



Oregon State University Marine Mammal Institute

MARINE MAMMAL INSTITUTE MONTHLY NEWS

The MMI News is a platform for communicating the activities and accomplishments of the faculty, staff, and students of the OSU Marine Mammal Institute. Toward the end of each month, we'll share our recent and upcoming fieldwork, publications, news items, workshops, outreach, awards, and more.

March–April 2024

RESEARCH UPDATES

Movement and Habitat Use of Endangered Central America and Threatened Mexican Distinct Population Segment of Humpback Whales, Bahia de Banderas México, January 31–February 12: For the second year, we deployed 18 satellite tags on humpback whales from the Central American and Mexican subpopulations of humpback whales in their breeding areas. In addition to tag deployments, echosounders were used to estimate prey densities and distributions, and drone photogrammetry

images were collected to estimate the body condition and growth rates of humpback whales.

Charlene Pérez will be using this year's and last year's satellite data to investigate the overlap between whale distribution and vessel traffic in Pacific Mexico, assess the risk of ship strikes in U.S. versus Mexican waters, and determine whether vessel traffic and small-scale fisheries near human population centers pose a risk to these distinct population segments. **Ally Kane** will be using lunge-feeding detections reported by the tags to study the foraging ecology of these two humpback populations (Central America and Mexico) in Bahia de Banderas, where humpbacks have been reported feeding intensively during the winter season, and more broadly throughout the Mexican breeding areas. The project aims to understand how supplemental



feeding in the breeding grounds may benefit humpback whales, and how anthropogenic impacts may negatively affect these threatened and endangered subpopulations. The field team included MMIs **Ladd Irvine, Robert Pitman, Lisa Ballance, and Jay Barlow**. Special thanks to Ed Amonsén and

Katherine Voss for partial funding support! Pls: **Joshua Stewart**, joshua.stewart@oregonstate.edu, and **Daniel Palacios**, daniel.palacios@oregonstate.edu.

Fin whale tagging to understand ship strike risk, Caleta de Chañaral Chile, March 2–11: Suction cup tags were deployed (and recovered!) on 11 fin whales off Northern Chile near Isla Chañaral with colleagues from the Universidad de Concepción and the Centro de Estudios Avanzados en Zonas Áridas. Of note, we recorded the deepest dive so far in the region (260 m) and had a tag last over 24 hours on one whale. The overall project is to assess the risk of ship strikes to blue whales in southern Chile, and to fin whales in northern Chile, by examining day–night differences in dive depths and sound levels. Fin whales feed throughout the southern hemisphere summer near a recently described submarine canyon and can be seen from shore feeding on layers of krill. This project was due to start last year but was delayed due to avian flu, which impacted not just birds but also sea lions and fur seals in the area. The project also trains Chilean students in marine mammal field work and data analysis. This project is funded by [Oregon Gray Whale License Plate](#) funds. Pls: **Kate Stafford** kate.stafford@oregonstate.edu, Susannah Buchan, and Carlos Olavarria.



Marine Predator and Prey Response to Climate Change: Synthesis of Acoustics, Physiology, Prey, and Habitat in a Rapidly Changing Environment ([SAPPHIRE](#)), South Taranaki Bight, Aotearoa New Zealand, July 2023–June 2027: The SAPPHIRE project's inaugural 2024 field season took place January 28–February 16. The project aims to understand the impacts of climate change on blue whales and krill by investigating their health under variable environmental conditions. To assess their health, however, a crucial first step is required: finding krill and whales! The South Taranaki Bight (STB) is a known foraging ground where blue whales typically feed on krill found in the cool and productive upwelled waters (see the [OBSIDIAN](#) project). This year, however, both krill and blue whales were notoriously absent from the STB. Contrary to the usual krill swarms, we observed abundant salps, a gelatinous plankton species that blue whales do not eat. After diligent searching and ultimately relocating to a different region, we were rewarded by capturing krill for on-board experiments and measurements of their nutritional quality. We thankfully located blue whales to conduct drone flights for photogrammetry measurements and collect fecal samples for hormone analysis. Additionally, we deployed two hydrophones that will record blue whale vocalizations for the next year. While this field season was certainly unexpected, our experiences emphasize the pay-off of being adaptable in the field to maximize time, money, and data collection efforts (during our 3-week cruise, we slept in 10 different ports or anchorages, added an aerial survey to expand our coverage, and made adjustments to broaden our originally planned study area). Oftentimes, abnormal field seasons that are initially perplexing provide the greatest insights into larger patterns. It will be fascinating to compare this year's blue whale and krill data in the greater context of environmental variability. A summary of the 2024 field

season can be found on the [GEMM Lab blog](#). Funding for this project is provided by the National Science Foundation. PIs: **Leigh Torres** (Leigh.Torres@oregonstate.edu), **Dawn Barlow**, **KC Bierlich**, Kim Bernard, and **Holger Klinck**.



Above left: A blue whale comes up for air (as seen from a drone piloted by KC Bierlich). Above right: Kim Bernard, Leigh Torres, KC Bierlich, and Dawn Barlow survey from the flying bridge of the R/V Star Keys.

Stranding Summary

Strandings recorded by **Jim Rice** and **Maya Bingham** (Oregon Marine Mammal Stranding Network) February 14–March 25, 2024:

Common Name	Strandings	Live Entanglements	Sent to Rehab	Necropsies	Euthanized	Calls Received
California sea lion	11	1	1	0	0	29
Guadalupe fur seal	1	0	0	0	0	1
harbor porpoise	2	0	0	1	0	3
harbor seal	9	0	0	1	1	17
loggerhead sea turtle	2	0	0	0	0	2
northern elephant seal	1	0	0	0	0	11
olive ridley sea turtle	3	0	0	0	0	3
Steller sea lion	4	0	0	0	0	5
striped dolphin	1	0	0	0	0	1
unidentified cetacean	1	0	0	0	0	2
unidentified pinniped	6	0	0	0	0	7
Total	41	1	1	2	1	81

View a map showing the locations of strandings over the last six months at <https://beav.es/qR6>

Affiliate Faculty Update

Robert (Bob) Pitman — I have been a MMI affiliate since 2020 (and married to the current MMI Director since 1994!). Prior to moving to Newport, I worked for almost 40 years as a marine ecologist for NOAA Fisheries in La Jolla, California, participating in over 100 marine bird and mammal survey cruises around the world. For 20 years, I conducted research on killer whales in the Arctic, Australia, and Antarctica. Recently I have become intrigued with beaked whales. I have published over 110

scientific papers and book chapters on various aspects of marine life and am currently working with colleagues on the 3rd edition of our *Marine Mammals of the World* field guide. I keep a busy field schedule. This year, **Lisa Ballance** and I conducted research in Bahia de Banderas, Mexico, and obtained the first confirmed recordings of pygmy beaked whale vocalizations (with Mexican colleagues and **Josh Stewart, Jay Barlow, and Ladd Irvine**). In May, I will spend 3 weeks in the northern Gulf of Mexico checking on the status of the critically endangered vaquita porpoise (last year we sighted only 10 individuals). In June, I will join an MMI team for 3 weeks off Baja California on the R/V *Pacific Storm* to search for what we believe might be Perrin's beaked whale — known from 6 strandings in California and never identified alive in the wild. In August or September, Lisa and I hope to join a marine mammal survey in the South China Sea with Chinese colleagues to look for Deraniyagala's beaked whale. I am co-author on a paper (currently in review) that reports the first live sightings of this enigmatic deep diver. My life goal is to see all of the world's cetaceans alive in the wild. (At this writing, I have seen 89 of 96 species; most of the missing species have never been identified alive in the wild.) When not at sea or behind my computer, I tend to my garden and pal around with our son Sprocket (a 7-lb Maltese).



PUBLISHED MANUSCRIPTS

Attard C. R. M., Sandoval-Castillo J., Lang A. R., Vernazzani B. G., **Torres L. G.**, Baldwin R., Jenner K. C. S., Gill P. C., Burton C. L. K., Barceló A., Sironi M., Jenner M.-N. M., Morrice M. G., Beheregaray L. B., & Möller L. M. (2024). Global conservation genomics of blue whales calls into question subspecies taxonomy and refines knowledge of population structure. *Animal Conservation*, <https://doi.org/10.1111/acv.12935>

Abstract: Blue whales (*Balaenoptera musculus*) are the largest living animal and, like other baleen whales, became endangered due to whaling. Here, we used population genomics to infer the number, distribution and other characteristics of subspecies and populations. We used the largest DNA dataset in blue whales, both in terms of genomic markers (16,661 SNPs and mtDNA) and geographic coverage (n = 276 for SNPs; n = 531 for mtDNA). We found greatest divergence among the eastern Pacific, Indo-western Pacific and Antarctic blue whales. There were indications that natural selection in different environments promoted divergence among these groupings. Within these regions, there was divergence between the eastern North and eastern South Pacific, and among the eastern Indian Ocean, the western South Pacific and the northern Indian Ocean. There was no divergence within the Antarctic. These findings are consistent with the current classification of Antarctic and Indo-western Pacific blue whales in the Southern Hemisphere as different subspecies but call into question the subspecies taxonomy of eastern Pacific blue whales. The study shows that opposite breeding seasons on either side of the equator do not necessarily inhibit connectivity across the equator, and reinforces that population structure needs to be well understood to conserve the diversity within species.

Ávila, J. V. C., Ticktin, T., Steward, A., Giehl, E. L. H., **Cantor, M.**, & Clements, C. (2024). Recovery of local agrobiodiversity after an extreme flood in Amazon floodplains. *Biological Conservation*. 292, 110536. <https://doi.org/10.1016/j.biocon.2024.110536>

Abstract: Agrobiodiversity is economically, socially, culturally, and ecologically important for resilience of local communities and their agroecosystems. We identified an extreme flood impact on Alpha and Beta agrobiodiversity before, immediately after and two years after the largest flood ever recorded in three different floodplain types along the middle Solimões River in

Amazonia. We found that palms and trees, and species native to Brazil, had higher survival rates in all three floodplain types. The low várzea showed the most expressive losses of ethnospecies and manioc Alpha diversity among the floodplain types; ethnospecies original diversities were not recovered even two years after the flood, and manioc had the slowest recovery. Ethnospecies Beta diversity was relatively homogeneous among floodplain types before the flood; after the extreme flood more heterogeneity was observed. These results highlight the vulnerability of local agrobiodiversity in the face of extreme climatic events, which drastically affect local food sovereignty and income sources.

Calambokidis, J., **Kratofil, M. A., Palacios, D. M., Lagerquist, B. A.,** Schorr, G. S., Hanson, M. B., Baird, R. W., Forney, K. A., Becker, E. A., Rockwood, R. C., & Hazen, E. L. (2024). Biologically Important Areas II for cetaceans within U.S. and adjacent waters — West Coast Region. *Frontiers in Marine Science*, 11. <https://doi.org/10.3389/fmars.2024.1283231>

Abstract: Here we update U.S. West Coast Biologically Important Areas (BIAs) that were published in 2015 using new data and approaches. Additionally, BIAs were delineated for two species that were not delineated in the 2015 BIAs: fin whales and Southern Resident killer whales (SRKW). While harbor porpoise BIAs remained the same, substantial changes were made for other species including identifying both larger overall areas (parent BIAs) and smaller core areas (child BIAs). For blue, fin, and humpback whales we identified, delineated, and scored BIAs using the overlap between the distribution and relative density from three data sources, leveraging the strengths and weaknesses of these approaches: 1) habitat density models based on Southwest Fisheries Science Center (SWFSC) line-transect data from systematic ship surveys conducted through 2018, 2) satellite tag data from deployments conducted by three research groups, and 3) sightings of feeding behavior from non-systematic effort mostly associated with small-boat surveys for photo-identification conducted by Cascadia Research Collective. While the previous BIAs were based solely on a more subjective assignment from only the small boat sightings, here we incorporate the other two data sources and use a more rigorous, quantitative approach to identify higher density areas and integrate the data types. This resulted in larger, better-supported, objective BIAs compared to the previous effort. Our methods are also more consistent with the delineation of BIAs in other regions. For SRKWs, the parent BIA was based on a modification of the Critical Habitat boundaries defined by the National Oceanographic and Atmospheric Administration (NOAA) and the Department of Fisheries and Oceans (DFO) Canada; a core BIA highlighting areas of intensified use was identified using both NOAA's Critical Habitat and kernel density analyses of satellite tag data. Gray whale BIAs were re-evaluated for the migratory corridor of Eastern North Pacific gray whales, for Pacific Coast Feeding Group feeding areas, and for gray whales that feed regularly in Puget Sound.

Cheeseman, T., **Barlow, J.,** Acebes, J. M., Audley, K., Bejder, L., Birdsall, C., Bracamontes, O. S., Bradford, A. L., Byington, J., Calambokidis, J., Cartwright, R., Cedarleaf, J., Chavez, A. J. G., Currie, J., Castro, R. C. D., Weerdt, J. D., Doe, N., Doniol-Valcroze, T., Dracott, K., ..., **Hayslip, C., ... , Palacios, D. M.,** ... & Clapham, P. (2024). Bellwethers of change: population modelling of North Pacific humpback whales from 2002 through 2021 reveals shift from recovery to climate response. *Royal Society Open Science*, 11(2), 231462. <https://doi.org/10.1098/rsos.231462>

Abstract: For the 40 years after the end of commercial whaling in 1976, humpback whale populations in the North Pacific Ocean exhibited a prolonged period of recovery. Using mark–recapture methods on the largest individual photo-identification dataset ever assembled for a cetacean, we estimated annual ocean-basin-wide abundance for the species from 2002 through 2021. Trends in annual estimates describe strong post-whaling era population recovery from 16 875 ($\pm$ 5955) in 2002 to a peak abundance estimate of 33 488 ($\pm$ 4455) in 2012. An apparent 20% decline from 2012 to 2021, 33 488 ($\pm$ 4455) to 26 662 ($\pm$ 4192), suggests the population abruptly reached carrying capacity due to loss of prey resources. This was particularly evident for humpback whales wintering in Hawai'i, where, by 2021, estimated

abundance had declined by 34% from a peak in 2013, down to abundance levels previously seen in 2006, and contrasted to an absence of decline in Mainland Mexico breeding humpbacks. The strongest marine heatwave recorded globally to date during the 2014–2016 period appeared to have altered the course of species recovery, with enduring effects. Extending this time series will allow humpback whales to serve as an indicator species for the ecosystem in the face of a changing climate.

Duporge, I., Lee, R., Eweida, A., Mackelworth, P., Ten, S., Alghamdi, A., Alkhamis, R., Cochran, J., Lee, S., & **Klinck, H.** (2024). Passive acoustic monitoring and visual sighting survey of cetacean occurrence patterns in the Kingdom of Saudi Arabia. *Marine Mammal Science*, e13113. <https://doi.org/10.1111/mms.13113>

Abstract: The available data on occurrence patterns of cetaceans in the Red Sea area of the Kingdom of Saudi Arabia is very limited. The dearth of information is of pressing conservation concern as the coastline is undergoing rapid development as part of the Kingdom's effort to diversify its national economy. To understand how these developments will impact cetaceans in the region, the first large-scale acoustic and visual survey in the Kingdom's part of the Gulf of Aqaba and the northeastern Red Sea was undertaken in 2020. The results of the acoustic surveys reveal 3.6 encounters per 100 km of track line of odontocete species with variable distribution across the study area. No baleen whale vocalizations were detected. Through visual surveys, five odontocete species were identified within the study area: *Tursiops truncatus*, *T. aduncus*, *Stenella attenuata*, *S. longirostris*, and two opportunistic sightings of single *Grampus griseus*.

Fernandez Ajó, A. F., Teixeira, C. R., de Mello, D. M., Dillon, D., **Rice, J. M.,** Buck, C. L., Hunt, K.E., Rogers, M.C., & **Torres, L.G.** (2024). A longitudinal study of endocrinology and foraging ecology of subadult gray whales prior to death based on baleen analysis. *General and Comparative Endocrinology*, 114492.759

Abstract: Individual-level assessments of wild animal health, vital rates, and foraging ecology are critical for understanding population-wide impacts of exposure to stressors. Large whales face multiple stressors, including, but not limited to, ocean noise, pollution, and ship strikes. Because baleen is a continuously growing keratinized structure, serial extraction, and quantification of hormones and stable isotopes along the length of baleen provide a historical record of whale physiology and foraging ecology. Furthermore, baleen analysis enables the investigation of dead specimens, even decades later, allowing comparisons between historic and modern populations. Here, we examined baleen of five sub-adult gray whales and observed distinct patterns of oscillations in $\delta^{15}\text{N}$ values along the length of their baleen plates which enabled estimation of baleen growth rates and differentiation of isotopic niche widths of the whales during wintering and summer foraging. In contrast, no regular patterns were apparent in $\delta^{13}\text{C}$ values. Prolonged elevation of cortisol in four individuals before death indicates that chronic stress may have impacted their health and survival. Triiodothyronine (T3) increased over months in the whales with unknown causes of death, simultaneous with elevations in cortisol, but both hormones remained stable in the one case of acute death attributed to killer whale predation. This parallel elevation of cortisol and T3 challenges the classic understanding of their interaction and might relate to increased energetic demands during exposure to stressors. Reproductive hormone profiles in subadults did not show cyclical trends, suggesting they had not yet reached sexual maturity. This study highlights the potential of baleen analysis to retrospectively assess gray whales' physiological status, exposure to stressors, reproductive status, and foraging ecology in the months or years leading up to their death, which can be a useful tool for conservation diagnostics to mitigate unusual mortality events.

Gomes, D. G., Ruzicka, J. J., Crozier, L. G., Huff, D. D., Brodeur, R. D., & **Stewart, J. D.** (2024). Marine heatwaves disrupt ecosystem structure and function via altered food webs and energy flux. *Nature Communications*, 15(1), 1988. <https://doi.org/10.1038/s41467-024-46263-2>

Abstract: The prevalence and intensity of marine heatwaves is increasing globally, disrupting local environmental conditions. The individual and population-level impacts of prolonged heatwaves on marine species have recently been demonstrated, yet whole-ecosystem consequences remain unexplored. We leveraged time series abundance data of 361 taxa, grouped into 86 functional groups, from six long-term surveys, diet information from a new diet database, and previous modeling efforts, to build two food web networks using an extension of the popular Ecopath ecosystem modeling framework, Ecotran. We compare ecosystem models parameterized before and after the onset of recent marine heatwaves to evaluate the cascading effects on ecosystem structure and function in the Northeast Pacific Ocean. While the ecosystem-level contribution (prey) and demand (predators) of most functional groups changed following the heatwaves, gelatinous taxa experienced the largest transformations, underscored by the arrival of northward-expanding pyrosomes. We show altered trophic relationships and energy flux have potentially profound consequences for ecosystem structure and function, and raise concerns for populations of threatened and harvested species.

Kaplan R. L., Derville S., Bernard K. S., Phillips E. M., & **Torres L. G.** (2024). Humpback-krill relationships are strongest at fine spatial scales in the Northern California Current region. *Marine Ecology Progress Series* 729:219-232. <https://doi.org/10.3354/meps14510>

Abstract: Understanding scale-dependent variability in predator–prey relationships is essential to ecosystem management. The Northern California Current (NCC) ecosystem is an important foraging ground for humpback (*Megaptera novaengliae*) and other rorqual whales, but it is also an area that presents diverse anthropogenic threats. Clarifying the most meaningful spatial scale to analyze relationships between whales and krill, a key prey item, is important to understanding ecosystem function and informing research and management efforts. To examine spatially explicit relationships between humpback whales and krill in the NCC, we analyzed concurrent whale sightings and acoustically detected krill abundance estimates collected in May and September between 2018 and 2022. We used generalized additive mixed models to predict humpback whale occurrence at a series of ecologically relevant nested spatial scales: 1, 2, 5, and 20 km. We found that relative krill abundance at a spatial scale of 5 km had the greatest influence on humpback whale occurrence. Our results suggest that whale and krill relationships at the 5 km scale may be both energetically profitable for whales to optimize foraging efficiency and also most detectable using our traditional methodological approaches (paired observer and echosounder surveys). We recommend that zooplankton prey data at the 5 km scale be incorporated into future humpback whale distribution models and considered for management applications in this region.

McCullough, J. L. K., Henderson, E. E., Trickey, J. S., **Barlow, J.**, Baumann-Pickering, S., Manzano-Roth, R., Alongi, G., Martin, S., Fregosi, S., **Mellinger, D. K., Klinck, H., Szesciorka, A. R.,** & Oleson, E. M. (2024). Geographic distribution of the Cross Seamount beaked whale based on acoustic detections. *Marine Mammal Science*, 40(1), 164–183. <https://doi.org/10.1111/mms.13061>

Abstract: Beaked whales produce frequency-modulated echolocation pulses that appear to be species-specific, allowing passive acoustic monitoring to play a role in understanding spatio-temporal patterns. The Cross Seamount beaked whale is known only from its unique echolocation signal (BWC) with no confirmed species identification. This beaked whale spans the Pacific Ocean from the Mariana Archipelago to Baja California, Mexico, south to the equator, but only as far north as latitude 29°N. Within these warm waters, 92% of BWC detections occurred at night, 6% during crepuscular periods, and only 2% during daylight hours. Detections of BWC signals on drifting recorders with a vertical hydrophone array at 150 m depth demonstrated that foraging often occurred shallow in the water column (<150 m). No other species of beaked whale to date has been documented foraging in waters this shallow. Given their nocturnal, shallow foraging dives, this species appears to prefer prey that may be available in the water column only during those hours. The foraging behavior of Cross Seamount beaked whales appears to be unique

among all beaked whales, and these findings contribute additional ecological and acoustic information which can help guide future efforts to identify this cryptic whale.

Morin, P. A., McCarthy, M. L., Fung, C. W. **Durban, J. W.**, Parsons, K. M., Perrin, W. F. Taylor, B. L., Jefferson, T. A., & Archer, F. I. (2024). Revised taxonomy of eastern North Pacific killer whales (*Orcinus orca*): Bigg's and resident ecotypes deserve species status. *Royal Society Open Science* 11: 231368. <https://doi.org/10.1098/rsos.231368>.

Abstract: Killer whales (*Orcinus orca*) are currently recognized as a single ecologically and morphologically diverse, globally distributed species. Multiple morphotypes or ecotypes have been described, often associated with feeding specialization, and several studies have suggested taxonomic revision to include multiple subspecies or species in the genus. We review the ecological, morphological and genetic data for the well-studied 'resident' and Bigg's (aka 'transient') ecotypes in the eastern North Pacific and use quantitative taxonomic guidelines and standards to determine whether the taxonomic status of these killer whale ecotypes should be revised. Our review and new analyses indicate that species-level status is justified in both cases, and we conclude that eastern North Pacific Bigg's killer whales should be recognized as *Orcinus rectipinnus* (Cope in Scammon, 1869) and resident killer whales should be recognized as *Orcinus ater* (Cope in Scammon, 1869).

Pirotta, E., Tyack, P. L., **Durban, J. W.**, Fearnbach, H., Hamilton, P. K., Harris, C. M., Knowlton, A. R., Kraus, S. D., Miller, C. A., Moore, M. J. & Pettis, H. M. (2024). Decreasing body size is associated with reduced calving probability in critically endangered North Atlantic right whales. *Royal Society Open Science*, 11(2), p.240050. <https://doi.org/10.1098/rsos.240050>

Abstract: Body size is key to many life-history processes, including reproduction. Across species, climate change and other stressors have caused reductions in the body size to which animals can grow, called asymptotic size, with consequences for demography. A reduction in mean asymptotic length was documented for critically endangered North Atlantic right whales, in parallel with declines in health and vital rates resulting from human activities and environmental changes. Here, we tested whether smaller body size was associated with lower reproductive output, using a state-space model for individual health, survival and reproduction that quantifies the mechanistic links between these processes. Body size (as represented by the cube of length) was strongly associated with a female's calving probability at each reproductive opportunity. This relationship explained 62% of the variation in calving among reproductive females, along with their decreasing health (20%). The effects of decreasing mean body size on reproductive performance are another concerning indication of the worsening prospects for this species and many others affected by environmental change, requiring a focus of conservation and management interventions on improving conditions that affect reproduction as well as reducing mortality.

Zahn, M. J., Ladegaard, M., Simon, M., **Stafford, K. M.**, Sakai, T., & Laidre, K. L. (2024). Accurate species classification of arctic toothed whale echolocation clicks using one-third octave ratios. *Journal of the Acoustical Society of America* 155. <https://doi.org/10.1121/10.0025460>.

Abstract: Passive acoustic monitoring has been an effective tool to study cetaceans in remote regions of the Arctic. Here, we advance methods to acoustically identify the only two Arctic toothed whales, the beluga (*Delphinapterus leucas*) and narwhal (*Monodon monoceros*), using echolocation clicks. Long-term acoustic recordings were analyzed from moorings in Northwest Greenland. Beluga and narwhal echolocation signals were distinguishable using spectro-grams where beluga clicks had most energy >30 kHz and narwhal clicks had a sharp lower frequency limit near 20 kHz. Changes in one-third octave levels (TOL) between two pairs of one-third octave bands were compared from over one million click spectra. Narwhal clicks had a steep increase between the 16 and 25 kHz TOL bands that was absent in beluga click spectra. Conversely, beluga clicks had a steep increase between the 25 and 40 kHz TOL bands that was absent in narwhal click spectra. Random Forest classification models built using the 16 to 25 kHz and 25 to 40 kHz TOL ratios

accurately predicted the species identity of 100% of acoustic events. Our findings support the use of echolocation TOL ratios in future automated click classifiers for acoustic monitoring of Arctic toothed whales and potentially for other odontocete species.

MMI IN THE NEWS

[These Puget Sound orcas could be designated as distinct species](#): **John Durban** was interviewed in this *Seattle Times* article about the findings of a new research paper on which he is a co-author. The article also features one of John's aerial photogrammetry images of killer whales.

[Whale song mystery solved by scientists](#): **Kate Stafford** was interviewed for a BBC article about a study from the University of Denmark that describes new findings on how whales produce sound.

[John Pienaar with Times Radio Drive](#): **Kate Stafford** was interviewed live on the Times Radio Drivetime show about whale singing behavior. Listen to her segment from 01:42:54 to 01:47:40.

[Migrating Whales Forced Into Danger's Path in 'Wild West' Arctic](#): **Angela Szesciorka** and **Kate Stafford's** recent paper on changing bowhead whale migration was covered in [Newsweek](#), the [American Geophysical Union \(press release\)](#), and [The Wildlife Society](#), and others.

[National Geographic Society Launches the Wildlife Intelligence Project](#): The National Geographic Society announced the launch of the Wildlife Intelligence Project, an initiative that funds and follows three National Geographic Explorers, including **Mauricio Cantor**.

[The Sounds of Climate Change](#): **Kate Stafford** was interviewed by the Arctic Research Foundation for an article on the changing underwater soundscape of the Arctic.

[How first contact with whale civilization could unfold](#): **Taylor Hersh** was interviewed for an article in *The Atlantic* about how artificial intelligence and research efforts like Project CETI may (or may not) help us communicate with whales.

[Oregon State University researchers are first to see at-risk bat flying over open ocean](#): Researchers aboard the R/V *Pacific Storm* — including **Lisa Ballance**, **Leigh Torres**, and Will Kennerley — made the first-ever documented sighting of a hoary bat flying over the open ocean.

[How scientists are using facial-recognition AI to track humpback whales](#) (KLCC/NPR): The North Pacific humpback whale population abruptly declined during a massive marine heatwave that warmed the eastern Pacific Ocean, scientists reported in the journal *Royal Society Open Science*. Co-authors include Daniel Palacios, Craig Hayslip, and Jay Barlow.

[Gray Whale, Long Absent From the Atlantic, Is Spotted Off Massachusetts](#): **Josh Stewart** was interviewed for an article in the *New York Times* about a recent sighting of a gray whale by the New England Aquarium.

[For the first time in centuries, a gray whale is spotted in New England](#): **Leigh Torres** was interviewed by the *Washington Post* about the gray whale sighting off of Massachusetts.

[Experts disagree on seabed mining impact on whales](#): **Leigh Torres** gave testimony to the New Zealand Environmental Protection Authority on the effects a plan to mine the seabed in the South Taranaki Bight would have on blue whales and other marine mammals.

[World Whale Day: Get to know 10 of Oregon's most popular gray whales](#): The gray whales featured on the [IndividuWhale website](#) were highlighted in this piece celebrating world whale day.

[Science and Wonder When Whales Strand on our Coast](#): **Jim Rice** was interviewed for the KLCC news radio program Oregon on the Record to discuss whale strandings on the Oregon coast.

[First-ever photos show humpback whales mating - and they're males](#): **Robert Pitman** was interviewed about this significant, and surprising event.

MEETINGS AND WORKSHOPS

The 8th International Bio-Logging Science Symposium, Tokyo, Japan, March 4–8: The International Bio-Logging Society (BLS) brings together researchers from around the world who are interested in bio-logging methods (use of electronic tags to track wildlife) and the scientific insights they generate. The BLS science symposiums are held every four years and feature innovative and leading-edge bio-logging research from scientists around the globe. At the 8th BLS symposium in March, **Michaela Kratofil** and **Daniel Palacios** gave presentations on their research using whale satellite tracking technology. Michaela presented a poster on her PhD research entitled “Individual-level variation in habitat selection of endangered Hawaiian false killer whales through lenses of social structure and resource availability.” Daniel gave an oral presentation entitled “Dispersal patterns, site fidelity, and residency of Eastern North Pacific blue whales at coastal tagging sites.”

Workshop on North Pacific Humpback Whale Assessment, University of Washington and NOAA Northwest Fisheries Science Center, Seattle, Washington, March 9–12: The Comprehensive Assessment of North Pacific humpback whales began in 2016 (IWC, 2017) with an intersessional workshop held in 2017 (IWC, 2018). Since then, the type of assessment model to be applied has been refined, additional analyses of abundance and genetic data have been undertaken, the structure of the areas included in the modeling and data analyses modified, and the set of stock structure assumptions (number of breeding stocks and the feeding areas to which they migrate) have been updated. The IWC Scientific Committee recommended an additional workshop to review and refine time series input data to the assessment model, to conduct initial assessment runs and develop a work plan for additional work to be conducted. **Debbie Steel** and **Franca Eichenberger** participated in this workshop and provided mixing matrices based on mixed stock analyses of mtDNA haplotypes and microsatellite genotypes to estimate apportionment from feeding grounds to breeding stocks.

[How Global South Research Can Shape the Future of Comparative Physiology](#), Kruger, South Africa, March 10–13: **Alejandro Fernandez Ajo** (Ale) was an invited presenter at this workshop, which aimed to address the underrepresentation of Global South research in comparative physiology by offering a platform for early career researchers to exchange ideas with leading experts. The focus included exploring the history and definition of comparative physiology, research approaches, and methods, as well as opportunities for Global South researchers in this field. Stay tuned for updates from Ale’s enriching experience at the workshop.

Scientific Review Group, NOAA Southwest Fisheries Science Center, La Jolla, California, March 11–15: **Scott Baker** and **Leigh Torres** attended the annual meeting of the Pacific Scientific Review Group as appointed scientific advisors. The group is appointed by NOAA and charged with reviewing the Stock Assessment Reports prepared for marine mammals by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, as mandated by the US Marine Mammal Protection Act.

[ICES-PICES 7th International Zooplankton Production Symposium](#), Tasmania, Australia, March 17–22: This conference brought together researchers from around the world to share new work on zooplankton in the Anthropocene, discuss emerging technologies, and assess global trends in zooplankton productivity and research. **Rachel Kaplan** gave an oral presentation on her PhD research entitled “Krill swarms offer variable energy density to predators in the Northern California Current Ecosystem.”

Ecology and Behavior of Large Whales and Intersections with Human Use of the Oceans, Duke University, Beaufort, North Carolina, March 27–30: Leigh Torres was invited to her alma mater (where she completed her master's of environmental management and her PhD in marine ecology 17 years ago), the Duke Marine Lab, to deliver a seminar, meet with students and faculty, and connect with fellow marine scientists.

Marine Mammal Institute Monthly Meeting, Hatfield Marine Science Center, Gladys Valley Building HMSC Guin Library Seminar Room, April 10, 12:30–1:30 pm Pacific: Leigh Torres will present research on Pacific Coast Feeding Group gray whales over the last 8 years and ask the question, “Why does the PCFG exist?” Please join us in person and bring your lunch. Alternatively, [join us via Zoom](#). Password: MMIMM
Meeting ID: 920 0880 1541
Phone: 1 971 247 1195 (Portland), 1 253 215 8782 (Tacoma), 1 301 715 8592 (Washington DC)

Marine Mammal Institute Monthly Meeting, Hatfield Marine Science Center, Guin Library Seminar Room, April 26, 12–1:30 pm Pacific: Jim Rice will give us updates on the Oregon Marine Mammal Stranding Network. Please join us in person and bring your lunch. Alternatively, [join us via Zoom](#) (Password: MMIMM; Meeting ID: 920 0880 1541).

OUTREACH AND ENGAGEMENT

Best practices for quantifying and reporting on rhythm in animal communication, February 28: Taylor Hersh was invited to present research from her first postdoctoral position to the University of Zurich's Bioacoustics Community group.

Ecology and evolution of cultural cooperative behavior among humans and dolphins, The National Geographic Society base camp, Washington DC, March 14: Mauricio Cantor participated in a 3-week media training workshop and gave a talk to the National Geographic Society about the new global project that will investigate all the remaining cases of dolphin–fisher cooperation in Brazil, India, and Myanmar in the next 4–10 years, starting May 2024.

Killer whale bycatch in Alaskan trawl fisheries, March 21: Hannah Myers and Craig Matkin were invited to present to the Pulse of the Salish Sea program.

[WorldOregon's Great Decisions 2024](#), *The High Seas Treaty from the Whales' Perspective*, Portland State University, Portland, Oregon, March 22: **Daniel Palacios** (pictured at right) was the featured speaker for the eighth and last topic in this series this year, where he talked about the how tracking whales can inform connectivity management for migratory species in Areas Beyond National Jurisdiction through frameworks like WWF's Protecting Blue Corridors initiative.



Heceta Bank: Oregon's Hidden Wonder, Cannon Beach Chamber Hall, Cannon Beach, OR, April 14: **Dawn Barlow** will be among the panelists during a moderated discussion following a public showing of this short film. This free event is a collaboration between Friends of Haystack Rock, the City of Cannon Beach, and OSU's Marine and Coastal Opportunities (MACO) program.

Marine Offshore Species Assessments to Inform Clean Energy, Gladys Valley Marine Studies Building, Hatfield Marine Science Center, April 11: **Lisa T. Ballance** will give this invited presentation to Rotary Club of Newport, an update on MMI's 4-year, \$2M research project (PI: **Ballance**, Co-PIs: **Baker, Lagerquist, Palacios, Orben, Stafford, Torres**) designed to inform decisions pertaining to the offshore wind energy industry.

[Reel Science: Heceta Bank: Oregon's Hidden Wonder](#), Oregon Museum of Science and Industry, Portland, April 30: **Lisa T. Ballance** will be among the panelists during a moderated discussion following a public showing of this short film.

[Exploding Whales Baseball](#), PK Park, Eugene OR, April 6: The 2024 season of Exploding Whales minor league baseball opens this month. Marine Mammal Institute representatives will host an outreach table at each of the games this summer that feature this alternate identity of the Eugene Emeralds. Exploding Whales home games will take place on April 6, April 27, May 11, May 24, June 29, July 5, and August 30. Right. MMI Postdoctoral scholars, **Franca Eichenberger** and **Taylor Hersh** test "Boomer's" knowledge in a whale trivia challenge.



[Marine Science Day](#), Hatfield Marine Science Center, April 13: MMI will be among the nearly 50 exhibitors at this annual family-friendly open house. Come by classroom 176 in the Gladys Valley Building to listen to recorded whale song, find out which animals strand on Oregon beaches, and answer the question, What do drones, poop, tags and remote sensing have in common?



Sat. April 13, 2024
10 am - 4 pm

AWARDS AND RECOGNITION

Emma Pearson was awarded the OSU-PNNL Distinguished Graduate Research Fellowship. She will be working with **Kate Stafford** and Joe Haxel (Pacific Northwest National Laboratory, PNNL) on projects devoted to improving our understanding of potential environmental effects from offshore renewable energy to help ensure the responsible and sustainable deployment of these technologies in the ocean environment. Studies supporting research interests of the MMI also align with the PNNL's Department of Energy mission-driven science, which ultimately supports the nation's goals for offshore renewable energy generation and reducing carbon emissions.

Clara Bird was awarded the Hatfield Student Organization's Bob Moch Memorial Endowment Award. This community service award recognizes graduate students who are involved in the HMSC and Oregon coastal communities.

Stephane P.G. Moura, co-advised by **Mauricio Cantor**, successfully defended her PhD thesis "Distribution and Spatial Dynamics of the Guiana Dolphin (*Sotalia guianensis*) as Indicators of Anthropogenic Impact Exposure on the Coast of Paraná, Southern Brazil" at her home institution, Federal University of Parana (Brazil), in March 2024. Stephane spent six months working on her doctoral research in the MMI between October 2022 and March 2023.

Bruce Mate and **Mary Lou Mate** (left) were among the 2024 inductees into the College of Agricultural Sciences' [Diamond Pioneer Agricultural Career Achievement Registry](#), which recognizes people who have made significant lifetime contributions to Oregon and its natural resources. The induction was celebrated with a luncheon and award ceremony on the OSU Corvallis campus.



On May 15, **Daniel Palacios** will begin his next professional chapter as Director of the Right Whale Ecology Program at the Center for Coastal Studies in Provincetown, Massachusetts. Daniel has been on the faculty of MMI since 2013 and has held the Endowed Professorship in Whale Habitats since 2018. He has been leading the Whale Habitat, Ecology and Telemetry Laboratory, which has been working on the development, advancement, and application of electronic tag technologies for studying whales. Daniel is deeply engaged with providing technical expertise to organizations and agencies such as the U.S. Marine Mammal Commission, the International Whaling Commission, and the International Union for Conservation of Nature.

As a native of Colombia, Daniel continues to actively promote research and science advancement in Latin America. This transition is both a tremendous loss to MMI and a tremendous opportunity for Daniel. We will continue to collaborate with him long into the future. Congratulations, Daniel!

The People Behind MMI Science

Charlene Pérez Santos — Charlene Pérez Santos is a master's student at the Marine Mammal Institute under the mentorship of **Josh Stewart**. Originally from Puerto Rico, Charlene earned her bachelor's degree in marine biology with a second concentration in wildlife management at the University of Puerto Rico. During her undergraduate studies, she developed a passion for marine mammals. Despite limited research resources in Puerto Rico for this field, she actively sought out volunteer and research opportunities in marine sciences. She volunteered at the Conservation Center of Manatees, worked as a field assistant in Coral Monitoring and Light Pollution Lagoon Projects, and served as a research assistant in aquaculture and aquaponic investigations.

Seeking to broaden her opportunities in the marine mammal field, she applied to the NOAA IN-FISH internship and was accepted, working on a survey for direct seafood marketing related to lobster fishing and North Atlantic right whales. Through that experience, Charlene connected with NOAA scientists who helped guide her path and secure fellowships like CIMERS and the NOAA Living Marine Resources Cooperative Science Center, which funds her master's studies. Charlene's thesis work aims to use movement data from humpback whales in the Mexico and Central America Distinct Population Segments, collected via satellite tags, to investigate the overlap between whale distribution and vessel traffic in Pacific Mexico, assess the risk of ship strikes in US versus Mexican waters, and determine if vessel traffic near human population centers poses a risk to these populations.



GRANTS: MILESTONES AND REPORTS

TEACHING CONTRIBUTIONS

Kate Stafford will teach Introduction to Bioacoustics FW 461/561 in [summer session](#) 4, July 22–August 16. The course focuses on marine bioacoustics and will cover passive and active acoustics sources, animal communication, tools used and the impacts of noise on animals. Students will learn how different species make and use sounds, will gain experience collecting and analyzing acoustic data, and will make their own hydrophones. They will also learn how bioacoustics can be used in conservation studies.

Renee Albertson will teach FW 302 Biology and Conservation of Marine Mammals in [summer session](#) 4, July 22–August 16. The course provides an examination of the biology of whales, pinnipeds, and other marine mammals, including general adaptations to a marine existence; systematics and

biogeography; reproduction; diving physiology; communication and echolocation; feeding and migratory behavior; and marine mammal/human interactions, including conservation issues.

Mauricio Cantor will co-lead (with Dr. Tara Whitty) the new course FW 568 Human Dimensions of Marine Mammal Conservation in [summer session 5](#), August 19–September 6. This course addresses the ethical, equitable, and effective conservation of marine mammals by studying social-ecological systems; transdisciplinarity; Design Thinking; human rights–based approach to management; social science and participatory research methods; responsible community engagement; and conservation evaluation, using real-world examples.

VISITING STUDENTS AND SCHOLARS

Daiane S. Marcondes and **Gabriel F. Fonseca** are PhD students from the Universidade Federal do Paraná (Brazil) who are conducting research at MMI from March through September 2024. Both Daiane and Gabriel are co-advised by **Mauricio Cantor** in their home institution and have secured external fellowships from the Brazilian Ministry of Education to conduct their research at OSU as visiting scholars. Daiane's research focuses on the social structure and communication of Guiana dolphins in southern Brazil and combines photo-ID with drone and acoustic sampling to investigate how the dolphins' social lives influence their whistle repertoires in areas of high and low anthropogenic activity. Gabriel's research on population dynamics of five sea turtle species applies drone and satellite tracking of live sea turtles with advanced statistical modeling to beach stranding data to predict areas of high mortality offshore.

PACIFIC STORM DISPATCHES

R/V *Pacific Storm* (pictured at right) continues to undergo her biennial haul-out at the Port of Toledo. She is now inside for sandblasting, having had all of the aft decking and hydraulic hosing removed. Following sandblasting, the vessel will undergo a marine survey and complete repainting before going back in the water in early April.



OTHER OF NOTE

Clarissa Teixeira and **Taylor Hersh** have been chosen to attend the 2024 Short Course on Bayesian Models for Ecologists at Colorado State University. The course will take place from June 3–13.

Robert Pitman shares a personal story, "[Tilting the Scales](#)," in *Natural History Magazine* about how difficult it can be not to intervene with the seeming cruelty of nature.



April 24 is Dam Proud Day! This [Dam Proud Day](#), we'll be rallying around our amazing graduate students, who are dedicating their lives to making the oceans a healthier and safer place for marine mammals. Every gift to the MMI Graduate Fellowship Fund on April 24 directly supports the ability of these hard-working students to bring their full selves to their studies and research.

And, every gift will bring us closer to reaching our three incredible challenge goals:

The Why-Can't-A-Beaver-Be-A-Marine-Mammal Challenge: We love beavers so much, we wish they were marine mammals. But until that happens, we'll honor our very own Beavers through celebrating the 5th anniversary of Dam Proud Day. Thanks to a generous anonymous donor, *the first 10 gifts from OSU alumni* to MMI on Dam Proud Day will unlock an additional \$2,000 for MMI graduate student support!

The Take-Care-of-Me-Like-A-Killer-Whale Challenge: Killer whale families take care of each other. Let's follow their example. (Here, share my salmon.) Even better, *when we reach \$5,000 in total gifts* for MMI graduate student support, a longtime MMI donor will match the entire amount, effectively doubling your gift! Let's rally together to take care of the next generation of marine mammal scientists.

The If-Dolphins-Were-Dollars Challenge: There is strength (and fun) in numbers. Some community-minded dolphins travel with thousands of others in superpods. *When the number of donors to MMI reaches 50*, an amazing \$10,000 dolphins (um, we mean dollars) will be unlocked for MMI graduate student support! We are grateful to an incredibly generous longtime MMI donor for making this superpod possible.

Join us on April 24 at [damproudday.org](#). And please help spread the word. We're stronger together!

ONGOING OSU MEETINGS

MMI Principal Investigators Meeting, monthly (**Lisa T. Ballance, Scott Baker, Mauricio Cantor, Daniel Palacios, Jim Rice, Kate Stafford, Josh Stewart, Leigh Torres**)

MMI Administrative Meeting, semimonthly (**Lisa T. Ballance, Dee Kennedy, Barb Lagerquist, Minda Stiles**)

Department of Fisheries, Wildlife, and Conservation Sciences Faculty Meeting, monthly (**Scott Baker, Lisa T. Ballance, Mauricio Cantor, Daniel Palacios, Kate Stafford, Josh Stewart, Leigh Torres**)

HMSC's Safety Awareness Forum Meeting, monthly (**Barb Lagerquist, Debbie Steel**)

College of Agricultural Sciences Administrators Meeting, monthly (**Lisa T. Ballance**)

Department of Fisheries, Wildlife, and Conservation Sciences Graduate Committee, monthly (**Leigh Torres**)

HMSC Admin Group Meeting, bimonthly (**Minda Stiles**)

MMI Leadership Meeting, quarterly (**Lisa T. Ballance, Scott Baker, Mauricio Cantor, Dee Kennedy, Barb Lagerquist, Daniel Palacios, Jim Rice, Kate Stafford, Josh Stewart, Minda Stiles, Leigh Torres**)

HARBOR Small Boat Program, quarterly (**Barb Lagerquist**)

College of Agricultural Sciences Administrative Managers Group, quarterly (**Minda Stiles**)

Branch Experiment Stations, MMI, and Agricultural and Marine Sciences Business Center Collaboration Meeting, three times per year (**Dee Kennedy**)

College of Agricultural Sciences Safety Advisory Committee, quarterly (**Barb Lagerquist**)

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