



The Society for Marine Mammalogy

<http://www.marinemammalogy.org>

March 28, 2016

President

Nick Gales
Australian Antarctic Division
Channel Highway
Kingston Tasmania 7050, Australia
nick.gales@aad.gov.au

President-Elect

Jay Barlow
Scripps Institution of Oceanography,
UCSD
5072 Gasconade Ave.
San Diego, CA 92110 USA
jay.barlow@noaa.gov

Secretary

Heather Koopman
Biology & Marine Biology
Univ. North Carolina Wilmington
601 S. College Road
Wilmington, NC 28403 USA
koopmanh@uncw.edu

Treasurer

Jim Harvey
Moss Landing Marine Laboratories,
8272 Moss Landing Rd.
Moss Landing, CA 95039 USA
jharvey@mml.calstate.edu

Members at Large

Simon Northridge
University of St. Andrews
St Andrews
Fife, KY16 9TS, UK
simon.northridge@st-andrews.ac.uk

Lorenzo Rojas Bracho
National Institute of Ecology and
Climate Change
6051 Business Center Court
San Diego, CA, USA
lrojasbracho@gmail.com

Carolina Loch S. Silva (Student)
Sir John Walsh Research Institute
University of Otago
carolina.loch@otago.ac.nz

Sarah Kienle (Student)
University of California Santa Cruz
Long Marine Laboratory
100 Shaffer Road
Santa Cruz, CA, USA 95060
skienle@ucsc.edu

Sr. Enrique Lendo Fuentes
Head of International Affairs Unit
SEMARNAT

Dear Mr. Lendo Fuentes

In response to your request, the Society for Marine Mammalogy initiated a review of the marine mammal impact assessment for the project called "Phosphatic black sands dredging activities in Don Diego deposits". The Chairs of the Society's Scientific Advisory Committee and Conservation Committee jointly choose reviewers from the Membership with appropriate expertise. The impact assessment document was reviewed independently by seven reviewers, and their consensus was summarized by the Chairs of these Committees. Their detailed consensus review is attached, below.

In brief:

In light of the recommendations of the Marine Mammal Society scientists, the Society recommends not issuing a permit for these activities until (1) there is better modeling of the likely range of behavioral impact due to the sounds produced by the dredging activity; (2) fuller consideration is given to the impact of suspended sediments, the potential toxic effects of such sediments, and the impact of such suspended sediments on blue whale feeding; and (3) potential population impacts are reassessed after consideration of the importance of this area for blue whale feeding."

President Elect,
Society for Marine Mammalogy

Jay Barlow

cc Nick Gales, President
SMM Board Members

Response to Review Request from

Secretaría de Medio Ambiente y Recursos Naturales

Society of Marine Mammalogy scientists knowledgeable in the areas of acoustics and blue and gray whale movements and foraging reviewed the English translation entitled "Study on Migration of the Blue and Gray Whales Related to the Operations of Don Diego Dredging Project in the Gulf of Ulloa, Baja California Sur." The reviewers (listed with brief biographies at the conclusion of this review) were affiliated with the Society's Conservation Committee or Committee of Scientific Advisors.

They raised the following concerns regarding the study. In several cases they found that the study incorrectly interpreted available information and in other cases there was a lack of sufficient information to fully evaluate the impact of the dredging operations on blue and gray whale populations.

Acoustic Impacts

The document (Table 4) states that 250 Hz is the lower end of the hearing range of gray, humpback and blue whales. This is wrong. Blue whales recorded in the Gulf of California had vocalizations ranging from 11 to 125 Hz (Thompson et al., 1996). We do not have any hearing thresholds for baleen whales, but a survey of literature estimating the best frequencies of hearing using anatomical models or finite element analyses suggest a range of best hearing from 1 to 8 kHz and an overall hearing range from 30 Hz to 25 kHz. Thus blue and gray whales are highly likely to be sensitive to frequencies ranging below and above those given in Table 4. Table 5 gives source levels between 168 and 175 dB re 1 μ Pa at 1 m. No information is presented on the propagation loss model, the bottom profile in the area of the dredging, and the behavioral response threshold used to estimate impact ranges and numbers. The standard reception threshold for behavioral change is 120 dB (e.g., Richardson et al. 1990 for bowhead whales responding to drilling and dredging). The report notes that "Sound experiments conducted as part of the MIA, indicate that the effect of noise from dredging and operation of the vessel spread in a radius of 5 km around the vessels." However without any data on the received levels at 5 km, the adequacy of such a threshold distance cannot be determined.

The report indicates that as part of the mitigation program they will be verifying the sound propagation with in-situ measurements. They should expect some behavioral responses of the whales out to a range at which the dredging and ship noise falls to 120 dB.

The reviewers agreed with the report's conclusion that the sounds associated with the dredging are very unlikely to cause temporary or permanent threshold shifts.

If dredging requires extensive ship operations, it is possible that whales might veer off the migration paths close to shore. Therefore it would be reasonable to monitor whale behavior from a dedicated vessel over the first year of operations to assure minimal impact is achieved.

Habitat alteration impacts

IB

Reviewers felt that while focusing on sound, the report neglected to discuss the impacts of habitat alteration caused by the dredging which can cause significant sediment plume generation that can be transported large distances depending on currents and grain size. The potential impacts of increased sediment in the water column locally, and in the surrounding ecosystem by transport, are not adequately considered. A permit application for a dredging proposal was denied by the New Zealand Protection Authority primarily due to uncertainty regarding the extent and impact of sediment plumes on the ecosystem, including foraging blue whales.

Inadequate consideration of the use of the area by cetaceans

Several reviewers noted the poor or inaccurate information on blue whale occurrence.

Overall the report seems to down play the occurrence and level of feeding of blue whales in the proposed region. Blue whale occurrence along the west coast of Baja has been poorly studied but this appears to be one of the more important areas in which blue whales feed and occur for most months of the year. While the report cites data from satellite tagged whales (Bailey et al. 2009) they misrepresent the key relevant points from this publication. Fig 3 in Bailey et al. (2009) shows Area Restricted Search (ARS) movements for blue whales indicating feeding in all seasons off the west coast of southern Baja with in or adjacent to the Gulf of Ulloa with heavy use of the Gulf especially in Spring.

Conclusion #4 that this is primarily a transit area for blue whales is inaccurate. It correctly points out that transiting blue whales likely pass farther offshore from the main operation but ignores the clear evidence of heavy blue whale feeding especially in spring in more coastal waters where operations are proposed.

Mitigation measures list a proposed suspension of dredging operations for the major week of blue whale transit each year but clearly with the more important prolonged and extensive use of this area for feeding for many months this would not provide much of a mitigation since the main impact of concern would be on feeding blue whales.

The proposers did not justify why they did not consider impacts of mining operations on other cetaceans known to be in the area including humpback, fin and Bryde's whales and numerous small cetaceans including pilot whales, Risso's dolphins, long-beaked common dolphins and Pacific white-sided dolphins.

In light of the recommendations of the Marine Mammal Society scientists, the Society recommends not issuing a permit for these activities until (1) there is better modeling of the likely range of behavioral impact due to the sounds produced by the dredging activity; (2) fuller consideration is given to the impact of suspended sediments, the potential toxic effects of such sediments, and the impact of such suspended sediments on blue whale feeding; and (3) potential population impacts are reassessed after consideration of the importance of this area for blue whale feeding.

Literature Cited

Bailey, H., B.R. Mate, D. M. Palacios, L. Irvine, S.J. Bograd, and D.P. Costa. 2009. Behavioural estimation of blue whale movements in the Northeast Pacific from state-space model analysis of satellite tracks. *Endangered Species Research* 10:93-106.



Richardson, W.J., B. Würsig, and C.R. Greene, Jr. 1990. Reactions of bowhead whales, *Balaena mysticetus*, to drilling and dredging noise in the Canadian Beaufort Sea. *Marine Environmental Research* 29:135-160

Thompson, P.O., L.T. Findley, O. Vidal, W.C. Cummings. 1996. Underwater sounds of blue whales, *Balaenoptera musculus*, in the Gulf of California, Mexico. *Marine Mammal Science* 12:288-293.

Reviewers:

Tiffini Brookens is a biologist with the Marine Mammal Commission in Bethesda, MD, where she has worked for the last six years. Tiffini received her MS in marine science from California State University and Moss Landing Marine Laboratory in 2006. Prior to working at the Commission, she worked at the Naval Undersea Warfare Center Division, Newport in Rhode Island. While at the Navy, Tiffini primarily dealt with the acoustic and impulsive effects of Navy testing and training activities on marine mammals. Her work integrates technical expertise regarding the various effects of sound on marine mammals in the evaluation and support of environmental compliance with numerous U.S. statutes, including the Marine Mammal Protection Act and the National Environmental Policy Act. Tiffini serves on multiple federal interagency working groups (e.g., the Subcommittee on Ocean Science and Technology's Ocean Noise and Marine Life Ad-Hoc Interagency Working Group and the Interagency Coordinating Group on Noise and Marine Mammals) and international review groups (e.g., the Seismic Code Review Group for New Zealand's Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations and the Stakeholder Review Group for the Joint Industry Program's Auditory Weighting Function Review) involving the effects of sound on marine mammals.

John Calambokidis is a Senior Research Biologist and one of the founders of Cascadia Research Collective, a non-profit research organization formed in 1979 based in Olympia, Washington. He periodically (1991-2013) serves as an Adjunct Faculty at the Evergreen State College teaching a course on marine mammals. His primary areas of expertise are the biology of marine mammals and the impacts of humans. He has served as Project Director of over 100 projects. He has authored two books on marine mammals (on blue whales and a guide to marine mammals) as well as more than 150 publications in scientific journals and technical reports. He has conducted studies on a variety of marine mammals in the North Pacific from Central America to Alaska. He serves as Project Manager of the Southern California Behavioral Response Study and has directed long-term research on the status, movements, and underwater behavior of blue, humpback, and gray whales. Some of his recent research has included attaching tags to whales with suction cups to examine their feeding behavior and vocalizations. His work has been covered on shows by National Geographic and others. In 2012 he received the American Cetacean Society's John Heyning Award for Lifetime Achievement in Marine Mammal Science.

Professor Vincent M. Janik is the director of the Scottish Oceans Institute at the University of St Andrews in the UK. He received his PhD from the School of Biology at St Andrews in 1998. Before joining the St Andrews faculty, he was a research fellow at the Woods Hole Oceanographic Institution, USA and a Royal Society University Research Fellow at the University of St Andrews, UK. In his research, he concentrates on vocal communication and the effects of noise in marine mammals as well as the evolution of complexity in animal communication and cognition in general. He has published over 70 research articles on these topics



in scientific journals such as Science, PNAS, and Current Biology and holds several international patents on acoustic deterrence techniques for mammals. In total, his research experience in these fields spans 26 years. He serves on the editorial board of the journal Animal Cognition and is the main editor of the Springer book series Animal Signals and Communication. He also was a fellow at the Centers for Advanced Study in Berlin (2009) and in Budapest (2003).

Dr. Laura May-Collado is a Lecturer and Associated Researcher at the Department of Biology, University of Vermont (UVM). She is also an Affiliated Professor at the Universidad Maritima Internacional de Panama, and Associated Researcher at Centro de Investigaciones del Mar y Liminologia, Universidad de Costa Rica. She has 18 years of experience on marine mammal research in Central America and the Caribbean. Laura received her M.Sc. at University of Costa Rica and her Ph.D. at Florida International University. She leads the RIEMMCCA network “Red de Investigadores de Mamiferos Acuaticos de Centro America y del Caribe” and several research projects in Panama and Costa Rica. Dr. May-Collado studies the evolution of acoustic communication in marine mammals using a number of approaches including phylogenetics, data mining, bioacoustics, and behavior. She also studies the impact of changing underwater soundscapes on marine mammal habitat use and communication. She is currently the co-advisor of three PhD students. At UVM, Laura teaches introductory courses on biology and high-level courses on Marine Mammals, Evolution, and Acoustic Communication. Laura serves on the Committee of Scientific Advisors for the Society for Marine Mammalogy. She has authored 33 peer-reviewed journal articles including two book chapters, and 22 reports to the International Whaling Commission and Governments of Panama and Costa Rica.

Dr. Leigh Torres is an Assistant Professor in the Department of Fisheries and Wildlife at Oregon State University. Leigh is a Principal Investigator within the Marine Mammal Institute where she leads a vibrant research lab that examines the spatial and behavioral ecology of a variety of marine megafauna species across diverse ecosystems. Leigh received her PhD in marine ecology in 2007 and her Master’s degree in environmental management in 2001, both from Duke University. Leigh has extensive experience studying the distribution and behavioral patterns of marine mammals and seabirds, often in the context of space-use conflicts with anthropogenic activities. Leigh has applied her skills and knowledge to multiple collaborative projects, including those oriented toward conservation management (e.g., fisheries overlap, MPA design), advancement of theoretical concepts (e.g., niche theory, animal movement patterns), descriptive and predictive outcomes (e.g., current and future habitat use patterns) and analytical method development and application (e.g., scale, model validation and transferability). Likewise, Leigh’s ecological research is broad and incorporates many topics including predator-prey interactions, habitat and prey availability, foraging theory, population connectivity and dispersal, migration corridors, competition, movement ecology, and scale. Leigh has been working in the field of marine ecology for 19 years, has 24 publications with over 400 citations, and currently supervises four graduate students and one post-doc.

Professor Jorge Urbán is a Professor of the Department of the Coastal and Marine Sciences of the Autonomous University of Baja California Sur at La Paz, B.C.S. where he has worked for 30 years. He received his Ph. D. from the National University of México (UNAM). He began his research on whales since 1982, when he initiated the first long term study on humpbacks in Mexico. Jorge has presented papers on this topic at more than 70 international meetings, and has written more than 100 scientific publications about the great whales and dolphins of the Gulf of California. He has special interest on the fin, humpback and gray whales, as well of



beaked whales from the Mexican Pacific. From 1991 to 1993 he was president of the Mexican Marine Mammologist Society (SOMEMMA). He is chairman of the Subcommittee of Whale-watching of the Scientific Committee of the International Whaling Commission, and member of the Cetacean Specialist Group of the IUCN. He currently is advisor of four PhD and 6 Master students and serves on dissertation committees of 6 others. He is the founder and leader of the Marine Mammal Research Program of the UABCS.

Professor Douglas Wartzok is Provost Emeritus and Professor of Biology at Florida International University. He received a Ph.D. in Biophysics (Neurophysiology) from the Johns Hopkins University. His research on marine mammals has taken him from the Arctic Ocean to Antarctica to study seals, whales and walrus. He and his colleagues and graduate students, have developed acoustic tracking systems for studying seals, and radio and satellite tracking systems for studying whales. His research focuses on behavioral and physiological ecology of marine mammals; sensory systems involved in under-ice navigation by seals; and psychophysical studies of captive marine mammals. For the past 15 years he has been involved in the issue of the effect of naval anti-submarine warfare sonar on marine mammals, in particular beaked whales. For eight years he edited Marine Mammal Science and is now Editor Emeritus. He has served as Chairman of the Committee of Scientific Advisors of the U.S. Marine Mammal Commission. He is the Chair of the Society for Marine Mammalogy Committee of Scientific Advisors. He was a member of the National Academy of Sciences Committee on "Assessing Ambient Noise in the Ocean with Regard to Potential Impacts on Marine Mammals," and chaired the NAS Committee on "Determining Biological Significance of Marine Mammal Responses to Ocean Noise." He is currently a member of the NAS Committee on the "Assessment of the Cumulative Effects of Noise and other Anthropogenic Stressors on Marine Mammals."

JB