FitzSimmons, N.N., Garcia-Cruz, M., Hays, G.C., Kelez, S., Lagueux, C.J., Madden Hof, C.A., Marco, A., Martins, S.L.T., Mobaraki, A., Mortimer, J.A., Nel, R., Phillott, A.D., Pilcher, N.J., Putman, N.F., Rees, A.F., Rguez-Baron, J.M., **Seminoff, J.A.**, Swaminathan, A., Turkozan, O., Vargas, S.M., Vernet, P.D., Vila-ça, S., Whiting, S.D., Hutchinson, B.J., Casale, P., & Mast, R.B. (2023). Marine turtle regional management units 2.0: an updated framework for conservation and research of wide-ranging megafauna species. *Endangered Species Research* 52: 209–223.

*Abstract.* – Delineating spatial boundaries that accurately encompass complex, often cryptic, life histories of highly migratory marine megafauna can be a significant conservation challenge. For example, marine turtles range across vast ocean basins and coastal areas, thus complicating the evaluation of relative impacts of multiple overlapping threats and the creation of coherent conservation strategies. To address these challenges, spatially explicit 'regional management units' (RMUs) were developed in 2010 for all marine turtle species, globally. RMUs were intended to provide a consistent framework that organizes conspecific assemblages into units above the level of nesting rookeries and genetic stocks, but below the species level, within regional entities that may share

demographic trajectories because they experience similar environmental conditions and other factors. From their initial conception, RMUs were intended to be periodically revised using new information about marine turtle distributions, life history, habitat use patterns, and population structure. Here, we describe the process used to update the 2010 RMU framework by incorporating newly published information and inputs from global marine turtle experts who are members of the IUCN Marine Turtle Specialist Group. A total of 48 RMUs for 6 of 7 marine turtle species and 166 distinct genetic stocks for all 7 species are presented herein. The updated RMU framework reflects a significant advance in knowledge of marine turtle biology and biogeography, and it provides improved clarity about the RMU concept and its potential applications. All RMU products have been made open access to support research and conservation initiatives worldwide.

**Morin, P.A., Martien, K., Lang, A.R., Hancock-Hanser, B., Pease, V.L., Robertson, K.M., Sattler, M., Slikas, E., Rosel, P.E., Baker, C.S., Taylor, B.L., & Archer, F.I. (2023).** Guidelines and quantitative standards for improved cetacean taxonomy using full mitochondrial genomes. *Journal of Heredity* 114:612-624. <https://doi.org/10.1093/jhered/esad049>

*Abstract* – In many organisms, especially those of conservation concern, traditional lines of evidence for taxonomic delineation, such as morphological data, are often difficult to obtain. In these cases, genetic data are often the only source of information available for taxonomic studies. In particular, population surveys of mitochondrial genomes offer increased resolution and precision in support of taxonomic decisions relative to conventional use of the control region or other gene fragments of the mitochondrial genome. To improve quantitative guidelines for taxonomic decisions in cetaceans, we build on a previous effort targeting the control region and evaluate, for whole mitogenome sequences, a suite of divergence and diagnosability estimates for pairs of recognized cetacean populations, subspecies and species. From this overview, we recommend new guidelines based on complete mitogenomes, combined with other types of evidence for isolation and divergence, which will improve resolution for taxonomic decisions, especially in the face of small sample sizes or low levels of genetic diversity. We further use simulated data to assist interpretations of divergence in the context of varying forms of historical demography, culture, and ecology.

**Carretta, J.V., Greenman, J., Wilkinson, K., Saez, L., Lawson, D., & Viezbicke, J. (2023).** Sources of human-related injury and mortality for U.S. Pacific West Coast marine mammal stock assessments, 2017-2021. NOAA Technical Memorandum NMFS-SWFSC-690. <https://swfsc-publications.fisheries.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-690.pdf>

*No abstract*

**Forney, K. A., Benson, S.R., & Becker, E.A. (2023).** A habitat-based spatial density model for harbor porpoise (*Phocoena phocoena*) off Oregon and Washington based on 2021-2022 aerial surveys. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-691. <https://doi.org/10.25923/xap3-r721>

*Abstract* – This study presents new abundance estimates for harbor porpoise, *Phocoena phocoena*, within shelf waters of the outer coasts of Oregon and Washington, USA. Habitat-based spatial density models were developed to estimate the abundance of three harbor porpoise stocks in this region, based on aerial surveys conducted during August-September 2021 and 2022. Model results and spatial density maps show the greatest

harbor porpoise densities within shallow waters and in waters with more uniform sea surface temperatures in the range of 14-16°C. The model-estimated abundance of 22,074 (CV=0.39) harbor porpoise within the range of the Northern Oregon/Washington Coast stock is very similar to the previous estimate of 21,487 (CV = 0.44) derived from 2010-2011 aerial surveys. A newly proposed Central Oregon stock, recommended for designation based on recent genetic studies, was estimated to contain 7,492 (CV = 0.42) harbor porpoises. The abundance of harbor porpoises within the reduced range of the Northern California/Southern Oregon stock, from which the Central Oregon stock was split, was estimated to be 15,303 (CV = 0.57). Combined these results provide updated abundance estimates for three porpoise stocks and the first habitat-based density estimates for harbor porpoises along the U.S. West Coast.

Oleson, E.M., Bradford, A.B., & **Martien, K.K.** (2023). Developing a management area for Hawai'i pelagic false killer whales. NOAA Technical Memorandum NMFS-PIFSC-150. 25pp. <https://doi.org/10.25923/c9qv-2v95>

*No Abstract*

Orbach, D.N., Gorter, U., & **Mesnick, S.** (2023). *Sexual Anatomy of Female Cetaceans: Art and Science Contribute Insights into Functionality*. In: B. Würsig & D.N. Orbach (Eds.), *Sex in Cetaceans* (pp. 85-102). Springer, Cham. [https://doi.org/10.1007/978-3-031-35651-3\\_5](https://doi.org/10.1007/978-3-031-35651-3_5)

*Abstract* – The relationship between sexual selection and the diversity and rapid evolution of male genitalia has been well-documented across many animal taxa, while the morphological variability of female genitalia has received comparatively little attention. Female whales, dolphins, and porpoises possess unusual flaps, folds, and blind sacs in their vaginas, which vary among taxa and may serve several functions. We review the relationship between form and function of these unusual vaginal structures in cetaceans and discuss evidence that supports or refutes various functional hypotheses. A compilation of three-dimensional vaginal endocast models, contemporary high-resolution photographs of dissected reproductive tracts, and detailed anatomical illustrations ranging over 175 years are used to highlight the diversity of forms and fill in gaps in taxonomic knowledge. We discuss the complementary nature of anatomical illustrations and modern analytical and visual tools and how they can help us better understand the evolution of such unusual morphological structures. We identify opportunities for future studies in cetacean genital evolution and discuss the insights they may provide into mating strategies of cetaceans.

Alves, F., **Mesnick, S.L.**, Rosso, M., & Pitman, R.L. (2023). *Beaked Whale Sexual Dimorphism, Mating Strategies, and Diversification*. In: B. Würsig & D.N. Orbach (Eds.), *Sex in Cetaceans* (pp. 385-413). Springer, Cham. [https://doi.org/10.1007/978-3-031-35651-3\\_17](https://doi.org/10.1007/978-3-031-35651-3_17)

*Abstract* – Beaked whales (Ziphiidae), with 24 currently recognized species, are arguably the least known large animals on the planet, despite being widespread and at times abundant. Mesoplodon, with 16 currently recognized species, is by far the most speciose cetacean genus. Recent technological and taxonomic advances, long-term photographic-identification studies, and historical whaling data have allowed new insights into their social and mating strategies and how these may have driven diversification within the family. In most beaked whales, only adult males have exposed teeth—a single “tusk” erupts from each lower jaw and is used in contests to determine access to breeding

females. How forcefully males of different species engage conspecifics varies widely based mainly on differences in tooth size/ placement and jaw structure. We compiled data on key dimorphic traits including beak modification, tooth size and location, and prevalence of scarring in adults, for all beaked whales. More detailed information is given for the four best-studied species—northern bottlenose whale and Baird’s, Cuvier’s, and Blainville’s beaked whales. We then compared these traits with what is known about their social organization and reproductive anatomy to make inferences about mating strategies. More aggressive species tend to occur in small groups with only one dominant adult male present and have small testes relative to body size, suggesting that male reproductive success is largely determined by precopulatory contest competition and female defense polygyny. Less aggressive species tend to occur (at least at times) in larger, mixed-sex groups with multiple adult males present, and females may mate with multiple males, which favors postcopulatory sperm competition and polygynandry. We further discuss how conflicting pressures arising from males using their beaks for both feeding and fighting could have sparked an adaptive radiation in tooth development and beak morphology among beaked whales, especially within Mesoplodon, which would have had implications for male-male competition, social structure, sexual strategies, and, perhaps ultimately, evolutionary divergence and speciation within this group.

**Mesnick, S.L.,** Reeves, R.R., Wade, P.R., Brakes, P., & Hersh, T.A. (2023). *Cetacean Sociality, Reproduction, and Conservation*. In: B. Würsig & D.N. Orbach (Eds.), *Sex in Cetaceans* (pp. 571-602). Springer, Cham. [https://doi.org/10.1007/978-3-031-35651-3\\_24](https://doi.org/10.1007/978-3-031-35651-3_24)

*Abstract* – The world’s cetaceans (like most of biodiversity) are in crisis, and the need for well-informed conservation action has never been greater. Scientific advancements over the last few decades have provided much insight on the reproductive anatomy, physiology, and behavior of whales, dolphins, and porpoises. Our goal in this chapter is to link scientific findings to practical actions that will improve resilience and conservation prospects of cetaceans. We provide an overview of human activities and their impacts on cetacean reproduction and review the progress (or lack thereof) toward conserving species, with a particular focus on those for which sociality and culture may be important to population recovery. For all cetaceans, it is important to preserve or, where necessary and feasible, reestablish the ecological, demographic, and social conditions that allow the animals to reproduce successfully in their natural environment. The better we understand and integrate knowledge concerning cetacean reproductive health into conservation strategies, the better the chances of achieving species recovery, protecting biodiversity, and preventing future extinctions.

Kennedy, A.S., Carroll, E.L., Zerbini, A.N., Baker, C.S., Bassoi, M., Beretta, N.A., Buss, D.L., Calderan, S., Cheeseman, T., Collins, M.A., Costa-Urrutia, P., Ensor, P., Groch, K., Leaper, R., **Olson, P.**, Passadore, C., Riet-Sapriza, F.G., Vermeulen, E., Vilches, F., Wood, A.G., & Jackson, J.A. (2023). Photo-identification and satellite telemetry connect southern right whales from South Georgia Island (Islas Georgias del Sur) with multiple feeding and calving grounds in the southwest Atlantic. *Marine Mammal Science*, 1–19. <https://doi.org/10.1111/mms.13089>

*Abstract* – The sub-Antarctic waters of South Georgia Island (Islas Georgias del Sur, SG/IG) are a regularly visited feeding ground for southern right whales (*Eubalaena australis*, SRW) in the southwest Atlantic. Satellite telemetry and photo-identification records were compared to better understand the role of SG/IG in the SRW migratory

network. We present the first insights from SRW satellite-tracked from the SG/IG feeding ground, habitat use patterns in the Scotia Arc, and movements to Antarctic habitats. Photo-identification comparisons to calving and feeding areas across the South Atlantic and a review of sightings of cetaceans reported from Bird Island (west of SG/IG) since 1979 illuminate long-term habitat use patterns in SG/IG. We present the first recorded migratory movement between SG/IG and multiple countries: Argentina, Uruguay, and Brazil. Photo-identification (1) linked SG/IG to a female SRW with a long-term sighting history in Brazil, and (2) provided the first match between SG/IG and the western Antarctic Peninsula, suggesting the latter could extend the feeding area for southwest Atlantic SRW. Satellite tracking and opportunistic sightings suggest that shelf and coastal waters west of SG/IG represent an important multi-season SRW feeding habitat and add to our overall understanding of habitats and ranges occupied by recovering southwest Atlantic SRW.

#### IV. Research findings:

#### V. Press:

#### VI. Local events - meetings or events hosted virtually:

*Tenth California Islands Symposium, Ventura, CA, 6-9 November 2023* – Beth Jaime and Alex Curtis (both MMTD/CMAP) attended the symposium, which provides an opportunity for researchers across a wide range of disciplines to connect and share their work on California islands. Alex Curtis presented the talk “Pelagic Forage from a Predator’s Perspective: A 42-year Quarterly Time Series of Sea Lion Diet from the Southern Channel Islands”.

*San Diego Natural History Museum, 14 November 2023* – For more than a decade, members of MMTD has provided the San Diego Natural History Museum “NAT Whalers” - museum-trained volunteer naturalists - with overviews of the biology and ecology of marine mammals and the science that the MMTD conducts. Beth Jaime (MMTD/CMAP) gave a virtual presentation to the Whalers on “Southern California Pinnipeds.” This public outreach and education help the SDNHM meet its mission to “inspire in all a respect for nature and the environment.”

*Sea Turtles of the Pacific, Bay Park Elementary School, San Diego, CA, 13 November 2023* – Cali Turner Tomaszewicz with the Marine Turtle Ecology & Assessment Program, presented the talk, "Sea Turtles of the Pacific" at a local elementary school highlighting the leatherback and loggerhead sea turtles which both migrate across the Pacific during their lifetimes. This is part of an in-progress project using these trans-Pacific migrants to connect students and scientific concepts, using sea turtles. Highlighted topics included MTEAP's work on the Species in the Spotlight, the Pacific Leatherbacks (<https://www.fisheries.noaa.gov/tags/leatherback-turtle>); and the collaborative project "Loggerhead





STRETCH" (<https://www.loggerheadstretch.org/>) featuring North Pacific Loggerheads.

*STEM Panel, Palomar College, San Marcos, CA, 17 November 2023* – Eric Archer participated in a STEM Panel for students at Palomar College. The six-member panel was composed of representatives from the fields of computer science, aerospace, engineering, and biology. The panel spent two hours discussing their career paths and current work and advising students interested in a variety of STEM careers.

**VII. Travel - meetings attended virtually:**

**VIII. Awards, grants, and recognition:**

**IX. Other of note:**

*Stranding summary for the weeks of 8 November-5 December 2023*

Cetaceans: 1

- On 20 November, Amanda Brooks (volunteer), Kerri Danil, Lexi Mena, Keiko Sherman, and Elyse Wurster participated in a response to and/or the necropsy of a moderately decomposed adult male long-beaked common dolphin that stranded at Moonlight Beach, Encinitas. Level A data, a biopsy, blubber, teeth, stomach, gonads, liver, and the skull were collected for life history studies. No cause of death could be determined due to decomposition.

Pinnipeds: 9 (no response)

Turtles: 0



**Elyse Wurster works with lifeguards to remove a deceased dolphin off of the beach and transfer it to SWFSC for examination**

**X. Where-about of Division Director:**

La Jolla