This underwater photo of "TYPE D KILLER WHALE" was taken this past January on an expedition to sub-Antarctic waters. Type D Killer Whale may be the least-known large marine animal on the planet, one of five ecotypes (populations that are distinct with respect to morphology, ecology, and behavior) found in Antarctic and sub-Antarctic waters that is rarely seen. The expedition collected three skin biopsy samples from these animals that will be used to determine if Type D is a new species of killer whale.

MMI's new director, Lisa T. Ballance, was a member of the scientific party on this expedition. Robert L. Pitman, who has also recently joined MMI, was the Principal Investigator.

This photo by B. Wellard was taken under the following permits: MMPA 19091-01; ACA 2017-029; IACUC SWPI 2017-01; Res 4402-18.

Oceans of Opportunity

I am thrilled to be here as the new director of Oregon State University's Marine Mammal Institute, and to join the communities of coastal Oregon. I have been here just a short time, since October 14th, but already two things are crystal clear: The talent here is deep. And the passion is palpable.

I come to MMI from NOAA, where I have been a marine ecologist for the past 30 years and director of the Marine Mammal and Turtle Research Division in La Jolla, California, for the past 12. Prior to that, I was the chief scientist for NOAA Fisheries' Eastern Tropical Pacific Dolphin and Ecosystem Assessment Surveys, which have provided the scientific basis for the “Dolphin Safe” label found on tuna cans in supermarkets all over this country. I have published over 100 papers on cetacean and seabird ecology; received research funding from the National Science Foundation, US Navy, Bureau of Ocean Energy Management, and the World Wildlife Fund; advised doctorate students and taught courses as a professor at the Scripps Institution of Oceanography; and I am a recipient of the Department of Commerce Bronze and Silver Medals. You can read more about my background at https://beav.es/ZMp.

(Director’s message continues inside.)
My introduction would not be complete without acknowledging Dr. Bruce Mate, who had the vision, talent, and dedication to build MMI from the beginning. His research, and the research conducted by Bruce, Scott, Leigh, Daniel, Ari, Markus, and many others he has brought into MMI, has had an impressive scientific footprint worldwide and has contributed significantly to our basic understanding of marine mammal biology and to better solutions for their management and conservation. It would be difficult to understated Bruce’s impact on marine mammal science, and I want to formally acknowledge his outstanding career. It is a privilege to join this group and to have Bruce remain with us as an Emeritus Professor for some time to come.

It is an exciting time for MMI! The Biennial Conference on the Biology of Marine Mammals is approaching, and we will have a strong showing there. The new Marine Studies Building here at the Hatfield Marine Science Center will soon be complete. It is an impressive feat of engineering and will bring MMI together in one beautiful space from our currently disparate locations. We will add two new professors to MMI over the next two years. And OSU’s Marine Studies Initiative is providing new opportunities to educate students and enhance our research and its impact.

The need for research on marine mammals, particularly science-based solutions to management and conservation problems, has never been greater. MMI has always been known for its outstanding science. We are poised to become even stronger. Our future is bright. I look forward to shaping it with you.

Lisa T. Ballance, PhD
Director, Marine Mammal Institute
Professor, Department of Fisheries and Wildlife

Dear friends,

I am happy to tell you that our new director of the Marine Mammal Institute, Dr. Lisa T. Ballance, has arrived. Everyone here is very excited. Lisa is an outstanding professional with decades of both research and administrative experience. When you visit Newport, please stop in to meet her — and say “hi” to me too, as I will still be working, albeit half time. Thank you so very much for your support of the growth and success of the MMI. Throughout this newsletter, you’ll see ample evidence of how your gifts and support have made us even more successful as a world-class institute. I’m excited about the future of MMI because of the talented people who are here and Lisa’s skills and ability to lead us in new directions.

My part-time efforts will help fund research and help donors who are interested in MMI. I am very grateful for your support over the years. Just look at what has come to pass! I now have enough experience to suggest ways that gifts can be more effective both for donors and the things they support. I am especially excited to see how effective estate planning options can be with just a small bit of effort ahead of time. Let me know if you would like to have a no-pressure discussion about any gifts or planning issues that might include MMI.

Elsewhere, you’ll read about the R/V Pacific Storm, which is on a mission for the University of Washington’s physical oceanography program replacing buoys and moorings along the northern Washington coast. On other vessel notes, we are acquiring two modern Zodiac rigid-hulled inflatable boats (RHIBs) from US Coast Guard federal surplus. They replace the now 30-year-old Volvo-powered RHIBs that have served us well but for which parts have become expensive and hard to find.

The new Marine Studies building is looking beautiful. MMI will occupy part of the third floor, just one floor away from the specially designed roof, which will be a vertical escape area from tsunamis. The building should open in June 2020, and we will keep you posted about a grand opening celebration.

Finally, Mary Lou and I are staying in Newport. We look forward to your visits when you are in the area. Now that we are (theoretically) going to have more time, perhaps we can even go out and catch our own Dungeness crabs to eat with you. We really look forward to seeing you more often. MMI will likely continue to offer exciting marine mammal trips. Maybe we will see you on some of these in the future. There are still a few spaces left for the Baja Gray Whale Expedition to San Ignacio Lagoon (March 5–13, 2020), if you would like to join us.

Bruce Mate, PhD
Professor Emeritus
This year marked the culmination of WhaleWatch, a NASA-funded project that involved the participation of academia, government, and private industry stakeholders — the shipping sector in this case — working together toward the goal of reducing human impacts on blue whales off the US West Coast [1]. The purpose of the project was to furnish NOAA Fisheries, the government partner, with “operational” (i.e., near-real-time) predictions of where blue whales might occur — not unlike the weather forecasts we rely upon to plan our daily activities. This information can then be used as a “decision-support tool” by NOAA to identify where whales may be most at risk from threats such as ship strikes, entanglements, or loud underwater sounds and implement management regulations accordingly to mitigate these threats.

The project had its genesis in an earlier study we published in 2009 [2] that undertook the first comprehensive examination of blue whale movements, from their feeding grounds in waters off the US West Coast (known as the “California Current ecosystem”) to their breeding grounds in the eastern tropical Pacific, based on a long-term data set of 104 satellite tracks collected by Oregon State University over the period 1994–2008 [3]. Leveraging this historical data set, WhaleWatch sought to model the relationship between whale distribution and oceanographic conditions and then predict the likelihood of where whales might occur during the feeding season (Figures 1 and 2). This had become the primary approach for modeling sighting data collected by systematic shipboard surveys [4] but had not been implemented on whale tracking data because the data had not been previously available in the required numbers.

Once the final blue whale distribution models were developed and validated [5], WhaleWatch became operational in late 2015 through a NOAA website as monthly predictions on a 25-km grid for the extent of the California Current ecosystem [6, 7]. The process was fully automated to acquire the latest oceanographic data, input them into the model, and generate updated predictions. Initially, these predictions were based on monthly values of environmental conditions, but in early 2019 the modeling framework was upgraded to take advantage of new, highly realistic three-dimensional computer simulations of the ocean. These simulations not only have much finer resolution than the previously used satellite products, but they also provide subsurface oceanographic measurements that are more relevant for blue whale ecology. The new operational version of WhaleWatch generates daily blue whale predictions on a 10-km grid [8] and should be available online soon!
The WhaleWatch project additionally developed a separate but complementary model to predict the intensity of blue whale foraging behavior based on oceanographic conditions [9], while also generating further methodology to reconcile multiple model predictions of whale distribution, whether from shipboard sighting surveys or from tracking data [10]. These advances should assist managers in making more efficient and informed decisions in terms of, for example, initiating mitigation measures such as vessel speed reductions or efforts to reduce overlap with ship traffic in areas with high predicted whale density. Finally, we also considered ship traffic mitigation strategies proposed by the stakeholders and used predictions from our models to assess the relative risk to the whales, as well as the logistical benefits and drawbacks of each strategy [11].

Beyond these forecasting applications, WhaleWatch had far-reaching impacts in other aspects that enhanced our understanding of blue whale distribution in the California Current ecosystem. We showed that the most important areas for whale aggregation largely overlapped with the shipping lanes leading into the Los Angeles and San Francisco ship terminals, the busiest ports on the West Coast [12]. We also discovered evidence that, while in their feeding grounds, blue whales relied more on their long-term memory of where reliable prey resources have been traditionally found than on the local prey availability in a given year [13].

WhaleWatch was at the interface of science and wildlife management, and its successful implementation relied on the joint efforts of a multi-institutional team of academic groups and governmental organizations, including the University of Maryland Center for Environmental Science, Oregon State University, and NOAA Fisheries’ West Coast Regional Office and its Science Centers in the Southwest and Pacific Islands regions. Measuring the direct impact of WhaleWatch in terms of reductions in ship strikes or entanglements will be difficult because such events are rarely observed and are presumed to be largely underreported — it’s a very big ocean after all. However, through the outreach and educational activities around our operational products and publications, as well as through NOAA’s own assessment of how the tool has influenced their decisions, we feel hopeful that the stakeholder community will continue making progress toward better balancing human uses of the marine environment with the protection of whale populations.
The tag, which we had deployed in 2015, was in pretty rough shape after almost four years of exposure to the elements, waves, and rocks. It was the only unrecovered tag out of a total of eight tags deployed on blue whales off Southern California in 2014 and 2015 as part of a Navy-funded study, and the data for those tags were being used in the paper I was currently revising! We were obviously very excited to add the data from this tag to the paper, as it had recorded thousands of dives during its 26-day deployment. Luckily, after some emails to emphasize how important it was to include this tag’s data in the manuscript, the journal’s editor gave us an extension. The paper was published — with the newly recovered tag’s data — in mid-September.

It has always felt a bit like unwrapping an unexpected present when one of our tags is found on a beach somewhere and returned with the data intact. The fact that this one was found by someone I knew, and its arrival was in time for a last-minute addition to the paper, made its return special. The published paper can be found online at https://tinyurl.com/fine-scale.

References

JUST IN TIME! A LOST TAG COMES HOME
Ladd Irvine, Senior Faculty Research Assistant, WTG

Sometimes the world is a small place and you are reminded of it at interesting times. In mid-May, we received peer reviews from a scientific journal on our paper studying fine-scale feeding behavior of blue and fin whales using archival tags. I had just started addressing the reviewer comments, which were due two weeks later, when I received a text message picture from Jeff Harris, a NOAA colleague studying pinnipeds on San Miguel Island off California. He was holding one of our tags and wondering if I knew what it was! It was one of our Advanced Dive Behavior tags, which record whale behavior data onboard the tag for several weeks, then release from a deployment housing and float at the surface for recovery. Not all of the tags get recovered, however, as some are shed from the whale while still attached to the housing and then sink. In this case, our colleague had been trying to catch an entangled sea lion, saw the tag sitting between some rocks as he ran past, and later went back to get it. He knew it was a tag of some sort and contacted me to see if I could point him toward who deployed it. I was very happy to do so!

The tag, which we had deployed in 2015, was in pretty rough shape after almost four years of exposure to the elements, waves, and rocks. It was the only unrecovered tag out of a total of eight tags deployed on blue whales off Southern California in 2014 and 2015 as part of a Navy-funded study, and the data for those tags were being used in the paper I was currently revising! We were obviously very excited to add the data from this tag to the paper, as it had recorded thousands of dives during its 26-day deployment. Luckily, after some emails to emphasize how important it was to include this tag’s data in the manuscript, the journal’s editor gave us an extension. The paper was published — with the newly recovered tag’s data — in mid-September.

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Searching for eDNA from beaked whales on the Navy's AUTEC range

Cetacean Conservation and Genomic Laboratory (CCGL)
By Scott Baker, PhD, Professor; and Debbie Steel, Senior Faculty Research Assistant

Species identification of whales, dolphins, and porpoises at sea remains a challenge for monitoring the impact of human activity, including activities by the Department of Defense. This is particularly true for cryptic or elusive species like beaked whales (Family Ziphiidea), some of which are known to be sensitive to anthropogenic disturbance.

Acoustic monitoring is widely used to detect the presence of cetaceans for the purposes of monitoring and mitigation. Although highly effective in many contexts, acoustic monitoring has several known limitations. First, detections are limited to individuals that are calling, which in many species is seasonal, sex-specific, or infrequent. Second, high frequency calls of some species (>100 kHz) are difficult to acoustically monitor because of current technical limitations. Third, species identification can be difficult to validate, particularly for the diverse but poorly described family of beaked whales.

Advances in analyses of environmental (e)DNA now offer an alternative for detection and identification of rare, cryptic, or vulnerable cetacean species. Here, the DNA that is shed or excreted from individuals during normal activity can be collected from the environment, concentrated, and amplified via the Polymerase Chain Reaction (PCR) using primers targeted for specific taxonomic groups. With previous funding from the Office of Naval Research (ONR), we first initiated a study of eDNA from killer whales (*Orcinus orca*) in the coastal waters of the Salish Sea in 2015 (Baker et al. 2018). This project demonstrated the potential to detect eDNA from the passage of killer whales over a period of at least two hours, despite movement of the water mass by several kilometers due to tidal currents. With the success of sampling inshore waters, we are now applying these methods to species in the open ocean, with the support of acoustic arrays maintained by the US Navy for training exercises.

The Navy maintains several instrumented ranges equipped with large arrays of bottom-mounted hydrophones typically used to track submarines and surface vessels during training exercises. The major ranges include the Atlantic Undersea Test and Evaluation Center (AUTEC) located near Andros Island in the Bahamas. This range includes a deep-water trench (>2,000 meters) referred to as the "Tongue of the Ocean" and is a known habitat for a small population of Blainville's beaked whale (*Mesoplodon densirostris*, Figure 1). Using the AUTEC hydrophone array, the activity of Blainville’s beaked whale can be used to guide the collection of eDNA samples and provide ground-truth data for the presence/absence of beaked whales in the sampling area.

With funding from the Strategic Environmental Research and Development Program of the Department of Defense, we spent 12 days on the AUTEC range in August collecting eDNA to confirm the species and population identity of beaked whales. The project involved collaboration with Diane Claridge and Charlotte Dunn, Bahamas Marine Mammal Research Organisation; Holger Klinck and Peter Dugan, Cornell University; Nevé Baker,
Reports of entangled humpback whales off of the US West Coast have increased over the last several years. This has created a complex management problem, as this area is a shared feeding ground for multiple humpback whale populations, each with different protection status under the US Endangered Species Act.


Humpback whales are now recognized by stocks, or Distinct Population Segments (DPS), based on the genetic differentiation of winter breeding grounds. Humpback whales from three DPS feed off the US West Coast. California, an entanglement “hot spot,” is the preferred foraging ground of the Endangered Central America DPS, where it mixes with the Threatened Mexico DPS, and to a lesser extent with the Hawaii DPS, considered recovered. Feeding boundaries for each DPS along the US West Coast and the relative abundance of each DPS on these shared feeding grounds remain unclear. Improving our understanding of the population structure on feeding grounds is important for the accurate assignment of anthropogenic mortality to each DPS, as mandated under the US Marine Mammal Protection Act. If mortality exceeds a calculated sustainable level for a given stock, NOAA is obligated to develop plans to reduce mortality, including potential fisheries closures.

Working in collaboration with Cascadia Research Collective, MMI’s Whale Telemetry Group, and the Oregon Marine Mammal Stranding Network, I am trying to better understand DPS mixing of humpback whales along the West Coast. To do so, we are conducting a large-scale genetic analysis by DNA profiling a comprehensive set of biopsy samples produced by 31 years of sampling across the West Coast. This work includes a substantial increase in sample size for the previously underrepresented coasts of Oregon and Washington. The results of this project are intended to inform the scientific basis of the management for this mixed-stock of humpback whales.
LOOKING TO SAVE WHALES

Reports of blue, humpback, and gray whale entanglements in fishing gear have increased in US West Coast waters recently, causing concern in Oregon. Entanglements threaten both whale populations and the stability of the crab fishery and coastal communities. A lack of information and understanding of whale distribution in Oregon waters was identified as a significant knowledge gap by the Oregon Whale Entanglement Working Group. Hence, the GEMM Lab initiated a research project to fill this data gap and link whale distribution patterns in Oregon with fishing effort to develop maps of entanglement risk, which could then be used to spatially manage fishing effort more effectively.

To collect whale occurrence data in Oregon waters, the GEMM Lab teamed up with the US Coast Guard to fly aboard their helicopters along set tracklines four times a month, in four different coastal regions of Oregon, over two years. These USCG whale surveys have been highly productive as the GEMM Lab has already conducted 29 surveys between March and September 2019, including recording more than 125 sightings of whales. Understanding when and where whales overlap with the fishery will allow discrete and targeted management actions, potentially including spatio-temporal fishery closures, to maximize effectiveness at protecting whales while also minimizing burdens to fishermen. This research is conducted collaboratively with the Oregon Department of Fish and Wildlife and is funded by the Oregon Dungeness Crab Commission and NOAA.

SPYING ON GRAY WHALES

Whales live complex and long lives, making long-term studies on whales critical to determining meaningful patterns. As the GEMM Lab wrapped up our fifth year of gray whale research in Port Orford, Oregon this year, our datasets now include over 250 tracklines of 40 different whales foraging for over 230 hours, with 571 zooplankton samples simultaneously collected to describe prey availability. With these data, we are investigating the foraging choices that whales make based on habitat type, caloric value and microplastic loads of the zooplankton prey, and individual specialization. This research is shedding light on the quality of gray whale prey in coastal Oregon waters and will address how individual feeding strategies may expose whales to different health risks or benefits.

We have also become well-acquainted with a few individual whales, including “Buttons,” a whale seen in Port Orford every year since the start of our research in 2015. During the 2019 summer, we tracked Buttons from our cliff-side location on nine different days for a total of 19 hours, bringing our total number of hours spying on Buttons in the last five years to a whopping 45 hours. He will likely be one of the shining stars of MSc student Lisa Hildebrand’s thesis chapter on gray whale foraging individualization.

The project also continues to incorporate and engage young scientists, allowing them to acquire new skills and techniques that will help shape their futures in STEM. The research team...
these vocalizations to illuminate seasonal patterns in blue whale feeding and breeding activity. We will also describe the soundscape and inputs from anthropogenic noise.

This research is the focus of Dawn Barlow’s PhD thesis. It is conducted collaboratively with Cornell University’s Bioacoustics Research Program and supported by the New Zealand Department of Conservation, Aotearoa Foundation, Marine Mammal Institute, and others.

A SEA OTTER HOMECOMING?

Sea otters once lived along the Oregon coast but were extirpated during the maritime fur trade more than 100 years ago. Now, managers, environmental organizations, and native tribes are interested in bringing this keystone species back to our waters. The GEMM Lab continues to inform these conversations through our research investigating the potential ecological needs and consequences of sea otter reintroduction to Oregon.

We have assessed the likelihood that sea otters could survive along the Oregon coast and the possible location of these areas by using habitat suitability and density model predictions compared with potential interactions with humans (e.g., fisheries, protected areas, and coastal communities).

While managers embark on a long process to ultimately decide whether sea otter reintroduction to Oregon is possible and feasible, our research is helping to guide and steer this process to ensure it is rooted in credible and sound science. This research is being conducted as part of MMI graduate student, Dominique Kone’s master’s thesis and is funded by the US Fish & Wildlife Service. With Dom’s graduate education coming to a close, the GEMM Lab is communicating our findings with stakeholders and will continue to collaborate and conduct research that will inform the reintroduction process and help managers determine if, how, and where sea otters should come back to Oregon.

THE SECRET LIVES OF BLUE WHALES IN NEW ZEALAND

Last year, the GEMM Lab and collaborators documented a new population of approximately 700 genetically distinct blue whales that are present in New Zealand waters year-round. This discovery bears significant management importance, as these blue whales live in an industrial region and may be impacted by human activities. The New Zealand government has since announced its intention to create a marine mammal sanctuary in the South Taranaki Bight and is supporting the GEMM Lab’s ongoing research to inform the sanctuary’s design. Three main areas of our research into the lives of New Zealand blue whales are highlighted below.

Health: In a comprehensive assessment of blue whale skin condition, we found that many whales are affected by cookie cutter shark bites and blister lesions. We will pair this information with body condition data derived from drone imagery and hormones extracted from blubber and fecal samples.

Habitat and Distribution: We are linking data on oceanography, prey, and whale distribution to describe the spatial patterns of blue whale habitat use and inform the design of an effective sanctuary. Preliminary results indicate that cool waters, dense krill aggregations, and a time-lag of 1.6 weeks after a strong wind event are important factors driving blue whale presence.

Acoustics: Five hydrophones continuously recorded blue whale calls for two years in our study area. The GEMM Lab is analyzing
Two Unusual Mortality Events

Oregon Marine Mammal Stranding Network (OMMSN)

By Jim Rice, Stranding Network Coordinator

It can be said that marine mammals are sentinels of ocean health and that changes in disease outbreaks can be seen as indications of disruptions in the marine environment, such as harmful algal blooms that can cause sudden mass mortalities due to exposure to biotoxins.

When stranding rates exceed normal patterns, NOAA Fisheries, the federal agency responsible for the management of marine mammal stocks under the Marine Mammal Protection Act (MMPA), has the authority to declare what is known as an unusual mortality event (UME), which is defined under the MMPA as a stranding event that is unexpected, involves a significant die-off of any marine mammal population, and demands immediate response.

In order for a UME to be formally declared, a national group of marine mammal health experts determines that one or more of seven criteria regarding the magnitude, the temporal and spatial nature of the event, and the vulnerability of the affected populations (e.g., listed as depleted, threatened, endangered, or declining) are met. Once a UME declaration is issued, a collaborative investigation of the event’s cause is launched, involving all pertinent stranding response groups as part of an investigative team, with heightened attention given to necropsy procedures and analyses.

Within the past few months, two separate UMEs have been declared in response to strandings involving two species of marine mammals along the Oregon coast: Guadalupe fur seals (Arctocephalus townsendi) and gray whales (Eschrichtius robustus).

The Guadalupe fur seal UME commenced in 2015 but was initially limited to California. In July 2019, however, with strandings increasing in Oregon and Washington well beyond historic norms, NOAA extended the UME to include those states as well, underscoring the increasing scope of this event.

To date, more than fifty stranded Guadalupe fur seals, which are listed as threatened under the Endangered Species Act and depleted under the MMPA, have been reported in Oregon in 2019 (prior to 2006, we had no stranding records of this species in Oregon). The vast majority of these have been malnourished yearlings, and most were found dead on the beach. Preliminary results suggest that ecological factors are likely responsible for the failure of these animals to find sufficient forage to survive.

The gray whale UME was declared on May 31, 2019, in response to an alarming increase in strandings. There have been over 200 gray whale mortalities reported so far this year from Mexico through Alaska (six in Oregon), and many of the carcasses that have been examined have appeared emaciated, with poor body condition (thin blubber layers) and moderate to heavy whale lice (cyamid) loads, suggesting that nutritional stress is a factor in this event as well.

Most gray whales feed in Arctic waters during the summer, consuming lipid-rich amphipods and other small invertebrates living along the seafloor and must strive to store enough fat reserves to sustain their metabolic needs over the next six months, which is a time of fasting during their winter migration to the calving and breeding waters of Baja California, and the subsequent return trip to their northern foraging areas. A failure to acquire adequate fat during the summer can lead to starvation-related mortalities during the following winter and spring.

It will take months or years of data collection, analysis, and interpretation before an official cause of this UME can be determined, but it appears likely that widespread malnutrition resulted from ecological disturbance of prey abundance, distribution, and/or quality. Although the precise drivers of the Guadalupe fur seal and gray whale UMEs currently remain uncertain, it is clear that the marine environment is going through profound changes and marine mammals are particularly sensitive to disruptions in its equilibrium.
LAGERQUIST
WINS OSU AWARD

We are proud to announce that MMI’s Barb Lagerquist has been chosen as OSU’s 2019 Outstanding Faculty Research Assistant.

Barb was recognized at the University Day awards dinner in September by President Ed Ray for her distinguished contributions to the university. This university-wide award recognizes scholarly achievement as well as innovation and effort that far exceed expectations.

Barb has been part of the MMI’s Whale Telemetry Group since 1992 and specializes in telemetry studies of large baleen whales. She is a Senior Faculty Research Assistant (FRA) in the Marine Mammal Institute and OSU Department of Fisheries and Wildlife within the College of Agricultural Sciences.

Congratulations, Barb, on this well-deserved honor!

MMI SHOWS UP BIG AT WORLD MARINE MAMMAL CONFERENCE, BARCELONA

This December, faculty, researchers, and graduate students from the Marine Mammal Institute will be presenting their research at the World Marine Mammal Conference in Barcelona, Spain. We are proud to have such strong representation at this important event. The special conference brings together scientists, managers, policy makers, educators, and students from more than 60 countries to discuss the world’s most pressing marine mammal science and conservation issues. Below, you will find a list of some of the research presented by the MMI with the name of the primary author who will be sharing the work:

Applications of two new satellite-linked tag types for long-term monitoring of large whale diving and feeding behavior: Dr. Daniel Palacios (WTG)

The biogeography of common bottlenose dolphins (T. truncatus) of the southwestern USA and Mexico: Alexa Kownacki, PhD student (GEMM Lab)

Cloudy with a chance of whales: Forecasting blue whale occurrence based on tiered, bottom-up models to mitigate industrial impacts: Dawn Barlow, PhD student (GEMM Lab)

A comparison of percent dorsal scar cover between populations of humpback whales (Megaptera novaeangliae) off California and the Western Antarctic Peninsula: Clara Bird, MSc Graduate Fellow (GEMM Lab)

An epigenetic clock for aging endangered Cook Inlet beluga whales: Dr. Ellie Bors, post-doctoral scholar (CCGL)

An evaluation of the ecological needs and effects of a potential sea otter reintroduction to Oregon, USA: Dominique Kone, MS student (GEMM Lab)

Genetic assignment of humpback whales, Megaptera novaeangliae, from feeding grounds in the eastern North Pacific to Distinct Population Segments: Karen Lohman, MSc Graduate Fellow (CCGL)

Investigating potential gray whale individual foraging specializations within the Pacific Coast Feeding Group: Lisa Hildebrand, MS student (GEMM Lab)

More than snacks: An analysis of drone-observed blue whale surface lunge feeding linked with prey data: Todd Chandler, FRA (GEMM Lab)

Skin in the game: Epidermal moult as a driver of long-distance migration in whales: Dr. Robert L. Pitman, courtesy faculty

Sounds of stress: Evaluating the relationships between variable soundscapes and gray whale stress hormones: Dr. Leigh Torres (GEMM Lab)

Species identification of cetaceans by environmental (e)DNA metabarcoding — a new tool for surveys of the high seas: Dr. C. Scott Baker (CCGL)

Stressed and slim, or relaxed and chubby? A simultaneous assessment of gray whale body condition and hormone variability: Leila Soledade Lemos, PhD student (GEMM Lab)

A synopsis of Hawaiian humpback whale movements, including migration routes to foraging destinations during 24 years of satellite-monitored tracking: Dr. Bruce Mate (WTG)
With the successful launch of the MMI’s Oregon Coastal Playground license plate this year, what could be more appropriate than investing the funds on research conducted in Oregon about our local gray whales? Between June and October, Dr. Leigh Torres’s Geospatial Ecology of Marine Megafauna Laboratory (GEMM Lab) conducted its fourth consecutive year of research on gray whales off the Oregon coast, through the generous support of drivers who have purchased nearly 9,000 whale license plates and vouchers. Vehicle registration renewals and new plate sales will provide an ongoing source of support for this and other local research, outreach, and student support.

The GEMM Lab noninvasively observes whales and measures their body condition using drones and collects opportunistic fecal samples for hormone analysis. This work has proved to be timely due to the current Unusual Mortality Event of gray whales with many malnourished individuals dying along the Pacific Northwest coast. Our research shows that gray whales feeding off Oregon in 2016 were in much healthier (fatter) body condition and had lower cortisol (stress) levels than in 2017 or 2018. Interestingly, we determined a strong correlation between those results and upwelling conditions, with likely reduced prey quality and availability for the hungry whales during the later years of our study.

Next up, Dr. Scott Baker’s Cetacean Conservation and Genomics Laboratory will conduct analyses of the fecal samples to determine the sex of individual whales and describe the population genetics of our Oregon gray whales. All these novel findings and methods used to monitor whale health and habitat are providing managers with new data and approaches to help sustain our whale populations faced with multiple threats.

MMI student Leila Lemos has undertaken this pioneering research for her PhD thesis, which has also been supported by the NOAA Ocean Acoustics Program, Oregon Sea Grant, and CIMRS. As the GEMM Lab continues our data collection and analyses, we hope to see the health our local gray whales rebound, and we are grateful to the community support through the gray whale license plate funds that allows us to enhance protection of these whales.

**THE STORM IS BACK!**

After two years of use by the OSU’s College of Earth, Ocean, and Atmospheric Sciences, MMI resumed operations of the vessel this year by doing a thorough haul-out, extensive maintenance, full survey, risk assessment matrix, and multiple inspections. The vessel is now in better condition than when we first acquired it in 2004. Among the refurbishments is a new mast that is ideal for at-sea observers (birds, marine mammals, or vessel activities). With a crew of up to five, the vessel can take seven scientists to sea for over a month without coming ashore (it has a 1,000 gallon/day fresh water maker).

We are excited to once again operate this outstanding vessel and are currently booking research charters into next year.