MEETING REQUESTED

Via Electronic Mail

March 30, 2020

Ms. Jolie Harrison
Chief, Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 90210

RE: Proposed Rule for U.S. Navy Training and Testing Activities in the Mariana Islands Training and Testing Study Area

Dear Ms. Harrison:

On behalf of the Natural Resources Defense Council ("NRDC") and our millions of members and activists, we are writing to submit comments on the Proposed Rule for U.S. Navy activities in the Mariana Islands Training and Testing ("MITT") Study Area. 85 Fed. Reg. 5782 (Jan. 31, 2020).

In addition, we request a virtual meeting at your earliest convenience to discuss the serious issues concerning beaked whales that are raised by this proposed rulemaking.

I. LEGAL FRAMEWORK

The MMPA was adopted more than forty years ago to ameliorate the consequences of human impacts on marine mammals. Its goal is to protect and promote the growth of marine mammal populations "to the greatest extent feasible commensurate with sound policies of resource management" and to "maintain the health and stability of the marine ecosystem." 16 U.S.C. § 1361(6). A careful approach to management was necessary given the vulnerable status of many of these populations (a substantial percentage of which remain endangered or depleted) as well as the difficulty of measuring the impacts of human activities on marine mammals in the wild. 16 U.S.C. § 1361(l), (3). "[I]t seems elementary common sense," the House Committee on Merchant Marine and Fisheries observed in sending the bill to the floor, "that legislation should be adopted to require that we act conservatively—that no steps should be taken regarding these animals that might prove to be adverse or even irreversible in their effects until more is known. As far as could be done, we have endeavored to build such a conservative bias into the

[MMPA].” Report of the House Committee on Merchant Marines and Fisheries, reprinted in 1972 U.S. Code Cong. & Admin. News 4148.

At the heart of the MMPA is its so-called “take” provision, which establishes a moratorium on the harassing, hunting, or killing of marine mammals, and generally prohibits any person or vessel subject to the jurisdiction of the United States from taking a marine mammal on the high seas or in waters or on land under the jurisdiction of the United States. 16 U.S.C. §§ 1362(13), 1371(a). Under the law, NMFS may grant exceptions to the take prohibition, provided it determines, using the best available scientific evidence, that such take would have only a negligible impact on marine mammal populations or stocks. NMFS must prescribe “methods” and “means of effecting the least practicable impact” on protected species as well as “requirements pertaining to the monitoring and reporting of such taking.” 16 U.S.C. §§ 1371(a)(5)(A)(ii), (D)(vi).

II. NEGLIGIBLE IMPACT ANALYSIS

Under the MMPA’s general permit provision, NMFS can authorize exceptions to the take moratorium only upon making an affirmative finding that an activity will have no more than a “negligible impact” on a species or stock. 16 U.S.C. §§ 1371(a)(5)(A)(i), (D)(i)(I). “Negligible impact” has been defined by the agency as one “that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival” (50 C.F.R. § 216.103); or, as the agency translates, one that is “not likely to reduce annual rates of adult survival or recruitment.” 71 Fed. Reg. 21,003 (Apr. 24, 2006). Here, NMFS proposes to authorize take of multiple island-associated populations, most of unknown population size and many presumably with small or limited ranges. To justify that authorization notwithstanding the lack of robust mitigation measures, the agency makes a number of assumptions that are not supported by the best available science.

A. Potential for serious injury and mortality

NMFS proposes to authorize only takes from auditory injury and significant behavioral disruption. In doing so, the agency assumes that no serious injuries and no mortalities will result from the months of major exercises, each involving substantial use mid-frequency active sources, underwater detonations, and other training and testing activities, slated to take place within the MITT Study Area each year. 85 Fed. Reg. at 5874 (stating that “[n]o take by serious injury or mortality is requested or anticipated to occur”). In doing so, the agency has misrepresented the science.

(1) Serious injury and mortality in beaked whales

NMFS asserts that the Navy’s activities will not result in a single mortality, or a single case of serious injury, of beaked whales around the Mariana Islands. That position is insupportable.

The stranding record in the Mariana archipelago shows a significant increase in beaked whale strandings over the last fifteen years, during a period when the Navy has ramped up its activities

in the area. As first noted in the Guam press, at least six beaked whale stranding events, each involving as many as three animals, have been reported in the archipelago since 2006, as compared with only a single stranding in the previous 35 years.[1] That number of recent stranding events was subsequently corrected to eight, in a paper that appeared earlier this year in a major, peer-reviewed journal. The paper, whose co-authors include several NMFS biologists, was able to correlate four of these events with Navy operations, a correlation that it describes as "highly significant."[2]

The observed correlation of Navy activities and beaked whale mortalities is hardly surprising. It is universally accepted, including by both NMFS and the Navy, that the use of mid-frequency naval sonar has resulted in numerous mass stranding events in various locations around the world, including but not limited to the Bahamas (2000),[3] the Canary Islands (1985, 1988, 1989, 1991, 2002, 2004),[4] Greece (1996, 1997, 2011),[5] Madeira (2000),[6] Spain (2006),[7] and the Virgin Islands (1999).[8] As commentators have long observed, beaked whales from relatively naïve populations are more likely to react in ways that result in serious injury or mortality.[9] Even in

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[1] *See* https://www.guampdn.com/story/news/2019/03/03/military-proposes-sonar-use-more-whales-wash-up-guams-shores/2865769002/.

[2] Simonis, A.E., R.L. Brownell, Jr., B.J. Thayre, J.S. Trickey, E.M. Oleson, R. Huntington, and S. Baumann-Pickering, Co-occurrence of beaked whale strandings and naval sonar in the Mariana Islands, Western Pacific, *Proceedings of the Royal Society B* 287: 20200070 (2020); *see also* Simonis, A., B. Thayre, E. Oleson, and S. Baumann-Pickering, Mid-frequency active sonar and beaked whale acoustic activity in the Northern Mariana Islands. *The Journal of the Acoustical Society of America*, 140(4): 3413-3413 (2016).

[3] Departments of Commerce and the Navy, Joint interim report: Bahamas marine mammal stranding event of 15-16 March 2000 (2001).

[4] Simmonds, M., and Lopez-Jurado, L.F., Whales and the military," *Nature* 337: 448 (1991); Martín, V., Servidio, A., and Garcia, S., Mass strandings of beaked whales in the Canary Islands, *in* P.G.H. Evans and L.A. Miller, *Proceedings of the Workshop on Active Sonar and Cetaceans*, at 33-36 (2004); Fernández, A., J.F. Edwards, F. Rodríguez, A. Espinosa de los Monteros, P. Herráez, P. Castro, J.R. Jaber, V. Martín, and M. Arbelo, "Gas and fat embolic syndrome" involving a mass stranding of beaked whales (Family *Ziphiidae*) exposed to anthropogenic sonar signals, *Veterinary Pathology* 42: 446–457 (2005).

[5] Frantzis, A., Does acoustic testing strand whales? *Nature* 392: 29 (1998); SACLANT Undersea Research Center, Summary Record: SACLANTCEN Bioacoustics Panel, SACLANTCEN M-133, La Spezia, Italy (1998); Frantzis, A., The first mass stranding that was associated with the use of active sonar (Kyparissiakos Gulf, Greece, 1996), *in* Evans, P.G.H., and Miller, L.A., Proceedings of the Workshop on Active Sonar and Cetaceans, at 14-20 (2004); Frantzis, A., "Growing numbers – Update on the mass stranding of Ziphius in the Ionian Sea, Greece," Posting of biologist to the MARMAM academic listserv, with previous updates embedded (Dec. 7, 2011).

[6] Ketten, D.R., Beaked whale necropsy findings (2002) (paper submitted to NMFS); Freitas, L., "The stranding of three Cuvier's beaked whales *Ziphius Cavirostris* in Madeira Archipelago—May 2000," *in* Evans, P.G.H., and Miller, L.A., Proceedings of the Workshop on Active Sonar and Cetaceans, at 28-32 (2004).

[7] International Whaling Commission, Report of the Scientific Committee, Annex K (2006) (IWC/58/Rep1).

[8] Personal communication of Dr. David Nellis, U.S. Virgin Island Department of Fish and Game, to Eric Hawk, NMFS (Oct. 1999); personal communication from Ken Hollingshead, NMFS, to John Mayer, Marine Acoustics Inc. (March 19, 2002); letter from William T. Hogarth, Regional Administrator, NMFS Southeast Regional Office, to RADM J. Kevin Moran, Navy Region Southeast (undated); personal communication from Ken Hollingshead, NMFS, to John Mayer, Marine Acoustics Inc. (March 19, 2002).

[9] *E.g.,* Wensveen, P.J., Isojunno, S., Hansen, R.R., von Benda-Beckmann, A.M., Kleivane, L., van Usselmuide, S., Lam, F.-P.A., Kvadsheim, P.H., DeRuiter, S.L., Curé, C., Narazaki, T., Tyack, P.L., and Miller, P.J.O., Northern

frequently exposed populations on instrumented Navy ranges, beaked whales are known to cease foraging and swim away tens of kilometers or more to escape the sonar source, a remarkably strong reaction.[10]

The best available science shows that serious injuries and mortalities are likely to far exceed the number of reported strandings. Numerous studies along multiple lines of evidence, including post-stranding pathology, laboratory study of organ tissue, and theoretical work on dive physiology, in addition to expert reviews,[11] indicate that behaviorally-mediated injury and mortality is occurring through maladaptive alteration of the dive pattern in response to Navy sonar exposure—impacts that occur at sea, independent of a whale's stranding. The pathologies observed in these animals are analogous to those experienced by terrestrial mammals in severe cases of decompression sickness, or "the bends," and are consistent with such outcomes as disorientation, debilitation, and death.[12] Experiments on common bottlenose dolphin to test for nitrogen bubble formation after sudden repetitive dives have found no evidence of gas bubble formation.[13] But beaked whales, which are adapted to perform long and deep dives, show saturation of nitrogen levels at the surface, making them particularly vulnerable.[14] Most beaked

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bottlenose whales in a pristine environment respond strongly to close and distant navy sonar signals, *Proceedings of the Royal Society B* 286: 20182592 (2019).

[10] *E.g.,* Tyack, P.L., Zimmer, W.M.X., Moretti, D., Southall, B.L., Claridge, D.E., Durban, J.W., Clark, C.W., D'Amico, A., DiMarzio, N., Jarvis, S., McCarthy, E., Morrissey, R., Ward, J., and Boyd, I.L., Beaked whales respond to simulated and actual Navy sonar, *PLoS ONE* 6(3):e17009.doi:10.13371/journal.pone. 0017009 (2011); DeRuiter, S.L., Southall, B.L., Calambokidis, J., Zimmer, W.M., Sadykova, D., Falcone, E.A., Friedlaender, A.S., Joseph, J.E., Moretti, D., Schorr, G.S., and Thomas, L., First direct measurements of behavioural responses by Cuvier's beaked whales to mid-frequency active sonar, *Biology Letters* 9(4): p.20130223 (2013); Joyce, T.W., J.W. Durban, D.E. Claridge, C.A. Dunn, L.S. Hickmott, H. Fearnbach, K. Dolan, and D. Moretti, Behavioral responses of satellite tracked Blainville's beaked whales (*Mesoplodon densirostris*) to mid-frequency active sonar, *Marine Mammal Science* 36: 29-46 (2020).

[11] *See, e.g.*, Fahlman, A., P.L. Tyack, P.J.O. Miller, and P.H. Kvadsheim, How man-made interference might cause gas bubble emboli in deep diving whales, *Frontiers in Physiology* 5: art. 13 (2014); Fernández, A., *et al.*, "Gas and fat embolic syndrome," *supra*; Hooker, S.K., Fahlman, A., Moore, M.J., Aguilar de Soto, N., Bernaldo de Quirós, Y., Brubakk, A.O., Costa, D.P., Costidis, A.M., Dennison, S., Falke, J., Fernandez, A., Ferrigno, M., Fitz-Clarke, J.R., Garner, M.M., Houser, D.S., Jepson, P.D., Ketten, D.R., Kvadsheim, P.H., Madsen, P.T., Pollock, N.W., Rotstein, D.S., Rowles, T.K., Simmons, S.E., Van Bonn, W., Weathersby, P.K., Weise, M.J., Williams, T.M., and Tyack, P.L., Deadly diving? Physiological and behavioural management of decompression stress in diving mammals, *Proceedings of the Royal Society of London, Pt. B: Biological Sciences* 279: 1041–1050 (2012); Bernaldo de Quiros, Y., Gonzalez-Diaz, O., Arbelo, M., Sierra, E., Sacchini, S., and Fernandez, A., Decompression vs. decomposition: Distribution, amount, and gas composition of bubbles in stranded marine mammals. *Frontiers in Physiology* 3: art. 177 (2012); Bernaldo de Quiros, Y., Gonzalez-Diaz, O., Mollerlokken, A., Brubakk, A.O., Hjelde, A., Saavedra, P., and Fernandez, A., Differentiation at autopsy between in vivo gas embolism and putrefaction using gas composition analysis, *International Journal of Legal Medicine 127*(2): 437–45 (2013)..

[12] Fernández, A., *et al.*, "Gas and fat embolic syndrome," *supra*

[13] Houser, D.S., L.A. Dankiewicz-Talmadge, T.K. Stockard, and P.J. Ponganis. 2010. Investigation of the potential for vascular bubble formation in a repetitively diving dolphin, *Journal of Experimental Biology*, 213, pp. 52–62.

[14] Hooker S.K., R.W. Baird, and A. Fahlman, Could beaked whales get the bends? Effect of diving behaviour and physiology on modelled gas exchange for three species: *Ziphius cavirostris*, *Mesoplodon densirostris* and *Hyperoodon ampullatus*, *Respiratory Physiology and Neurobiology* 167: 235-46 (2009); Hooker, S.K., *et al*., Deadly

whale casualties are bound to go undocumented because of the species' preference for deep water and the small chance that a dead or injured animal would actually strand, particularly along islands with strong currents.[15]

Remarkably, NMFS dismisses the risk of beaked whale stranding and other mortality events based on the arguments that "a causal relationship" has not been clearly established between sonar exposure and stranding and that "sonar was considered only one of several factors that, in their aggregate, may have contributed to a stranding event…" 85 Fed. Reg. at 5821-25. In light of the available scientific evidence, this position is both arbitrary and irresponsible. NMFS' method in its Proposed Rule is to cast doubt on an undefined subset of previous stranding events on the grounds that the precise mechanism of harm could not be established, even while describing in detail the abundance of pathological and forensic evidence. *Id.* In taking the view, the agency is misaligned with the requirements of the MMPA, which requires that decisions be based on best available science and which, consistent with the 1994 Amendments to the Act, implicitly sets a probability standard of *potentiality* for takes resulting in serious injury and mortality.

Let us be clear: The Navy is almost certainly killing beaked whales in the Mariana islands. NMFS' expectation of a lack of serious injury and mortality is contradicted by the record, and the agency's failure to recognize the problem and respond to it as the MMPA requires is nothing short of shameful.

(2) Mitigation effectiveness

As with the other elements of its take estimates (see below), NMFS, following the Navy, has applied a post-modeling adjustment to its estimate of lethal take that substantially reduces the total number. That adjustment, in the case of serious injury and mortality, purports to account for the effectiveness of visual observers in detecting marine mammals within the blast zone of an underwater explosion (or within the radius of permanent acoustic injury); but NMFS' borrowed methods here are non-transparent and misconceived.

The Navy's DEIS for the MITT Study Area starts with the species-specific g(0) factors applied in professional marine mammal abundance surveys, then multiplies them by simple factors to reflect the relative effectiveness of its lookouts in routine operating conditions. Yet the Navy's sighting effectiveness is likely to be much poorer than that of experienced biologists dedicated exclusively to marine mammal detection, operating under conditions that maximize sightings. As

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diving? *supra*; Costidis, A.M., and S.A. Rommel, The extracranial arterial system in the heads of beaked whales, with implications on diving physiology and pathogenesis, *Journal of Morphology* 277: 5–33 (2016).

[15] Faerber, M.M., and Baird, R.W., Does a lack of observed beaked whale strandings in military exercise areas mean no impacts have occurred? A comparison of stranding and detection probabilities in the Canary and main Hawaiian Islands, *Marine Mammal Science* 26: 602-13 (2010); P.A. Alison, C.R. Smith, H. Kukert, J.W. Deming, and B.A. Bennett, Deep-water taphonomy of vertebrate carcasses: a whale skeleton in the bathyal Santa Catalina Basin, 17 *Paleobiology* 78-89 (1991). *See also* G. Wobeser, *Investigation and Management of Disease in Wild Animals* 13-15 (1994) (observing as a general principle in wildlife management that observed mortality in wildlife populations typically represents a subset of actual mortality).

one recent paper observed, for example, abundance survey rates declined significantly as sea states rose above Beaufort 1.[16] Off the Mariana Islands, sea states are typically very high—so high as to frustrate efforts to conduct standard trackline abundance surveys in the region. *See* 85 Fed. Reg. at 5845. For example, during one trackline survey conducted during the late winter/ early spring of 2012, more than half the viable survey hours were spent in Beaufort 5 and 6, with some additional whole days grounded due to high winds and swells.[17] Under such conditions, Navy visual surveys can seldom approximate the sighting effectiveness of a large-vessel abundance survey. It is worth noting, as does the Marine Mammal Commission, that courts, experts, and NMFS itself on previous occasions have questioned the effectiveness of the Navy's lookout regime.[18] Indeed, we know from the Navy's own studies that Navy watchstanders charged with implementing exclusion zones appear to fare much poorer in detecting marine mammals than do trained protected species observers, who are generally not allowed aboard ship.[19]

In any case, the public has no meaningful way to further evaluate the agencies' adjustment since the Proposed Rule does not provide the scores used to generate the effectiveness factor or the agencies' pre-adjustment take numbers, nor does the Navy in the ancillary report NMFS references. 85 Fed. Reg. at 5846. We support the recommendation of the Marine Mammal Commission that, "[s]ince the Navy has yet to determine the effectiveness of its mitigation measures, it is premature to include *any* related assumptions to reduce the numbers of marine mammal takes."[20]

Given the apparent effect of this post-model analysis on the agency's mortality estimates—accounting perhaps for the drop in expected deaths from 150 (during the previous five-year period) to virtually zero—NMFS should have made the Navy's approach transparent and explained the rationale for its acceptance of that approach. NMFS' failure to do so has prevented the public from effectively commenting on NMFS's approach to this issue, in contravention of the APA, on a matter of obvious significance to the agency's core negligible impact findings. 5 U.S.C. § 553(b), (c); 5 U.S.C. § 706(2)(D).

B. Failure to set proper thresholds and weighting functions for auditory impacts and non-lethal injuries

(1) Thresholds and weighting functions

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[16] Barlow, J., Inferring trackline detection probabilities, g(0), for cetaceans from apparent densities in different survey conditions, *Marine Mammal Science* 31: 923-943 (2015)

[17] HDR, Guam and Saipan marine species monitoring: Winter-spring survey 15-29 March (2012).

[18] Comments of Dr. Peter O. Thomas, Executive Director, Marine Mammal Commission, to Jolie Harrison, NMFS (June 17, 2015) (comments on NMFS's proposed rule authorizing Northwest Training and Testing Activities).

[19] *See, e.g.*, Watwood, S., Rider, S., Richlen, M., and Jefferson, T., *Cruise report: Marine species monitoring & lookout effectiveness study*, Submarine Commanders Course, February 2015, Hawaii Range Complex (2016) (prepared under Navy contract).

[20] Comments of Dr. Peter O. Thomas, Executive Director, Marine Mammal Commission, to Jolie Harrison, NMFS, at 16 (Mar. 12, 2020) (comments on MITT Proposed Rule).

NMFS has largely followed the Navy in revising its hearing loss thresholds to reflect certain new data and modeling approaches. But as we have repeatedly advised, the criteria that the agency has produced to estimate temporary and permanent threshold shift in marine mammals[21] are erroneous and non-conservative.

Wright (2015)[22] has identified several statistical and numerical faults in NMFS' approach, such as pseudo-replication and inconsistent treatment of data, that tend to bias the criteria towards an underestimation of effects. Similar and additional issues were raised by a dozen scientists during the public comment period on the draft criteria held by NMFS.[23] At the root of the problem is the agency's broad extrapolation from a small number of individual animals, mostly bottlenose dolphins, without taking account of what Racca *et al.* (2015b)[24] have succinctly characterized as a "non-linear accumulation of uncertainty." NMFS failed to address the basic errors identified by these and other experts; nor did it perform a sensitivity analysis to understand the potential magnitude of those errors.

Hearing loss remains a very significant risk where, as here, the agency has not required aerial or passive acoustic monitoring as mandatory mitigation, appears unwilling to restrict operations in low-visibility conditions, and has set safety-zone bounds that are inadequate to protect high-frequency cetaceans even from permanent threshold shift. NMFS should not rely exclusively on its auditory guidance in determining "Level A" take, but should, at minimum, produce a conservative upper bound such as by retaining the 180-dB threshold, or by performing a sensitivity analysis.

(2) Avoidance adjustment

As with its estimates of serious injury and mortality and of behavioral take, NMFS, following the Navy, makes certain post-modeling adjustments to its estimates of non-lethal injury, based, for this type of impact, on flawed assumptions about animal avoidance and mitigation effectiveness.

By itself, the Navy's avoidance adjustment effectively reduces the number of estimated auditory injuries by 95%, on the assumption that marine mammals initially exposed to three or four sonar transmissions at levels below those expected to cause permanent injury would avoid injurious exposures. This assumption has no scientific basis. While it is certainly true that some marine mammals will flee the sound, there are no data to indicate how many would do so, let alone that

[21] Finneran, J.J., Auditory weighting functions and TTS/ PTS exposure functions for cetaceans and marine carnivores (2015).

[22] Wright, A.J., Sound science: Maintaining numerical and statistical standards in the pursuit of noise exposure criteria for marine mammals, *Frontiers in Marine Science* 2: art. 99 (2015).

[23] Comments from Racca, R., Hannay, D., Yurk, H., McPherson, C., Austin, M., MacGillivray, A., Martin, B., Zeddies, D., Warner, G., Delarue, J., and Denes S., JASCO, to N. LeBoeuf, NMFS (Sept. 14, 2015) (comments on NMFS' 31 July 2015 notice (80 Fed. Reg. 45642)); Letter from Racca, R., Yurk, H., Zeddies, D., Hannay, D., Austin, M., MacGillivray, A., Warner, G., Martin, B. and McPherson, C., JASCO, and Tyack, P., University of St. Andrews, to A.R. Scholik-Schlomer, NMFS (Sept. 11, 2015) ("Request for an extension of the public comment period on the proposed acoustic guidelines for assessing the effects of anthropogenic sound on marine mammals").

[24] Letter from Racca, R. *et al.* (Sept. 14, 2015), *supra*.

95% would move as expeditiously as the Navy presumes. Marine mammals may remain in important habitat, and the most vulnerable individuals may linger in an area, notwithstanding the risk of harm; marine mammals cannot necessarily predict where an exercise will travel; and Navy vessels engaged in certain activities may move more rapidly than a marine mammal that is attempting to evacuate. Avoidance adjustments were first used in 2012, for an environmental impact report prepared under the California Environmental Quality Act; in that case, the authors, to compensate for their nonconservative assumptions about avoidance, presumed that every instance of permanent threshold shift would result in biological removal.[25] NMFS should not create an under-supported, nonconservative adjustment for avoidance here.

C. Failure to set proper thresholds for behavioral impacts

In its Proposed Rule, NMFS, following the Navy, has abandoned the narrowly conceived behavioral risk function that it employed in previous authorizations. In lieu of a simple dose-response curve, the agency applies a biphasic function that assumes an unmediated dose-response relationship at higher received levels and a context-influenced response at lower received levels. And instead of limiting its data sources to three studies, at least one of which—the response of captive bottlenose dolphins to tones generated in a temporary threshold shift experiment—was inapposite and should never have been used, the agency, again following the Navy, has incorporated data from a broader set of behavioral response studies, including the SOCAL BRS and the 3S project funded jointly by the U.S., French, and Norwegian navies.

We agree that a biphasic approach is better suited to the data and incorporates contextual factors better than the simple approach it used in previous analyses; and we concur with the agencies' expansion of data sources along with their removal of the threshold shift experiment as a basis for analysis, as we have recommended. The resulting functions, however, depend on some inappropriate assumptions that tend to significantly underestimate effects.

(1) Data sources

For example, two of the proposed behavioral response functions rely substantially on captive animal studies, even though it is generally accepted that captive animals, especially (but not limited to) those that have previously been trained, are likely to be less responsive to intrusive sound.[26] *Every* data point that informs the agencies' pinniped function, and *nearly two-thirds* of the data points informing the odontocete function (30/49), are derived from a captive animal study. In the case of the odontocete function, the reliance on captive studies exacerbates that function's heavy dependence on the bottlenose dolphin, a species that is generally considered relatively insensitive, to represent a diverse set of taxa with divergent sensitivity and reactiveness to mid-frequency anthropogenic noise. If, for example, the number of wild killer whale data points (n=8) and captive bottlenose dolphin data points (n=30)—a discrepancy that owes itself to

[25] Wood, J., Southall, B.L., and Tollit, D.J., PG&E Offshore 3-D Seismic Survey Project EIR: Marine Mammal Technical Report, Appendix H (2012) (CSLC EIR No. 758).

[26] *E.g.*, Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A. and Burns, W.C.G., Navy sonar and cetaceans: Just how much does the gun need to smoke before we act? *Marine Pollution Bulletin*, *56*(7): 1248-1257 (2008).

the greater accessibility of captive animals—were exchanged, such that killer whales represented the larger and bottlenose dolphins the lesser amount of data, the resulting response function would differ substantially.

Additionally, the risk functions do not incorporate (nor does NMFS apparently consider) a number of relevant studies on wild marine mammals, such as a passive acoustic study on blue whale vocalizations and a tagging study on behavioral responses to dipping sonar, for which received levels are either available or can be estimated.[27] It is not clear from the Proposed Rule, or from the Navy's recent technical report on acoustic "criteria and thresholds," on which NMFS' approach here is based,[28] exactly how each of the studies that NMFS employed was applied in the analysis, or how the functions were fitted to the data, but the available evidence on behavioral response raises serious concerns that the functions are not conservative for some species. For this reason and others, and given the obvious importance of this analysis for future acoustic impact analyses, we ask NMFS to make additional technical information available, including from any expert elicitation and peer review, and to re-open public comment on this issue.

(2) Incorporating effects of dipping sonar

As noted above, dipping sonar, like hull-mounted sonar, appears to be a significant predictor of deep-dive rates in beaked whales, with the dive rate falling significantly (e.g., to 35% of that individual's control rate) during sonar exposure, and likewise appears associated with habitat abandonment. Importantly, these effects were observed at substantially greater distances (e.g., 30 or more km) from dipping sonar than would otherwise be expected given the systems' source levels and the beaked whale response thresholds developed from research on hull-mounted sonar.[29] Researchers have hypothesized that the inherently unpredictable nature of dipping sonar—the inability of whales to track its progress in the water—make it a disproportionately powerful stressor.[30] Yet all the data sources used to produce the Navy's behavioral response functions concern hull-mounted sonar, an R/V-deployed sonar playback, or an in-pool source. The Navy's generic behavioral response function for beaked whales thus does not incorporate their heightened response to these sources, although such a response would be presumed to shift its risk function "leftward." Nor do the response functions for other species account for this difference, although unpredictability is known to exacerbate stress response in a diversity of

[27] Melcon, M.L., Cummins, A.J., Kerosky, S.M., Roche, L.K., and Wiggins, S.M., Blue whales respond to anthropogenic noise, *PLoS ONE* 7(2): e32681 (2012); Falcone, E.A., Schorr, G.S., Watwood, S.L., DeRuiter, S.L., Zerbini, A.N., Andrews, R.D., Morrissey, R.P., and Moretti, D.J., Diving behavior of Cuvier's beaked whales exposed to two types of military sonar, *Royal Society Open Science* 4(8): 170629 (2017).

[28] SSC Pacific, Technical report: Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis (Phase III) (June 2017).

[29] Falcone et al., Diving behavior of Cuvier's beaked whales exposed to two types of military sonar, *supra.*

[30] *Id.*

mammalian species[31] and should conservatively be assumed, in this case, to lead to a heightened response in marine mammal species other than beaked whales.

(3) "Cut-off" distances

As with its estimates of serious injury and mortality and of auditory impacts and non-lethal injury, the behavioral take estimates NMFS presents in its Proposed Rule have been substantially reduced through post-model analyses. In particular, NMFS has applied "cut-offs" in estimating the number of behavioral impacts on marine mammals, assuming that any animals exposed to disruptive noise beyond a particular cut-off distance is not taken, notwithstanding their actual degree of exposure.

NMFS, following the Navy, does not provide pre-adjusted take numbers, as noted above, but it is evident that these cut-offs significantly affect the estimates. As the Marine Mammal Commission observed in its Proposed Rule comments, for sonar bin MF1 "the estimated numbers of takes would be reduced to zero for odontocetes beginning where the probability of response is 40 percent and for beaked whales where the probability of response is 45 percent (Table 6.4-9 in the LOA application). For mysticetes, takes would be eliminated for MF1 sources at a received level of 154 dB re 1 μPa equating to a probability of response of 17 percent. While that percentage may seem inconsequential, the received level is actually greater than the level at which actual context-based behavioral responses were observed for feeding blue whales (see Figure 3 in Goldbogen et al. 2013)." [32]

Not only does this adjustment make no sense theoretically (again as the Commission has observed) given that distance is already incorporated in the response functions as a contextual factor; not only are the chosen cut-offs for each group of species based on little to no evidence; but the results are plainly inconsistent with the available data, including but not limited to blue whale feeding response (Goldbogen et al. 2013), blue whale vocalization response (Melcon et al. 2012), and opportunistic data from strandings (e.g., Southall et al. 2006).[33] Again, as the Commission notes, "Use of cut-off distances could be perceived as an attempt to reduce the numbers of takes."[34] We urge NMFS to reject this arbitrary, highly concerning approach to impact analysis.

(4) Behavioral thresholds for explosives

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[31]Wright, A.J., Soto, N.A., Baldwin, A.L., Bateson, M., Beale, C.M., Clark, C., Deak, T., Edwards, E.F., Fernández, A., Godinho, A. and Hatch, L.T., Anthropogenic noise as a stressor in animals: a multidisciplinary perspective. *International Journal of Comparative Psychology* 20(2): 250-73 (2007).

[32] Comments of Dr. Peter O. Thomas on MITT Proposed Rule, *supra*, at 4.

[33] Goldbogen, J.A., Southall, B.L., DeRuiter, S.L., Calambokidis, J., Friedlaender, A.S., Hazen, E.L., Falcone, E.A., Schorr, G.S., Douglas, A., Moretti, D.J., Kyburg, C., McKenna, M.F., and Tyack, P.L., Blue whales respond to simulated mid-frequency military sonar, *Proceedings of the Royal Society B* 280(1765): 20130657 (2013); Melcon, M.L., *et al*., Blue whales respond to anthropogenic noise, *supra*; Southall, B.L., Braun, R., Gulland, F.M.D., Heard, A.D., Baird, R.W., Wilkin, S.M., and Rowles, T.K., Hawaiian melon-headed whale (*Peponacephala electra*) mass stranding event of July 3-4, 2004 (2006) (NOAA Tech. Memo. NMFS-OPR-31).

[34] Comments of Dr. Peter O. Thomas on MITT Proposed Rule, *supra*, at 4.

For purposes of take estimation, the Navy effectively assumes that marine mammals do not respond behaviorally to single explosive detonations. This assumption appears to derive from final rules issued under the MMPA for ship-shock trials in the late 1990s and 2000s, and is entirely without empirical support. The Navy's preferred alternative provides for detonations with net explosive weights up to 1000 lbs., enough to sink a vessel. As the Marine Mammal Commission observes, "The Navy provide[s] no justification for why it believes that an animal would exhibit a significant behavioral response to two 5-lb. charges detonated within a few minutes of each other but would not exhibit a similar response for a single detonation of 50 lbs., let alone detonations of more than 500 lbs."[35] To restate the Commission's conclusion: NMFS should estimate and ultimately authorize behavior takes of marine mammals during *all* explosive activities, including those involving single detonations.[36]

D. Lack of support for negligible impact findings

To issue an incidental take authorization under the MMPA, NMFS has an affirmative duty to find that the authorized activities will have only a "negligible impact" on a marine mammal species or population. *See* 16 U.S.C. § 1371(a)(5)(A). Apart from the problems identified above, which result in underestimates of mortality, injury, hearing loss, and behavioral disruption, NMFS has failed to provide a negligible impact analysis that accounts for the repeated exposure of individual marine mammal populations to the Navy's activities or the agency's own lack of abundance data for what are likely to be range-limited populations. Moreover, it ignores evidence of impacts indicative of population-level harm that have begun to occur since Navy activities began ramping-up in the area. This failure is most egregious in the case of beaked whales.

First, with respect to beaked whales, NMFS is disregarding plain evidence of mortality and population-level harm consistent with the arrival of Navy activity among naïve populations of these highly, maladaptively reactive species. As discussed above, the stranding record shows a significant rise in the number of beaked whale strandings around the Mariana archipelago coincident with the Navy's ramp-up of activities there; and four of these stranding events have been correlated with Navy activities in a recent paper by NOAA and other scientists, to an extent deemed "highly significant." Furthermore, and also as discussed above, the best available science indicates that, for multiple reasons, the number of actual beaked whale casualties is likely to far exceed the number of reported strandings. Not only does the NMFS permitting office fail to assess the implications of these mortalities for impacts on the islands' beaked whale populations, as it must in making a "negligible impact" determination, it assumes that no beaked whales in the area will suffer serious injury or mortality as a result of the Navy's activities.

This failure is only exacerbated by the unsupported assumptions that NMFS makes about the size and structure of the region's beaked whale populations. At least four species of beaked whale are found within the MITT Study Area: Cuvier's beaked whale, Blainville's beaked whale,

[35] *Id*. at 5.

[36] *Id*.

Longman's beaked whale, and Ginkgo-toothed beaked whale. Beaked whales were acoustically detected in almost every month where there was recording effort off Saipan and Tinian (2010-2013).[37] While limited information on population structure is available, the best available science shows differences in the echolocation signal frequency of Blainville's beaked whales between the Northern Marianas Islands and other locations in the Pacific, Western Atlantic, and Gulf of Mexico, indicative of a population specific to the Northern Marianas Islands.[38] This finding is consistent with studies in other parts of the world, which have demonstrated remarkable site-fidelity in beaked whale populations. Range-limited populations have been found on the shelf break approximately 50 km east of Cape Hatteras,[39] as well as off Canada, in the Mediterranean, off Southern California, in the Bahamas, and around the Hawaiian Islands.[40] Yet NMFS assumes, counter to the available evidence, that beaked whales around the Mariana archipelago have no population structure and are part of large, cosmopolitan populations.

Resident populations are at relatively greater risk of cumulative exposure to noise and other disturbances. The Cuvier's beaked whale population off Cape Hatteras was recently cited as a key example in a scientific study highlighting the greater potential harm to the population from seismic surveys, given its residency to the area.[41] The authors emphasize that "displacement can also be a significant source of harm (including injury or death), particularly for small, resident populations that may have 'nowhere to go' and for which the costs of leaving their habitat may be severe."[42] The study, which was led by NMFS biologists, emphasizes how "[f]ailure to consider effects of both noise exposure and displacement of Cuvier's beaked whales from their habitat in this region could lead to more severe biological consequences than 'Level B Harassment' (as defined under US law), because (1) not all animals that can be injured are likely

[37] Hill, M.C., Cetacean research in the Marianas (2015) (PowerPoint presentation, available at: https://www.navymarinespeciesmonitoring.us/files/2514/5452/1661/Hill_2015-ppt-program_review.pdf).

[38] Baumann-Pickering, S., J.S. Trickey, K.E. Frasier, and E.M. Oleson, Geographic differences in Blainville's beaked whale (*Mesoplodon densirostris*) echolocation clicks (2018) (MPL Technical Memorandum no. 630).

[39] McLellan, W.A., R.J. McAlarney, E.W. Cummings, J.T. Bell, A.J. Read, and D.A. Pabst, "Year-round presence of beaked whales off Cape Hatteras, North Carolina," poster presentation at the 21st Biennial Conference on the Society of Marine Mammalogy, San Francisco, CA, Dec. 13-18, 2015 (2015); Baird, R.W., D.L. Webster, Z. Swaim, H.J. Foley, D.B. Anderson, and A.J. Read, Spatial use by odontocetes satellite tagged off Cape Hatteras, North Carolina in 2015: Final report (2016) (submitted to Naval Facilities Engineering Command Atlantic, Norfolk, Virginia, under Contract No. N62470-10-3011); Stanistreet, J.E., D.P. Nowacek, S. Baumann-Pickering, J.T. Bell, D.M. Cholewiak, J.A. Hildebrand, L.E. Hodge, H.B. Moors-Murphy, S.M. Van Parijs, and A.J. Read, Using passive acoustic monitoring to document the distribution of beaked whale species in the western North Atlantic Ocean, *Canadian Journal of Fisheries and Aquatic Sciences* 74(12): 2098-109 (2017).

[40] *See*, *e.g.*, Wimmer, T., and H. Whitehead, Movements and distribution of northern bottlenose whales, *Hyperoodon ampullatus*, on the Scotian shelf and in adjacent waters, *Canadian Journal of Zoology* 82: 1782-94 (2004); Falcone, E.A. and G.S. Schorr, Distribution and demographics of marine mammals in SOCAL through photoidentification, genetics, and satellite telemetry (2014) (prepared for CNO N-45); Forney, K.A., B.L. Southall, E. Slooten, S. Dawson, A.J. Read, R.W. Baird, and R.L. Brownell Jr., Nowhere to go: noise impact assessments for marine mammal populations with high site fidelity, *Endangered Species Research* 32: 391-413 (2017); Stanistreet, J.E. et al., Using passive acoustic monitoring to document the distribution of beaked whale species, *supra*.

[41] Forney, K.A. *et al*., Nowhere to go, *supra*.

[42] *Id*. at 403.

to be detected, and (2) displacement out of their population range may adversely affect foraging rates, reproduction, or the health of Cuvier's beaked whales."[43]

In short, NMFS reaches conclusions about the impacts of Navy activities on beaked whales within the MITT Study Area that are contradicted by the best available science. Far from meeting its burden, under the MMPA, to determine that impacts from the proposed activities will be negligible, it is putting multiple populations at risk.

Second, as with beaked whales, NMFS' negligible impact analysis for virtually all the species found within the MITT Study Area assumes that each species constitutes a single population. This is deeply problematic as marine mammals in other lower-latitude archipelagos—particularly in the well-studied Hawaiian Islands, which the agencies otherwise rely on throughout as a proxy for their marine mammal density assumptions—are known to occur in small, resident populations. Such populations are acutely vulnerable to Navy sonar. Around Hawaii, island-based residency and endemism has been seen across a taxonomically diverse range of small whale and dolphin species, including the beaked whales, melon-headed whales, spinner and bottlenose dolphins. The broad take estimates presented in the Proposed Rule, and the negligible impact analysis that they are meant to support, provide no insight into the specific impacts proposed for such small populations, and the agency's assumption that these populations do not exist is not supported by the record.

Third, the agency assumes that all the Navy's estimated impacts would not affect individuals or populations through repeated activity—even though the takes anticipated each year would affect the same populations and, indeed, would admittedly involve extensive use of some of the same biogeographic areas. And, while NMFS states that behavioral harassment (aside from those caused by masking effects) involves a stress response that may contribute to an animal's allostatic load, it assumes without further analysis that any such impacts would be insignificant. Both statements are factually insupportable given the lack of any substantial population analysis or quantitative assessment of long-term effects in the Proposed Rule, in addition to the numerous deficiencies in the thresholds and modeling that NMFS has adopted from the Navy.

Most of NMFS' discussion consists, once again, of generalized statements meant to suggest why the estimated levels of take will not result in greater than negligible impacts on marine mammals. For example, NMFS discounts the potential for population-level impacts by asserting that, "based on the nature of the Navy activities and the movement patterns of marine mammals, it is unlikely any particular subset would be taken over more than a few sequential days." 85 Fed. Reg. at 5875. Yet NMFS presents no details of the Navy's operations in support of this position. As the agency is aware, the Navy tends to reuse many of the same geographic areas for training and testing; the potential for repeated take of the same marine mammals exists even during routine testing activities that may be concentrated geographically; and non-sequential exposures can, of course, lead to cumulative effects on individual fitness. These effects can have population-level consequences, especially in small, resident populations, such as (to draw from other regions) the Kohala resident stock of melon-headed whales for which NMFS' own experts

[43] *Id*. at 401.

have expressed concern,[44] or the AUTEC-resident population of Cuvier's beaked whales, for which population-level effects are indicated.

Notably, the Proposed Rule makes no attempt to apply any of the methods used by the marine mammal research community to assess population-level harm. Such methods, involving quantitative or detailed qualitative assessment, include but are not limited to the use of reasonable proxies for population-level impact;[45] models of masking effects;[46] energetic models, such as on foraging success;[47] chronic noise;[48] and stress.[49] What scant quantitative analysis the agency does provide are averages of the number of times individual marine mammals are likely to be taken annually as a result of the Navy's activities. But these averages are derived simply by dividing population abundance by the amount of annual take; that is, they assume a static distribution of marine mammals across the range, an assumption that has no biological reality. It should be obvious even from NMFS' use of the word "average" that certain individuals within a population, for reasons of distribution and other contextual factors, will be exposed significantly more often than others. The agency does not consider the effects of these more frequent exposures on individual and population fitness, nor, again, does NMFS provide more than general statements discounting the significance of the expected take.[50]

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[44] *Id.*

[45] *E.g.*, National Research Council, Marine mammal populations and ocean noise: Determining when noise causes biologically significant effects (2005); Wright, A.J. (ed.), Report on the workshop on assessing the cumulative impacts of underwater noise with other anthropogenic stressors on marine mammals: from ideas to action, Proceedings of workshop held by Okeanos Foundation, Monterey, California (26-29 August 2009); Wood et al., PG&E Offshore 3-D Seismic Survey Project EIR, *supra.*

[46] *E.g.*, Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., "Acoustic masking in marine ecosystems as a function of anthropogenic sound sources," IWC Sci. Comm. Doc. SC/61/E10 (2009); Clark, C.W., Ellison, W.T., Southall, B.L., Hatch, L., van Parijs, S., Frankel, A., and Ponirakis, D., Acoustic masking in marine ecosystems: intuitions, analysis, and implication, *Marine Ecology Progress Series* 395: 201-22 (2009).

[47] Lusseau, D., Bain, D.E., Williams, R., and Smith, J.C., Vessel traffic disrupts the foraging behavior of southern resident killer whales *Orcinus orca*, *Endangered Species Research*, 6: 211-21 (2009); Williams, R., Lusseau, D., and Hammond, P.S., Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*), *Biological Conservation* 133: 301-11 (2006); New, L.F., Moretti, D.J., Hooker, S.K., Costa, D.P., and Simmons, S.E., Using energetic models to investigate the survival and reproduction of beaked whales (family *Ziphiidae*), *PLoS ONE* 8: e68725 (2013); Farmer, N.A., K. Baker, D.G. Zeddies, S.L. Denes, D.P. Noren, L.P. Garrison, A. Machernis, E.M. Fougeres, and M. Zykov, Population consequences of disturbance by offshore oil and gas activity for endangered sperm whales (*Physeter marcocephalus*), *Biological Conservation* 227: 189-204 (2018).

[48] NOAA, "Cetecean and Sound Mapping," available at: www.st.nmfs.noaa.gov/cetsound (accessed Mar. 29, 2020).

[49] A special issue of the *International Journal of Comparative Psychology* (20:2-3) is devoted to the problem of noise-related stress response in marine mammals.

[50] For example, NMFS argues, here and elsewhere, that the majority of behavioral disruptions would occur at the lower end of the exposure level (*e.g.*, for odontocetes, between 154 dB and 166 dB) and therefore would not be severe. But as the agency's own biphasic model of behavioral disturbance assumes, contextual factors like baseline activity and time of year can strongly affect the severity of a marine mammal's response, particularly at lower levels of exposure; and the scientific literature is replete with examples of severe responses to relatively moderate exposures to naval sonar and other sources. *See*, *e.g.*, Gomez, C., Lawson, J.W., Wright, A.J., Buren, A.D., Tollit, D., and Lesage, V., A systematic review on the behavioural response of wild marine mammals to noise: The disparity between science and policy, *Canadian Journal of Zoology* 94: 801-19 (2016). Furthermore, in making a

Moreover, NMFS states that because populations of beaked whales and other odontocetes in the Bahamas and other Navy fixed ranges that have been operating for decades appear to be stable, this suggests a lack of long-term consequences as a result of exposure to Navy training and testing activities. 85 Fed. Reg. 5890. The agency adds that, as beaked whales have been documented to travel hundreds of kilometers as part of their normal pattern, leaving an area where sonar or other anthropogenic sound is present "may have little, if any, cost to such an animal." *Id*. As discussed in the section of this letter on time-area management, these arguments are not supported by the best available science on beaked whales. Many beaked whale populations are now known to be resident to certain areas[51] and, as such, especially vulnerable to population-level impacts as a result of cumulative anthropogenic disturbance.[52] Counter to NMFS assertion that no evidence of population-level consequences exist, an apparent beaked whale population sink is observed on the AUTEC range, attributed to the high levels of cumulative noise exposure at the site;[53] and similar concerns have focused attention on resident beaked whale populations on the Navy's SOCAL range, which exhibit strenuous responses to mid-frequency sonar notwithstanding their repeated exposure.[54]

The agency's assumptions about cumulative risk to marine mammals are unsupported.

Fourth, NMFS does not consider the potential for acute synergistic effects from multiple activities taking place at one time, as happens during major exercises or from Navy activities in combination with other actions. For example, the agency does not consider the greater susceptibility to vessel strike of animals that have been temporarily harassed or disoriented, nor does NMFS consider (for example) the synergistic effects of noise with other stressors in producing or magnifying a stress response.[55] This lack of analysis is not supportable under the MMPA. Without an accurate assessment of existing threats to marine mammals, NMFS lacks a sufficient environmental baseline to determine whether the Navy's action will have no more than a negligible impact on marine mammal species and stocks.

Fifth, as with its 2013 rulemaking for Southern California and Hawaii, the agency has not apparently considered the impact of Navy activities on a population basis for many of the marine mammal populations within the MITT area. Instead, it has lodged discussion for many populations within broader categories, most prominently "mysticetes" (14 populations) and

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negligible impact determination, NMFS must analyze the impacts of the take it has authorized, not merely the take it anticipates. *See Conservation Council*, 97 F.Supp.3d at 1220-22.

[51] *E.g*., Baird, R.W., et al., Spatial use by odontocetes satellite tagged off Cape Hatteras, North Carolina, *supra*; Read, A.J., unpublished data, *in* Forney et al., Nowhere to go, *supra*; McLellan, W.A., *et al*., Year-round presence of beaked whales off Cape Hatteras, North Carolina, *supra*.

[52] Forney et al., Nowhere to go, *supra*.

[53] Claridge, D., Population ecology of Blainville's beaked whale (*Mesoplodon densirostris*) (2013) (Ph.D. thesis); Claridge, D., *et al.*, unpublished data.

[54] Falcone et al., Diving behaviour of Cuvier's beaked whales exposed to two types of military sonar, *supra*.

[55] Wright et al., Do marine mammals experience stress related to anthropogenic noise? *supra*.

"odontocetes" (37 populations), that in some cases correspond to general taxonomic groups. Such grouping of stocks elides important differences in abundance, demography, distribution, and other population-specific factors, making it difficult to assume "that the effects of an activity on the different stock populations" are identical. *Conservation Council*, 97 F.Supp.3d at 1223. That is particularly true where small, resident populations are concerned, and differences in population abundance, habitat use, and distribution relative to Navy activities can be profoundly significant.

The agency must revise its negligible impact findings.

E. Offsets for undetected and unreported collisions in assessing ship-strike risk

To determine the risk of a direct vessel collision with marine mammals, an approach that NMFS supports, the Navy begins with the number of ship-strikes reported by Navy vessels operating in the HSTT Study Area since 2009, when its reporting and monitoring requirements were standardized; pro rates that number over the Navy's steaming days during the same period; estimates strandings over the next five-year period given the number of expected future steaming days; and then runs a Poisson distribution to account for the probability that a slightly lesser or greater number will be struck within the same period.

This approach, however, fails to account for the likelihood that ship strikes since 2009 were unintentionally underreported. Vessel collisions are generally underreported in part because they can be difficult to detect, especially for large vessels. For example, analyses of North Atlantic right whale strike data have concluded that such data are likely to grossly underestimate the actual number of animals struck, in part because animals struck but not observed or recovered cannot be accounted for.[56] The Poisson distribution, being based on reported strikes, does not account for this problem. Additionally, the Navy's analysis does not address the potential for increased strike risk of non-Navy vessels as a consequence of acoustic disturbance. For example, some types of anthropogenic noise have been shown to induce near-surfacing behavior in right whales, increasing the risk of ship-strike—by not only the source vessel but potentially by third-party vessels in the area—at relatively moderate levels of exposure.[57] An analysis based on reported strikes by Navy vessels *per se* does not account for this additional risk. In assessing ship- strike risk, the Navy should include offsets to account for potentially undetected and unreported collisions.

III. MITIGATION AND MONITORING

In authorizing "take" under the general authorization provision of the MMPA, NMFS has the

[56] Reeves, R.R., Read, A.J., Lowry, L., Katona, S.K., and Boness, D.J, Report of the North Atlantic Right Whale Program Review, 13–17 March 2006, Woods Hole, Massachusetts (2007) (prepared for the Marine Mammal Commission).

[57] Nowacek, D.P., Johnson, M.P. and Tyack, P.L., North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli, *Proceedings of the Royal Society of London B: Biological Sciences* 271: 227-31 (2004).

burden of meeting the Act's mitigation standard. Specifically, and as noted above, the agency must prescribe "methods" and "means of effecting the least practicable adverse impact" on marine mammals and set additional "requirements pertaining to the monitoring and reporting of such taking." 16 U.S.C. §§ 1371(a)(5)(A)(ii), (D)(vi). While NMFS is required to consult with the Department of Defense before making a determination under this provision, and to consider "personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity" (id.), the "least practicable adverse impact" standard is, in any case, a rigorous one. *NRDC v. Pritzker*, 828 F.3d at 1133; see also, *e.g.*, *Conservation Council*, 97 F.Supp.3d at 1231.

A. NMFS' interpretation of the MMPA's mitigation standard

The Ninth Circuit's opinion in *Pritzker* rejected the agency's formulation of the "least practicable adverse impact" standard in a number of important ways. Perhaps most significantly, it held that NMFS—in a *post hoc* attempt to excuse its own failure—had wrongly imported the "population-level focus" of the MMPA's "negligible impact" requirement into the Act's mitigation provision; and it held that the agency, when faced with scientific uncertainty, had erred on the side of underprotection, whereas the law requires measures "aimed at protecting marine mammals *to the greatest extent practicable* in light of military readiness needs." *NRDC v. Pritzker*, 828 F.3d at 1134 (emphasis added). Unfortunately, in addressing the *Pritzker* opinion, NMFS, in its Proposed Rule, introduces at least one element that is plainly inconsistent with the opinion and the underlying statute.

The *Pritzker* Court made clear that NMFS, in arguing—as justification for failing to prescribe additional mitigation measures—that "the agency 'cannot mitigate adverse population-level impacts to any degree less than zero,'" had improperly imported a "population-level focus" into the MMPA's mitigation standard. 828 F.3d at 1134. Yet here NMFS, while clarifying that population-level impacts are mitigated "through the application of mitigation measures that limit impacts to individual animals," has again set population-level impact as the basis for mitigation. 85 Fed. Reg. at 5850. Because NMFS' mitigation analysis is opaque, it is not clear what practical effect this position may have on its rulemaking.

The Proposed Rule is also unclear in its application of the "habitat" emphasis in the MMPA's mitigation standard. As NMFS recognizes (id. at 5852), the Act requires mitigation achieving the least practicable adverse impact on both marine mammals *and their habitat*, "paying particular attention to rookeries, mating grounds, and areas of similar significance." 16 U.S.C. § 1371(a)(5)(A)(i)(II). Consistent with this, the *Pritzker* Court held that protecting marine mammal habitat from Navy sonar is "of paramount importance" under the law, and that, in defining habitat for mitigation, the agency is compelled to err on the side of overprotection rather than underprotection where data on marine mammal distribution are limited. *NRDC v. Pritzker*, 828 F.3d at 1138, 1141. On that basis, the Court ruled that NMFS had failed to adequately identify Offshore Biologically Important Areas—not only in data-poor regions, but in other regions, such as the Northwest Hawaiian Islands, where the agency "faced the familiar choice of how to handle uncertainty, and chose underprotection without adequately explaining the decision, or how the least practicable adverse impact standard for mitigation was met." *Id*. at 1141 n.14; *see also id.* at

1136-41. While, again, the agency's discussion in the Proposed Rule is opaque, its apparent failure even to attempt to identify other viable time-area measures, let alone to consider them in the context of the MMPA's protective purpose, suggests that the agency has not addressed this aspect of the *Pritzker* decision.

Once it has set forth the correct mitigation standard, the agency must apply it. The MMPA, as noted above, sets forth a "stringent standard" for mitigation that requires the agency to minimize impacts to the lowest practicable level. *NRDC v. Pritzker*, 828 F.3d at 1135 (citation omitted). The agency must conduct its own analysis and clearly articulate it; it "cannot just parrot what the Navy says." *Conservation Council*, 97 F.Supp.3d at 1230. Yet NMFS, in past authorizations of Navy activities, has done little more than parrot the Navy's position on mitigation, accepting, without any meaningful evaluation of its own, the Navy's assertions of impracticability. *Id.* The baselessness of this approach can be seen from the outcome of *Conservation Council*, where the parties were able to reach a settlement agreement establishing time-area management measures (*inter alia*) on the Navy's SOCAL and Hawaii Range Complexes notwithstanding NMFS' finding, following the Navy, that all such management measures would substantially affect military readiness and were not practicable. Unfortunately, there is no indication in the Proposed Rule that NMFS has, as yet, done anything different here.

B. Time-area management

Spatial restrictions designed to protect important habitat are one of the most effective available means to reduce the potential impacts of noise and disturbance on marine mammals, including mid-frequency sonar and noise resulting from other naval activities.[58] In its DEIS, the Navy proposed to implement three Geographic Mitigation Areas: Marpi Reef and Chalan Kanoa Reef, in which explosives activities would be barred during the seasonal humpback whale breeding season; and Agat Bay Nearshore, in which explosives and hull-mounted sonar activities would be prohibited to protect a sheltering area for spinner dolphins. Since the Navy submitted its application, NMFS has proposed extending the Marpi and Chalan Kanoa Reef Mitigation Areas to encompass the 400-meter isobaths (although the initiative for even this may have come from the Navy, *see* 85 Fed. Reg. at 5865) and establishing a messaging system to notify Navy personnel of humpback whale occurrence in those areas. Remarkably, it does not propose or adequately consider any other protected areas within this vast range complex, nor whether it should expand the proscription on activities in those few areas whose biological importance it recognizes.

(1) Evaluation of proposed Geographic Mitigation Areas

[58] *See, e.g.*, Agardy, T., N. Aguilar, A. Caňadas, M. Engel, A. Frantzis, L. Hatch, E. Hoyt, K. Kaschner, E. LaBrecque, V. Martin, G. Notarbartolo di Sciara, G. Pavan, A. Servidio, B. Smith, J. Wang, L. Weilgart, B. Wintle, and A. Wright, A global scientific workshop on spatio-temporal management of noise (2007) (Report of workshop held in Puerto Calero, Lanzarote, June 4-6, 2007); Dolman, S., N. Aguilar Soto, G. Notarbartolo di Sciara, and P. Evans, Technical report on effective mitigation for active sonar and beaked whales (2009) (report commissioned by European Cetacean Society); Memorandum from Dr. Jane Lubchenco, NOAA Administrator, to Ms. Nancy Sutley, CEQ Chair (Jan. 19, 2010); Convention on Biological Diversity, Scientific synthesis on the impacts of underwater noise on marine and coastal biodiversity and habitats (2012) (U.N. Doc. UNEP/CBD/SBSTTA/16/INF/12).

a. Marpi Reef Geographic Mitigation Area

The Marpi Reef Geographic Mitigation Area is intended to provide year-round protection for marine mammals from in-water explosives and a seasonal (December-April) reporting requirement for MF1 surface-ship hull-mounted mid-frequency active sonar used in this area, due to aggregations of breeding humpback whales occurring at this time. Other species afforded protection by the prohibition on explosives include spinner dolphins, bottlenose dolphins, short-finned pilot whales, and false killer whales, all of which have been documented at Marpi Reef (*see* DEIS at Appendix I-5).

The boundaries of the proposed Marpi Reef Geographic Mitigation Area are defined by a simple polygon encompassing recorded sightings of humpback whales at the reef during a broad-area line-transect survey in 2007 and during non-systematic small-boat surveys occurring from 2010 through 2018 (DEIS at Appendix I-5), as modified by NMFS. However, defining the Geographic Mitigation Area based solely on survey sightings may overlook other important habitat in the immediate vicinity (described below) that shares the same characteristics and supports the same biological function.

In addition, humpback whales, like all baleen whales, are particularly vulnerable to vessel collisions, which can cause serious injury and mortality.[59] A recent study carried out in the 4-island region around Maui indicates that humpback whale calves are at relatively higher risk. Calves represented 25-39% of whales not seen until <300 m distance from vessels, which would constitute a "near-miss," even though they comprised only 7-9% of the population.[60] Collision risk was found to correlate directly to vessel speed: Encounters with humpback whales dropped by 91.5% when vessels were traveling at 12.5 knots or less.[61] As such, it is important that the NMFS prescribe vessel speed limits in this important breeding habitat. Mandatory speed limits, such as those that the agency has put in place to protect North Atlantic right whales, have proven effective; NMFS has no basis on which to determine that its "notification message" measure—which would depend on non-specialist, non-dedicated Navy observers operating effectively in unfavorable sea states—would be as effective, or effective at all. And there is no reason why NMFS cannot reasonably accommodate national security needs to create exceptions to the rule if needed.

We therefore make the following recommendations with respect to this area:

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[59] *E.g.*, Redfern, J.V., M.F. McKenna, T.J. Moore, J. Calambokidis, M.L. Deangelis, E.A. Becker, J. Barlow, K.A. Forney, P.C. Fiedler, and S.J. Chivers, Assessing the risk of ships striking large whales in marine spatial planning. *Conservation Biology* 27(2): 292-302 (2013); Rockwood, R.C., J. Calambokidis, and J. Jahncke, High mortality of blue, humpback and fin whales from modeling of vessel collisions on the US West Coast suggests population impacts and insufficient protection, *PLoS ONE*, 12(8): e0183052 (2017).

[60] Currie, J.J., S.H. Stack, S.K. Easterly, G.D. Kaufman, and E. Martinez, Modeling whale-vessel encounters: the role of speed in mitigating collisions with humpback whales (*Megaptera novaeangliae*), *Journal of Cetacean Research and Management* 17: 57-63 (2015).

[61] *Id.*

1. *Extend the Marpi Reef Geographic Mitigation Area boundaries to include a buffer than encompasses humpback whale sightings data.*

In defining the boundaries of the Marpi Reef Geographic Mitigation Area, we recommend that the Navy include a buffer that encompasses the humpback whale sightings beyond this contour (*i.e.*, the distance between the 400 m depth contour and the southernmost point of the current proposed Marpi Reef Geographic Mitigation Area [DEIS at Appendix I, Figure I-2]).

2. *Implement vessel speed restrictions from December through April.*

Ship strikes (as noted above) and vessel noise pose a serious risk to humpback whales, particularly in calving and breeding areas. As such, the Navy should implement restrictions to limit vessel speed within the Marpi Reef Geographic Mitigation Area from December through April.

3. *Prohibit use of mid-frequency active sonar, including dipping sonar, year-round.*

To be blunt, NMFS' sonar notification requirement is not a mitigation measure, but a reporting requirement that does not in any way reduce the extent of training and testing with active acoustics in the area. Use of hull-mounted mid-frequency sonar, at least within the MF1 bin, should be restricted. Similarly, the Marpi Reef Geographic Mitigation Area should include a year-round prohibition on air-deployed mid-frequency active sonar. Dipping sonar has been shown to have disproportionate impacts on beaked whales and may impact other species in a similar manner, due to the unpredictability of the signal.[62]

4. *Prohibit use of low-frequency active sonar from December through April*

Baleen whales are vulnerable to the impacts of low-frequency active sonar, particularly in calving areas where low-amplitude communication calls between mothers and calves can be easily masked.[63] Low-frequency sonar within the Area should be prohibited from December through April.

b. Chalan Kanoa Reef Geographic Mitigation Area

The Chalan Kanoa Reef is intended to provide year-round protection for marine mammals from in-water explosives and a seasonal (December-April) reporting requirement for MF1 surface-ship hull-mounted mid-frequency active sonar used in this area is required due to aggregations of breeding humpback whales. Other species afforded protection by the prohibition on explosives include spinner dolphins, bottlenose dolphins, short-finned pilot whales, false killer whales, rough-toothed dolphins, and pygmy killer whales, all of which have been documented at Chalan Konoa Reef (DEIS at Appendix I-16-I-17).

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[62] Falcone et al., Diving behavior of Cuvier's beaked whales exposed to two types of military sonar, *supra*.

[63] Videsen, S.K., L. Bejder, M. Johnson, and P.T. Madsen, High suckling rates and acoustic crypsis of humpback whale neonates maximise potential for mother–calf energy transfer, *Functional Ecology* 31(8): 1561-73 (2017).

The boundaries of the proposed Chalan Kanoa Reef Geographic Mitigation Area are defined by a simple polygon encompassing exposed fringing reef, reef flats exposed at low tide, nearshore shallow waters (less than 20 meters in depth), and a portion of Saipan Harbor (DEIS at Appendix I-13), as modified by NMFS. The relative concentration of total marine mammal sightings and tag detections as observed and documented between 2007 and 2018, which include seasonal (February-March) humpback whale sightings documented during non-systematic small-boat surveys occurring from 2015 through March 2018. *Id*.

In addition, as with Marpi Reef, vessel speed restrictions and a prohibition on low-frequency sonar should be observed during the humpback whale breeding season. Given the observed presence of particularly noise-sensitive species at Chalan Kanoa Reef (*e.g.*, false killer whales), the Navy should also impose a year-round prohibition on hull-mounted (MF1 at minimum) and air-deployed mid-frequency active sonar within the Geographic Mitigation Area.

We therefore make the following recommendations with respect to this area:

1. *Implement vessel speed restrictions from December through April.*

As with Marpi Reef, ship strikes and vessel noise pose a serious risk to humpback whales, particularly in calving and breeding areas. As such, the Navy should implement restrictions to limit vessel speed within the Chalan Kanoa Reef Geographic Mitigation Area from December through April.

2. *Prohibit use of mid-frequency active sonar year-round.*

As with Marpi Reef, use of hull-mounted mid-frequency sonar, at least within the MF1 bin, should be restricted. Additionally, the Chalan Kanoa Reef Geographic Mitigation Area should include a year-round prohibition on air-deployed mid-frequency active sonar. Dipping sonar has been shown to have disproportionate impacts on beaked whales and may impact other species in a similar manner.

3. *Prohibit use of low-frequency active sonar from December through April.*

Baleen whales are vulnerable to the impacts of low-frequency active sonar, particularly in calving areas. Low-frequency sonar should therefore be prohibited within the Area from December through April.

c. Agat Bay Nearshore Geographic Mitigation Area

The Agat Bay Nearshore Geographic Mitigation Area is intended to provide year-round protection for spinner dolphins and sea turtles from in-water explosives and MF1 surface-ship hull-mounted mid-frequency active sonar (DEIS at Appendix I-26).

The boundaries of the proposed Agat Bay Nearshore Geographic Mitigation Area are designed to encompass the shoreline between Tipalao, Dadi Beach, and Agat on the west coast of Guam, with a boundary across the bay enclosing an area of approximately 5 km^2 in relatively shallow waters (less than 100 m) (DEIS at Appendix I-21). The boundaries are based on spinner dolphin sightings documented during small boat surveys from 2010 through 2014. Sea turtle sightings from 2010 through 2014 were also used. *Id*. In this case, we recommend the southern portion of the Geographic Mitigation Area be extended westwards to include the 100 m depth contour to encompass the aggregation of sightings and protect nearshore habitat for these species.

We therefore make the following recommendation with respect to this area:

Extend the southern boundary of the Agat Bay Nearshore Geographic Mitigation Area boundaries seaward to the 100 m depth contour and include a buffer area sufficient to accomplish the goal of avoiding mass disruption of spinner dolphins.

In defining the boundaries of the Agat Bay Nearshore Geographic Mitigation Area, we recommend that the Navy extend the southern portion of the Mitigation Area westwards out to the 100 m depth contour (DEIS Appendix I at Figure I-4). This extension would encompass a cluster of sea turtle sightings and protect nearshore habitat that, based on sightings data, appear generally important for spinner dolphins and sea turtles. *Id*. We also strongly advise NMFS to establish a buffer zone around the Area to the greatest practicable extent, in order to reduce the risk of disruption of spinner dolphin behavior within the Area; and to expand the same restriction, at minimum, to dipping sonar.

(2) Additional habitat areas of importance within MITT Study Area for species other than beaked whales

Remarkably, although the Navy preliminarily identified and subsequently rejected three additional areas as potentially important habitat for mitigation, NMFS does not appear to have given any thought to these areas; nor did it appear to conduct its own analysis of any other area with the MITT, notwithstanding the importance placed by the courts in *Conservation Council* and *Pritzker* on the agency's robust, independent implementation of the mitigation requirement. Such additional habitat areas of potential importance include the following.

a. Sperm whale calving and nursery habitat offshore Agat Bay, Guam

In a 2012 survey, a single sperm whale was sighted close to the western coast of Guam.[64] Additionally, Eldredge (2003) reported a sighting of a group of sperm whales including a newborn calf, made during June 2001 off the west coast of Guam.[65] Just over one-quarter of the sightings (26%) were in or on the periphery of Agat Bay, an area where the bathymetry drops to depths beyond 2000 m very quickly, and closer to shore than any other area around Guam, Rota,

[64] HDR, Guam-Saipan marine species monitoring winter-spring survey, March 2012 (2012) (submitted to Naval Facilities Engineering Command Pacific under Contract No. N62470-10- D-3011).

[65] Eldredge, L.G., The marine reptiles and mammals of Guam, *Micronesica*, 35/36: 653-660 (2003).

or Saipan, making it appropriate habitat for sperm whales.[66] NMFS should establish a Mitigation Area in the offshore area of Agat Bay encompassing the continental shelf break and slope and extending out to the 2000 m depth contour to protect this potentially important calving and nursing area for endangered sperm whales.

b. Sperm whale breeding and calving habitat offshore Apra Harbor, Guam

Sightings of several sperm whale calves and a large bull have been observed 2.5 km offshore of the mouth of Apra Harbor.[67] NMFS should prescribe a Mitigation Area offshore of Apra Harbor, encompassing the continental shelf break and slope and extending out to the 2000 m depth contour, to protect this potential breeding and calving habitat for endangered sperm whales.

c. Spinner dolphin resting habitat at Bile Bay, Tumon Bay, and Double Reef, Guam

As with Agat Bay, spinner dolphin resting habitat in lagoons is well characterized[68] and has been identified in Bile Bay, Tumon Bay, and Double Reef located on the west side of Guam.[69] NMFS should establish Mitigation Areas in these bays to protect important habitat for spinner dolphins.

d. Breeding habitat for a possibly resident pygmy killer whale population and resting habitat for spinner dolphin at Cocos Island and Lagoon, Guam

Eight pygmy whales were encountered west of Guam in 2013 and the same group with a new calf was encountered west of Cocos Island in 2014 indicating that this area comprises important breeding and calving habitat for a population of pygmy killer whales that exhibits site fidelity to the area.[70] Cocos Lagoon (off Merizo) is also known as important resting habitat for spinner dolphins.[71] In addition, Cocos Island and Lagoon may represent high-use areas for sea turtles.[72] NMFS should protect Cocos Lagoon and the continental shelf and slope waters west of Cocos Island seaward to the 2000 m depth contour as important habitat areas for multiple species.

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[66] HDR, Summary report: Compilation of visual survey effort and sightings for marine species monitoring in the Mariana Islands Range Complex (2014) (submitted to Naval Facilities Engineering Command Pacific (NAVFAC) under Contract No. N62470-10-D-3011).

[67] P. Thorson, G. Fulling, T. Norris, C. Hall, and K. Sawyer, Marine mammal and sea turtle survey and density estimates for Guam and the Commonwealth of the Northern Mariana Islands (2007) (submitted to Naval Facilities Engineering Command, Pacific under Contract No. N68711-02-D-8043).

[68] Thorne, L.H., D.W. Johnston, D.L. Urban, D.L., J. Tyne, L. Bejder, R.W. Baird, S. Yin, S.H. Rickards, M.H. Deakos, J.R. Mobley Jr, and A.A. Pack, Predictive modeling of spinner dolphin (*Stenella longirostris*) resting habitat in the main Hawaiian Islands, *PLoS One 7*(8): e43167 (2012).

[69] HDR, Summary report, *supra*.

[70] Hill, M.C., A.D. Ligon, M.H. Deakos, A.C. U, A. Milette-Winfree, A.R. Bendlin, and E.M. Oleson, Cetacean surveys in the waters of the southern Mariana Archipelago (February 2010 – April 2014) (2014) (NMFS PIFSC data report DR-14-013).

[71] HDR, Summary report, *supra*.

[72] Jones, T.J., and K.S. Van Houtan, Sea turtle tagging in the Mariana Islands Range Complex (MIRC) (2014) (submitted to the U.S. Navy by the Marine Turtle Assessment Group, NMFS PIFSC).

e. Short-finned pilot whale core use areas, west of Guam and Rota

The area of highest probability of use for eleven short-finned pilot whales satellite-tagged off Guam and Rota during the summers (June through August) of 2013, 2014, and 2016, were located off the west sides of Guam and Rota (see Figure 1).[73] Short-finned pilot whales found off Guam and Rota are genetically different from short-pinned pilot whales found off Saipan and Tinian,[74] indicating that these core areas represent important habitat for a genetically distinct group of short-finned pilot whales and two distinct social networks within that group (the Guam social network is separate from the Rota social network).[75] NMFS should designate a Geographic Mitigation Area to protect, at minimum, the ten percent "highest use area" for short-finned pilot whales.

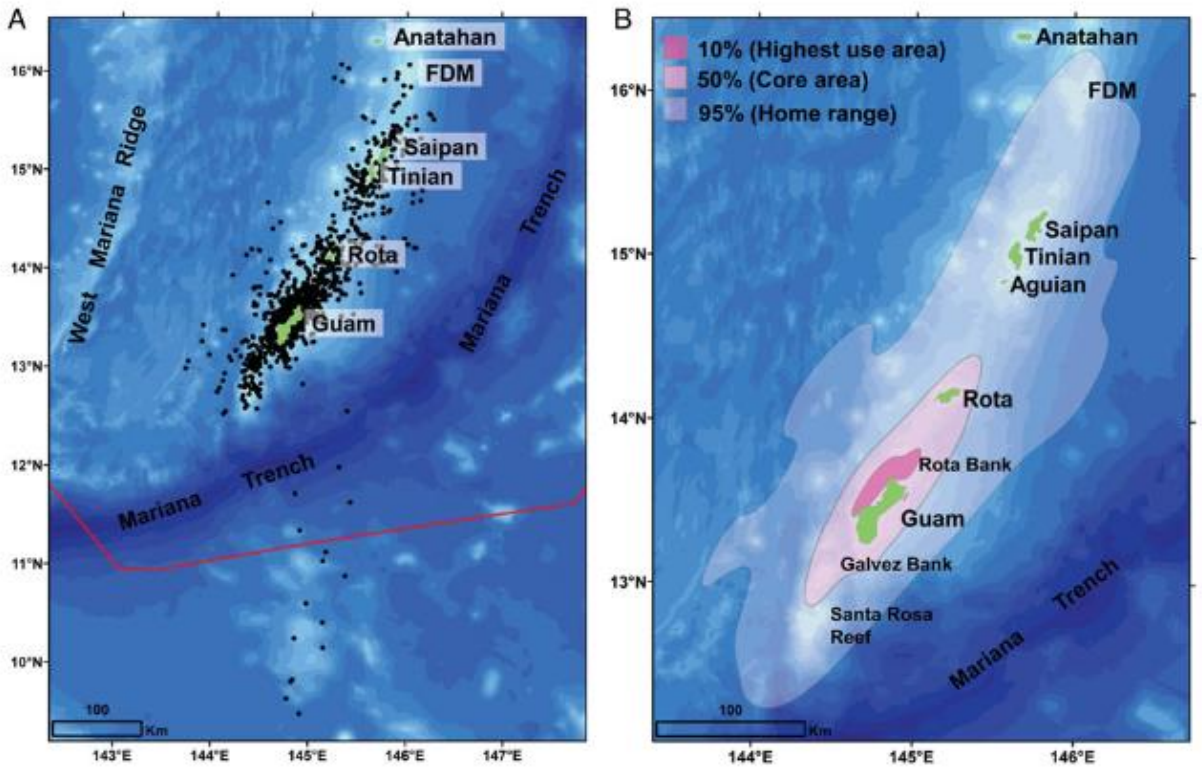

Fig. 1. Panel A: Two-daily satellite tag locations (n = 1,007) from 11 short-finned pilot whales satellite tagged off Guam and Rota during summer (June–August) 2013, 2014, 2016 (black dots). Panel B: the probability density contours (magenta 10%, pink 50%, violet 95%) estimated from kernel densities of the satellite tag locations. Red line denotes the Guam and Commonwealth of

[73] Hill, M.C., A.R. Bendlin, A.M. Van Cise, A. Milette-Winfree, A.D. Ligon, M.H. Deakos, and E.M. Oleson, Short-finned pilot whales (*Globicephala macrorhynchus*) of the Mariana Archipelago: Individual affiliations, movements, and spatial use, *Marine Mammal Science* 35: 797-824 (2018).

[74] Martien, K. K., M.C. Hill, A.M. Van Cise, K.M. Robertson, S.M. Woodman, L. Dollar, V.L. Pease, and E.M. Oleson, Genetic diversity and population structure in four species of cetaceans around the Mariana Islands (2014) (NMFS Tech. Memo NOAA-TM-NMFS-SWFSC-536).

[75] Hill, M.C. et al., Short-finned pilot whales (*Globicephala macrorhynchus*) of the Mariana Archipelago, *supra*.

the Northern Mariana Islands exclusive economic zone boundary. All individuals were a part of the main social cluster. (Adapted from Hill et al. 2018).

f. Persistent important habitat for spinner and bottlenose dolphins and potential feeding habitat for Bryde's whales, Rota Bank

Spinner dolphins and bottlenose dolphins were consistently encountered within 500 m of the same location at Rota Bank over four years,[76] and the area is considered an offshore area with higher relative abundance of spinner dolphins.[77] Bottlenose dolphins have low genetic diversity relative to other populations and show evidence of nuclear introgression with Fraser's dolphin, indicating a hybridization event; bottlenose dolphins in the Marianas are therefore a small genetically isolated and genetically distinct population.[78] A Bryde's whale was also observed lunge-feeding at Rota Bank in 2015, indicating it may serve as a feeding area for this species.[79] NMFS should establish a Mitigation Area to protect important habitat for multiple species of marine mammals at Rota Bank.

g. Important resting habitat for spinner dolphins, Tanapaq Lagoon, Saipan

Spinner dolphin resting habitat is well characterized in Tanapaq Lagoon, Saipan.[80] As with Agat Bay, NMFS should establish a Mitigation Area to protect this important habitat for spinner dolphins.

(3) General recommendations for geographic mitigation within the MITT Study Area

In carrying out its Geographic Mitigation Assessment, we are concerned that the Navy has made unsupported assumptions that lead to the outright dismissal of potential Mitigation Areas located in data-poor areas that may otherwise be afforded further consideration. NMFS, in following the Navy, has adopted the same assumptions.

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[76] Hill M.C., A.D. Ligon, M.H. Deakos, A.C. Ü, A.J. Milette-Winfree, and E.M. Oleson, Cetacean surveys of Guam and CNMI waters: May – July, 2012: Including individual photo-identification of pilot whales, spinner dolphins and bottlenose dolphins (2010-2012) (2013) (submitted to the U.S. Pacific Fleet Environmental Readiness Office, NMFS PIFSC Data Report DR-13-001); Hill, M., A. Ligon, M. Deakos, A. Ü, A. Milette-Winfree, and E. Oleson, Cetacean surveys in the waters of the southern Mariana Archipelago (2010-2012) (2013) (submitted to the U.S. Pacific Fleet Environmental Readiness Office, NMFS PIFSC Data Report DR-13-005); Hill M.C. et al., Cetacean surveys in the waters of the southern Mariana Archipelago (February 2010-April 2014), *supra*.

[77] Hill M.C. et al., Cetacean surveys in the waters of the southern Mariana Archipelago (February 2010-April 2014), *supra*.

[78] Martien et al., Genetic diversity and population structure in four species of cetaceans around the Mariana Islands, *supra*; Martien, K., S. Woodman, K. Robertson, M. Hill, L. Dolar, F. Archer, and E. Oleson, Introgressive hybridization of Fraser's dolphin mitochondrial and nuclear DNA into Mariana Islands bottlenose dolphins (2015) (presentation at the 21st Biennial Conference on the Biology of Marine Mammals, 13-18 December 2015, San Francisco, California).

[79] Unpublished data.

[80] HDR, Summary report, *supra*.

As noted above, the Ninth Circuit has soundly rejected an underprotective approach to data-poor areas, pursuant to the MMPA's mitigation provision. Specifically, the Court held, *inter alia*, that NMFS, in predicating its Offshore Biologically Important Areas (OBIAs) in such regions on habitat-specific data, had made a policy choice inconsistent with its duty to prescribe mitigation producing the "least practicable adverse impact" on marine mammals. *NRDC v. Pritzker*, 828 F.3d 1125, 1140 (9th Cir.). Protecting habitat, as the Court recognized, is "of paramount importance" under the MMPA. *Id.* at 1141 (citing the mitigation requirement's application to "species or stock and their habitat" and NMFS' duty to "pay[] particular attention to rookeries, mating grounds, and areas of similar significance"). To meet that law's "stringent standard" (*id.* at 1129), the agencies must follow a more precautionary approach that does not proceed "as if the 'no data' scenario were equivalent to… 'no biological importance'" (*id.* at 1140, quoting a NMFS White Paper identifying potentially important habitat, *infra*). *See* 40 C.F.R. § 1502.2(d).

As such, NMFS should consider the guidelines for capturing biologically important marine mammal habitat in data-poor areas, provided by NMFS' subject-matter experts, that were addressed by the Ninth Circuit, as those guidelines are relevant to the broader MITT Study Area, much of which is comprised of data-poor, offshore areas. These "White Paper" guidelines call for: (i) designation as OBIAs of all continental shelf waters and waters 100 km seaward of the continental slope as biologically important for marine mammals; (ii) establishment of OBIAs within 100 km of all islands and seamounts that rise within 500 m of the surface; and (iii) nomination as OBIAs of high-productivity regions that are not included in the continental shelf, continental slope, seamount, and island ecosystems above as biologically important.

In addition, and consistent with the Court's decision in *Pritzker*, NMFS should adjust its approach to geographic mitigation as follows:

First, NMFS must not dismiss the existence of persistent areas of primary productivity. In its discussion of the West Mariana Ridge, the DEIS states: "The Navy recognizes that biological productivity is often associated with bathymetric features like ocean ridges and seamounts; however, productivity in such areas is often highly dependent on changeable conditions, including weather patterns, wind intensity and direction, localized currents and eddies, and the presence of nutrients in the water column." DEIS at I-27. To the contrary, biophysical coupling leads to static bathymetric features promoting and retaining areas of elevated localized production, resulting in persistent biodiversity 'hotspots' in the open ocean.[81] This mechanism is well supported in marine systems and has led in other contexts, including the development of Important Marine Mammal Areas (IMMAs) that NMFS has incorporated into its LFA

[81] Hyrenbach, K.D., K.A. Forney, and P.K. Dayton, Marine protected areas and ocean basin management, *Aquatic conservation: Marine and freshwater ecosystems* 10(6): 437-58 (2000); Palacios, D.M., S.J. Bograd, D.G. Foley, and F.B. Schwing, Oceanographic characteristics of biological hot spots in the North Pacific: A remote sensing perspective, *Deep Sea Research Part II: Topical Studies in Oceanography*, 53(3-4): 250-69 (2006); Ferguson, M.C., J. Barlow, R. Brownell Jr., and R. Pittman, Identifying areas of biological importance (2010) (*NRDC v. Pritzker*, 62 F.Supp. 3d 969 (N.D. Cal. 2013), A.R. Bates no. F-2189, F-2192; Hazen, E.L., R.M. Suryan, J.A. Santora, S.J. Bograd, Y. Watanuki, and R.P. Wilson, Scales and mechanisms of marine hotspot formation, *Marine Ecology Progress Series* 487: 177-83 (2013).

rulemaking, to static bathymetric features being considered as a strong basis for marine protected area and biologically important area establishment.[82]

Second, NMFS must not conflate the lack of survey effort with an absence of biologically important habitat. In relation to the West Mariana Ridge, which has received little targeted research effort, the DEIS states: "The available data do not indicate that the West Mariana Ridge or surrounding area is an area of key biological importance for marine mammals or other marine species, nor is it clear that limiting the use of sonar and explosives in the area would result in an avoidance or reduction of impacts. Therefore, the West Mariana Ridge area does not meet the Navy's criteria for effective geographic mitigation." DEIS at App. I-27, I-28. The DEIS continues: "Based on the distribution of marine mammals as known from visual surveys and satellite tag detections within the Study Area (Figure I-5), limiting Navy training and testing activities at the West Mariana Ridge and surrounding region to the 3,500 m isobath would not result in avoiding "high concentrations" of marine mammals." DEIS App. I-27. Yet it is clear from Figure I-5 that the data the Navy is relying on to support this statement originate from studies carried out specifically in the vicinity of the Marianas Islands, far to the east; moreover, the target species of those studies are island-associates and would be unlikely to make regular commutes across the ~250 km to the Ridge, even if some individuals may do so. As such, the Navy cannot make *any* conclusions regarding the biological importance of the West Mariana Ridge based on these data alone. As discussed above, the bathymetric complexity of the Ridge provides strong support that it likely serves as a biologically important area for multiple species.

Third, NMFS, in following the Navy, overlooks evidence of island-associated small or resident populations, and relative risk to those populations. The DEIS states that "there are no indications from satellite tag data or photographic identification of marine mammals that there are any island-associated small or resident populations of marine mammals in the Mariana Islands." DEIS at I-30. Yet there is evidence, for example, of two demographically independent stocks of spinner dolphins around the archipelago—one around Guam and the other from Rota northward.[83] The Guam spinner dolphins resemble populations observed in Hawaii, exhibiting very close association with calm bays during the day. The Rota spinner dolphins are also found in nearshore waters, but in much more dynamic and turbid waters, and also on offshore shallow reefs.[84] In addition, satellite telemetry data suggest bottlenose dolphins are associated with the islands and offshore reefs and seamounts, and that a connected population between Guam and islands north of Saipan exists.[85] This population is likely to be relatively small given encounter rates and re-sight rates for individuals.[86]

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[82] Hyrenbach, Marine protected areas, *supra*; Ferguson et al., Identifying areas of biological importance, *supra*.; IUCN-MMPATF, Initial guidance on the use of selection criteria for the identification of Important Marine Mammal Areas (IMMAs) (2016).

[83] Hill et al., Short-finned pilot whales (*Globicephala macrorhynchus*) of the Mariana Archipelago, *supra*.

[84] Hill M.C. et al., Cetacean surveys in the waters of the southern Mariana Archipelago (February 2010 – April 2014), *supra*.

[85] *Id*.

[86] *Id*.

Moreover, the DEIS includes a statement suggesting that cumulative exposure to training and testing activities do not negatively affect small and resident populations of marine mammals: "Additionally, research from areas, including Hawaii, where training and testing activities occur more often and involve more concentrated use of sonar and explosives, such as at the Pacific Missile Range Facility, has documented the presence of numerous small and resident populations of marine mammals and long-term residency of individuals (Baird et al., 2015). These marine mammals have co-existed for decades alongside areas of concentrated Navy training and testing activity." DEIS at App. I-30. This is completely misleading and at odds with NMFS' effort to identify Biologically Important Areas for small, resident populations. Resident populations are at relatively greater risk of cumulative exposure to noise and other disturbances. Relatively few marine mammal species occur in the Pacific Missile Range Facility as compared to other islands in the main Hawaiian archipelago, suggesting an incompatibility of repeated Navy activity with some species. Elsewhere in the archipelago, the Big Island stock of melon-headed whales was recently cited as a key example in a scientific study highlighting the potential harm to the population from naval sonar, given its residency to the area.[87] The authors emphasize a general point of how "displacement can also be a significant source of harm (including injury or death), particularly for small, resident populations that may have 'nowhere to go' and for which the costs of leaving their habitat may be severe."[88] For this and other reasons, NMFS has identified the presence of small, range-limited populations as a critical factor in defining Biologically Important Areas ("BIAs") and has endeavored to systematically identify BIAs off the U.S. mainland on that basis.[89]

These "severe" effects have been borne out within the Navy's AUTEC Operating Area. A comprehensive study of the population ecology of beaked whales in the Grand Bahama Canyon has demonstrated that the "Cul de Sac" region has high relative density of beaked whale species (Ziphius cavirostris and Mesoplodon spp.) compared to other portions of the Andros-AUTEC Operating Area ("OPAREA").[90] While the Cul de Sac is part of the OPAREA, it is an acoustically "quiet" region not currently used for tactical sonar exercises. To the north, the Cul de Sac is directly connected to the Tongue of the Ocean ("TOTO"), a deep-water basin that is home to the AUTEC hydrophone array and, as such, the site of regular mid-frequency active sonar training activities. The TOTO provides foraging habitat for Blainville's beaked whales and probably for other species as well;[91] however, the density of beaked whales in the TOTO is estimated to be just over half that of the Cul de Sac (39.5 whales/1000 km2 compared to 73.4 whales/ 1000km2 for Mesoplodon spp.). Fewer immature animals and calves were observed in the TOTO, although the number of females was comparable between the two sites,[92] adding to ongoing concern that the regular use of mid-frequency active sonar at AUTEC is driving the

[87] Forney, K.A., Nowhere to go, *Endangered Species Research* 32: 391-413 (2017).

[88] *Id*. at 403.

[89] Ferguson, M.C., C. Curtice, J. Harrison, and S.M. van Parijs, Biologically important areas for cetaceans for U.S. waters—Overview and rationale, *Aquatic Mammals* 41(1): 2-16 (2015).

[90] Claridge, D., et al., Unpublished data.

[91] Hazen, E.L., D.P. Nowacek, L.S. Laurent, P.N. Halpin, and D.J. Moretti, The relationship among oceanography, prey fields, and beaked whale foraging habitat in the Tongue of the Ocean, *PLoS ONE*, 6(4): e19269 (2011).

[92] Claridge, D., et al., Unpublished data.

lower recruitment and overall densities of beaked whales in the TOTO.[93] It is entirely remiss for NMFS to ignore evidence of small and resident populations within the MITT Study Area and afford them no additional protections.

C. Mitigation for beaked whales in the MITT Study Area

For military readiness activities, mitigation under the incidental take provisions of the MMPA is driven by two standards. As discussed above, NMFS must prescribe measures that achieve the "least practicable adverse impact" on marine mammals, consistent with the rulings of *Pritzker*, *Conservation Council*, and other cases. But, per NMFS' regulations, mitigation measures may also be necessary to support a "negligible impact" determination, when such a determination cannot otherwise be made. Given the best available science, also discussed above, we do not believe it is possible for NMFS to make a negligible impact determination for beaked whales under the terms set forth in the proposed rule. It is therefore imperative, both to satisfy the negligible impact standard and to meet its obligations under the mitigation provision of the MMPA, that the agency give up its pretense of assuming that no harm will occur and focus its attention on substantially reducing mortality risk in the islands' beaked whale populations.

Several types of measures are available, corresponding to both the planning and operational phases of Navy activities. These include but are not limited to geospatial planning, such as concentrating activities in areas with relatively low occurrence of beaked whales or siting the highest-risk activities, such as multi-platform sonar exercises, in areas of low occurrence; restricting or limiting activities in known or presumed beaked whale habitat preference, based on bathymetry and other static oceanographic features; and using fixed or mobile passive acoustic sources to detect beaked whales, with appropriate triggers for suspension and relocation of an exercise. Many of these measures, and others, have been discussed in the literature for years, yet none, apparently, has been discussed or considered by the agency in promulgating this rule.[94]

Because NMFS has not taken this problem seriously, the Proposed Rule gives the public little in the way of mitigation options to respond to. NRDC recommends, of course, that the agency consider the full range of options in determining the mitigation measures needed to meet its responsibility under both the "negligible impact" and "least practicable adverse impact" provisions of the statute. We note in particular the finding from the Canary Islands, a former hotspot for beaked whale mass strandings, that no such stranding events have occurred there since the establishment of a 50 nm sonar exclusion area in 2004.[95] Given the expertise needed to produce an optimal mitigation plan, however, we strongly advise the agency to assemble a group of subject-matter experts, including experts on beaked whale distribution, monitoring, and conservation from the Southwest Regional Science Center, researchers from the Pacific Islands Regional Science Center who have led the work on beaked whales in the archipelago, and outside experts on the conservation biology of beaked whales.

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[93] Claridge, D., Population ecology of Blainville's beaked whale (*Mesoplodon densirostris*), *supra.*

[94] *See*, *e.g.*, Dolman et al., Technical report on effective mitigation for active sonar and beaked whales, *supra*; Fernandez, A., M. Arbelo, and V. Martin, No mass strandings since sonar ban, *Nature* 497: 317 (2013).

[95] Fernandez et al., No mass strandings, *supra*. That positive record has continued to this date.

D. Additional mitigation research and requirements

NMFS should consider the following additional measures, whether as mitigation measures to prescribe or as research.

(1) Mitigation to improve detection effectiveness during explosives events

At night and during periods of low-visibility, the Navy's ability to detect marine mammals within its safety zone declines significantly.[96] Additionally, some endangered species engage in rest or shallow diving during the night, increasing their vulnerability to ship collision and to injury from explosives and ordnance.[97] Many individual Navy exercises, tests, and maintenance activities last eight hours or fewer,[98] making avoidance of nighttime activity practicable, in most cases.

While NMFS states that "[n]early all explosive events would occur during daylight hours to improve the sightability of marine mammals and thereby improve mitigation effectiveness" (85 Fed. Reg. at 5880), the agency does not restrict any of these events to daylight hours in its proposed regulation, nor, correspondingly, does it require the Navy to report when, for exigent national security reasons, it must derogate from such a restriction. The agency should do so.

Furthermore, NMFS provides no assurance that explosives activities, even if they occur during daylight hours, will take place in sea states mild enough to make visual observation possible. Obviously, any mitigation measure dependent on visual observation will be ineffectual in the MITT Study Area without further means of compensating for the high sea states and low-visibility conditions that typically prevail. We therefore urge NMFS to consider additional measures to address this fundamental problem, either by enhancing the observation platforms to include aerial and/or passive acoustic monitoring (such as glider use), as has been done here with sinking exercises, or by restricting events to particular Beaufort sea states (depending on likely species presence and practicability).

(2) Sonar signal modifications

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[96] *E.g.*, Barlow, J., Gerrodette, T. and Forcada, J., Factors affecting perpendicular sighting distances on shipboard line-transect surveys for cetaceans, *Journal of Cetacean Research and Management* 3: 201-12 (2001); Barlow, J., and Gisiner, R., Mitigation and monitoring of beaked whales during acoustic events, *Journal of Cetacean Research and Management* 7: 239-49 (2006).

[97] Goldbogen, J.A., *et al.*, Mechanics, hydrodynamics and energetic of blue whale lunge feeding: efficiency dependence on krill density, *supra*; *see also*, *e.g.*, Calambokidis, J., Schorr, G.S., Steiger, G.H., Francis, J., Bakhtiari, M., Marshal, G., Oleson, E.M., Gendron, D. and Robertson, K., Insights into the underwater diving, feeding, and calling behavior of blue whales from a suction-cup attached video-imaging tag (CRITTERCAM), *Marine Technology Society Journal* 41: 19-29 (2007).

[98] U.S. Department of the Navy, Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for Hawaii-Southern California Training and Testing, at App. A (2017).

NOAA's Ocean Noise Strategy puts an emphasis on source modification, along with habitat management, as an important means of reducing acoustic impacts on marine life.[99] In the case of naval activities, behavioral response studies on harbor porpoises and gray seals have yielded preliminary insights into how different characteristics of the sonar signal may differentially affect marine mammals in terms of impact. This research highlights ways in which the sonar signal might be modified to reduce the level of impact at the source.

For example, research to date suggests that behavioral response to up-sweep and down-sweep signals vary, depending on the presence or absence of harmonics (i.e., side-bands). For 1 to 2 kHz sweeps with harmonics, harbor porpoises were observed to swim further away from the sound source in response to the up-sweeps than to the down-sweeps; in the absence of harmonics, however, sweep type (up-sweep and down-sweep) caused no significant difference in the response. For simulated naval sonar sounds with fundamental frequencies in the 1 to 2 kHz range containing harmonics, using down-sweeps appears to affect harbor porpoise less than up-sweeps.[100] A related study showed that for 1-2 kHz sweeps without harmonics, a 50% startle response rate occurred at maximum received levels (mRLs) of 133 dB re 1 μPa; for 1-2 kHz sweeps with strong harmonics at 99 dB re 1 μPa; and for 6-7 kHz sweeps without harmonics at 101 dB re 1 μPa.[101] A follow-up study quantifying the behavioral effects of 25-kHz FM signals with high frequency side bands showed that harbor porpoise respiration rate, a probable indicator of stress-response, increased by ~39% compared to signals without side bands at an average received sound pressure level of 148 dB re 1 μPa.[102]

Based on these studies, mitigating active sonar impacts might be achieved by employing down-sweeps with harmonics or by reducing the level of side bands (or harmonics).[103] To our knowledge, the Navy is not presently investigating signal modification as a potential mitigation measure, nor, unfortunately, has NMFS required it—despite repeated urgings from NRDC, the California Coastal Commission, and others. Given the tangible management implications of this research and the potentially broad benefits to multiple species through modification at the signal source, we recommend again that more research of this nature be carried out in order to

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[99] Gedamke, J., Harrison, J., Hatch, L., Angliss, R., Barlow, J., Berchok, C., Caldow, C., Castellote, M., Cholewiak, D., De Angelis, M.L., Dziak, R., Garland, E., Guan, S., Hastings, S., Holt, M., Laws, B., Mellinger, D., Moore, S., Moore, T.J., Oleson, E., Pearson-Meyer, J., Piniak, W., Redfern, J., Rowles, T., Scholik-Schlomer, A., Smith, A., Soldevilla, M., Stadler, J., Van Parijs, S., and Wahle, C., Ocean Noise Strategy Roadmap (2016).

[100] Kastelein, R.A., Schop, J., Gransier, R., Steen, N., and Jennings, N., Effect of series of 1 to 2 kHz and 6 to 7 kHz up-sweeps and down-sweeps on the behavior of a harbor porpoise (*Phocoena phocoena*), *Aquatic Mammals* 40: 232-42 (2014).

[101] Kastelein, R.A., Steen, N., Gransier, R., and de Jong, C.A.F., Threshold received sound pressure levels of single 1-2 kHz and 6-7 kHz up-sweeps and down-sweeps causing startle responses in a harbor porpoise (*Phocoena phocoena*), *Journal of the Acoustical Society of America* 131: 2325-33 (2012).

[102] Kastelein, R.A., van den Belt, I., Gransier, R., and Johansson, T., Behavioral response of a harbor porpoise (*Phocoena phocoena*) to 25.5- to 24.5-kHz sonar down-sweeps with and without side bands, *Aquatic Mammals* 41: 400-11 (2015).

[103] Kastelein et al., Effect of series of 1 to 2 kHz and 6 to 7 kHz up-sweeps and down-sweeps on the behavior of a harbor porpoise (*Phocoena phocoena*), *supra*; Kastelein et al., Behavioral response of a harbor porpoise (*Phocoena phocoena*) to 25.5- to 24.5-kHz sonar down-sweeps with and without side bands, *supra*.

understand the extent to which these results can be generalized across species. In parallel, the feasibility of implementing signal modifications (such as those recommended above) into Navy operations should be explored.

Other signal characteristics may also be of interest. For example, short rise times (i.e., rise times less than or equal to 15 ms) are correlated across mammalian species with startle response, raising concerns about sensitization. In a 2011 study, researchers demonstrated that sounds with short rise times elicited an acoustic startle response in captive grey seals, followed by "rapid and pronounced" sensitization, taking hold after about 3 playbacks, whereas sounds with longer rise times failed to induce a startle response and did not sensitize the animals.[104] The startled seals then displayed sustained spatial avoidance, rapid flight responses, and "clear signs of fear conditioning," and, once sensitized, even avoided food that was proximate to the sound source. According to the authors, sounds with short rise times thus have "the potential to cause severe effects on long-term behavior, individual fitness and longevity of individuals in wild animal populations."[105] In a follow-on study, high-frequency echosounders with short rise times were found to produce a strong behavioral response in the same species, leading the researchers to conclude that it could produce startle responses, and therefore potentially sensitization, as well.[106]

Here, too, we recommend further research and exploration of the feasibility of signal modification.[107]

While the Navy rejects modifying sonar sound sources as a mitigation measure (DEIS at 5-80), a decision that was summarily upheld by NMFS during its recent Proposed Rule for Navy activities off Southern California and Hawaii, it never explains why making the modifications implicated by the marine mammal behavioral studies discussed above would be impracticable. Indeed, some of those modifications, such as converting up-sweeps to down-sweeps, would not alter the system's spectral output in any way. We believe source modification requires greater validation across species and in more behavioral contexts before any decisions are made to alter signals—but given the preliminary data, and given the potential of this measure to reduce the instances and severity of behavioral harassment—*particularly for such marine mammal populations as beaked whales off the Mariana Islands,* for which the agency cannot lawfully make a negligible impact finding—we urge NMFS to require the Navy to expedite that research.

Finally, we note that the Navy's ongoing research off Southern California presents a strong

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[104] Götz, T., and Janik, V.M., Repeated elicitation of the acoustic startle reflex leads to sensitisation in subsequent avoidance behaviour and induces fear conditioning, *BMC Neuroscience* 12:30, doi:10.1186/1471-2202-12-30 (2011).

[105] *Id*.

[106] Hastie, G.D., Donovan, C., Götz, T., and Janik, V.M., Behavioral responses by grey seals (*Halichoerus grypus*) to high frequency sonar, *Marine Pollution Bulletin* 79: 205-210 (2014).

[107] Other factors associated with acoustic effects on humans, such as rise-time in the time-frequency domain of complex signals, kurtosis in frequency and amplitude variability, and non-linear harmonic interactions within complex signals, may also be relevant but have not been studied in the marine mammal context.

opportunity for advancing mitigation research in this area. Its multi-year Southern California behavioral response studies provide baseline data and a vehicle for testing the effects of sonar modifications in the field. Research on modified signals can be incorporated into those ongoing behavioral response studies as a variant on exposure experiments on tagged animals, for which there already exists data on blue whales, fin whales, Cuvier's beaked whales, and other species. Again, we strongly recommend that NMFS require and set a timeline for this research within the context of the present rulemaking.

(3) Thermal detection systems

Because mitigation measures based on visual observation, such as safety zone maintenance, results in highly limited risk reduction for most species and under most conditions (e.g., Leaper *et al.* 2015;[108] see Impacts section for further discussion), we view alternative detection measures as a significant area for development. Thermal detection offers a supplement to visual detection measures and has been demonstrated to outperform observers in number of detected whale blows and ship-whale encounters due to its ability to continuously monitor a 360° field of view during both daylight and nighttime hours.[109] In addition, aerial-mounted infrared cameras have proven able to detect thermal 'trails' up to 300 m behind humpback whales, formed by the thermal mixing of the stratified water that persists for up to 2 minutes.[110] The emerging development of automated whale blow detection systems for infrared video[111] also indicate this technology can feasibly be used for real-time whale detection and mitigation.

The Navy correctly indicates the limitations inherent in thermal detection systems, including its lesser utility in warmer temperatures and foggy conditions (DEIS at 5-69), when whale blow is less distinguishable from the ambient air; but such systems are effective in colder conditions as a supplement to visual monitoring. NMFS should consider requiring the Navy to employ thermal detection in optimal conditions, or, alternatively, require the establishment of a pilot program for thermal detection, with annual review under the adaptive management system. According to the DEIS, the Navy "plans to continue researching thermal detection technology to determine their effectiveness and compatibility with Navy applications." DEIS at 5-70. A pilot program would be consistent with that interest, while allowing for trial use as a monitoring measure. Further, we note that BC Ferries and some offshore wind developers—as well as the Air Force—are

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[108] Leaper, R., Calderan, R.S., and Cooke, J. A simulation framework to evaluate the efficiency of using visual observers to reduce the risk of injury from loud sound sources, *Aquatic Mammals* 41: 375-87 (2015).

[109] Burkhardt, E. Kindermann, L., Zitterbart, D., and Boebel, O., Detection and tracking of whales using a shipborne, 360° thermal-imaging system, *in* Popper, A.N., and Hawkins, A. (eds.), *The Effects of Noise on Aquatic Life* (2012); Peckham, J., O'Young, S.D., and Jacobs, J.T., Comparison of medium and long wave infrared imaging for ocean based sensing, *Journal of Ocean Technology* 10: 113-128 (2015); Zitterbart D.P., Kindermann, L., Burkhardt, E., and Boebel, O., Automatic round-the-clock detection of whales for mitigation from underwater noise impacts, *PLoS ONE* 8: art. e71217 (2013).

[110] Churnside, J., Ostrovsky, L., and Veenstra, T., Thermal footprints of whales, *Oceanography* 22: 206-09 (2009).

[111] Santhaseelan, V., and Asari, V.K., Automated whale blow detection in infrared video, *in* Zhou, J. (ed.), *Computer Vision and Pattern Recognition in Environmental Informatics*, at 58-78 (2015); Zitterbart et al., Automatic round-the-clock detection of whales, *supra*.

presently undertaking similar pilot programs with thermal detection systems; there plainly is no reason why the U.S. Navy cannot do the same.

(4) Mitigation and reporting of Navy ship speeds

The speed at which Navy vessels operate during testing and training exercises, and during general transit between exercises, has direct implications for the probability of mortality from a ship strike[112] as well as for the size of the ship's acoustic footprint.[113] A vessel speed of 15 knots is estimated to result in an 80% probability of mortality if a ship strike were to occur, and this probability approaches 100% at a speed of 20 knots or higher.[114] Slowing ships below 10 knots can reduce collision rates by 90% and decrease the probability of serious injuries or death.[115] The acoustic footprint of vessels also widens dramatically with speed; an increase from a ~7 km footprint at a speed of 10 knots to a ~14 km footprint at 12 knots was observed for commercial shipping vessels in waters off British Columbia.[116] While the Navy has indicated a need to operate at higher speeds under certain circumstances, such as when an aircraft carrier must maintain a minimum wind speed relative to ground in order to launch and receive aircraft (DEIS at 5-64), there are other conditions when maintaining a 10-knot vessel speed is surely practicable. The Proposed Rule does not contain any indication that a practicability analysis was conducted, nor does it prescribe any speed reduction measure. We ask that NMFS conduct a practicability analysis and implement vessel speed reduction in (at minimum) the Marpi Reef and Chalan Kanoa Mitigation Areas and other areas of importance to humpback whales, as was done for the North Atlantic right whale in the AFTT Study Area.

Additionally, given that the speed of Navy ships during all aspects of their operations potentially impacts marine mammals, we recommend that the agency require the Navy to collect and report data on ship speed as part of the rulemaking process. This will allow for objective evaluation by NMFS of ship-strike risk, of harassment resulting from vessel activity, and of the potential benefit of additional speed-focused mitigation measures.

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[112] Conn, P.B., and Silber, G.K., Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales, *Ecosphere* 4: art. 43 (2013); Laist, D.W., Knowlton, A.R., and Pendleton, D., Effectiveness of mandatory vessel speed limits for protecting North Atlantic right whales, *Endangered Species Research* 23: 133-47 (2014).

[113] NOAA, Shipping noise and marine mammals: A forum for science, management, and technology, Final report of the National Oceanic and Atmospheric Administration (NOAA) International Symposium, held in Arlington, VA (May 18-19, 2004) (2004); Gryba, R.D., Using fine scale marine mammal distributions to predict potential effects of underwater vessel noise (2015) (presentation at the 21st Biennial Conference on the Biology of Marine Mammals, held in San Francisco, CA (Dec. 13-18, 2015)).

[114] Conn, P.B., and Silber, G.K., Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales, *supra*.

[115] *Id.*; Wiley D.N., Thompson, M., Pace, R.M., and Levenson, J., Modeling speed restrictions to mitigate lethal collisions between ships and whales in the Stellwagen Bank National Marine Sanctuary, USA, *Biological Conservation* 144: 2377–81 (2011); Laist, D.W. et al., Effectiveness of mandatory vessel speed limits for protecting North Atlantic right whales, *supra*.

[116] Gryba, R.D., Using fine scale marine mammal distributions to predict potential effects of underwater vessel noise, *supra.*

(5) Compensatory mitigation

To the extent that additional operational mitigation is impracticable, NMFS should consider a compensatory mitigation scheme to help improve the conservation status or habitat of affected populations. Compensatory mitigation is a concept that is routinely employed in implementation of the Endangered Species Act, Clean Water Act, and other environmental laws, and is consistent with the Marine Mammal Protection Act, which is broad in its characterization of mitigation. 16 U.S.C. § 1371(a)(5)(A)(II)(aa) (requiring NMFS to prescribe not only "permissible methods of taking pursuant to [a specified activity]," but also "other means of effecting the least practicable adverse impact" on affected marine mammal species and populations and on their habitat). NMFS should consider requiring compensatory mitigation for the adverse impacts of the permitted activity on marine mammals and their habitat that cannot be prevented or mitigated.

D. Long-term monitoring

As part of its species monitoring program in the Pacific, the Navy has supported baseline research into the occurrence, distribution, and population structure of marine mammal species and stocks through tagging and passive acoustic monitoring studies and other approaches.[117] The resulting data provide baseline information upon which the extent of exposure to disturbance from training and testing activities, individual and, ultimately, population-level impacts, and the effectiveness of mitigation measures, can be evaluated. In addition, studies involving aerial surveys, passive acoustic monitoring, and tagging have produced important information on spatial and temporal habitat use that can be used to directly inform seasonal or year-round Mitigation Areas for training and testing activities.

In addition to requiring long-term monitoring studies,[118] we recommend that NMFS prioritize Navy research projects that aim to quantify the impact of training and testing activities at the individual, and ultimately, population-level. First, detailed, individual-level behavioral-response studies, such as focal follows and tagging using DTAGs, carried out before, during, and after Navy operations, can provide important insights for these species and stocks. Second, recent studies using DTAGs have also been used to characterize social communications between individuals of a species or stock, including between mothers and calves;[119] we recommend studies be prioritized that further characterize the suite of vocalizations related to social interactions.

[117] Department of the Navy, 2016 U.S. Navy annual marine species monitoring report for the Pacific: A multi-range monitoring report for Hawaii-Southern California Training and Testing (HSTT), Mariana Islands Training and Testing (MITT), Northwest Training and Testing (NWTT), and the Gulf of Alaska Temporary Maritime Activities Area (GOA TMAA) (2017).

[118] Long-term data collection using comparable methods is needed to capture trends in marine mammal abundance or shifts in distribution or seasonality; such information is essential to understand population-level effects of Naval or other human activities, as well as the response of species and stocks to the impacts of climate change.

[119] Videsen et al., High suckling rates and acoustic crypsis of humpback whale neonates, *supra*.

Third, the use of unmanned aerial vehicles is also proving useful for surveying marine species,[120] and can provide a less invasive approach to undertaking focal follows. Imagery from unmanned aerial vehicles can also be used to assess body condition and, in some cases, health of individuals.[121] We recommend that NMFS require the Navy to use these technologies for assessing marine mammal behavior before, during, and after Navy operations (e.g. swim speed and direction, group cohesion). In addition, studies into how these technologies can be used to assess body condition should be supported as this can provide an important indication of energy budget and health, which can inform the assessment of population-level impacts.

IV. NEPA COMPLIANCE

NMFS cannot rely on the Navy's EIS to fulfill its obligations under NEPA. NEPA requires federal agencies to include an environmental impact statement ("EIS") "in every recommendation or report on . . . major Federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C). While the law allows agencies to adopt an EIS of another agency, that document must "meet[] the standards for an adequate statement" under NEPA regulations. 40 C.F.R. 1506.3(a). Here, NMFS cannot rely on the Navy's unlawful EIS. *See, e.g., Sierra Club v. United States Army Corps of Engineers*, 701 F.2d 1011, 1030 (2d Cir. 1983) (holding that permitting agency cannot rely on action agency's inadequate EIS).

The fundamental purpose of an EIS is to compel decision-makers to take a "hard look" at a particular action, both at the environmental impacts it will have and at the alternatives and mitigation measures available to reduce those impacts, before a decision about how to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC*, 462 U.S. 87, 97 (1983); *Robertson*, 490 U.S. at 349.[122] But the Navy's DEIS serves only that agency's interests, considering only the purpose and need of military readiness, thus limiting the range of alternatives and mitigation. The purpose and need of the proposed action, as set forth in the DEIS, is "to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas." DEIS at 1-4.

Notably, the Navy's purpose and need is unrelated to NMFS' statutory obligations and results in alternatives that are insufficient for the MMPA rulemaking. NMFS' duty is, in part, to prescribe regulations for the incidental take of marine mammals "effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for subsistence uses." 16 U.S.C. § 1371(a)(5)(A)(i). While military readiness effectiveness must be considered, *id.* § 1371(a)(5)(ii), the ultimate purpose of the MMPA is to protect marine

[120] Hodgson, A., Peel, D., and Kelly, N., Unmanned aerial vehicles for surveying marine fauna: assessing detection probability, *Ecological Applications* 27: 1253-67 (2017).

[121] Christiansen, F., Dujon, A.M., Sprogis, K.R., Arnould, J.P.Y., and Bejder, L., Noninvasive unmanned aerial vehicle provides estimates of energetic cost of reproduction in humpback whales, *Ecosphere* 7(10): art. e01468 (2016).

[122] The requirement that an agency must look before it leaps is a bedrock principle of the NEPA process. *Save the Yak Comm. v. Block*, 840 F.2d 714, 718 (9th Cir. 1988).

mammals, and NMFS is charged with that duty. Thus, NMFS has a distinct purpose and need for its proposed regulations governing the incidental take of marine mammals. That purpose and need would dictate a different set of alternatives.

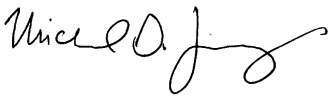
Moreover, the Navy's alternative analysis does not satisfy the requirements of NEPA on its own terms. An EIS must "inform decision-makers and the public of the reasonable alternatives which would *avoid or minimize adverse impacts or enhance the quality of the environment*." 40 C.F.R. § 1502.1 (emphasis added). In its EIS, the Navy developed only two alternatives aside from the no-action alternative: an alternative based on a "representative year of training and testing to account for the typical fluctuation of training cycles, testing programs, and deployment schedules," and an alternative that "includes the same types of training activities" but adds a number of Fleet-level exercises "should unanticipated emergent world events require increased readiness levels." DEIS at 2-21. Because these alternatives are based on operational objectives rather than on environmental concerns, they do not meet the requirements of the statute.

Without significant revision, the Navy's DEIS cannot meet NMFS' NEPA obligations. We urge NMFS to recognize that the alternatives and mitigation set forth in the Navy's DEIS are inadequate and to supplement the document accordingly.

V. CONCLUSION

Thank you for considering our comments. As always, we welcome the opportunity to meet with you, your staff, and other relevant offices at any time to discuss these matters; and we request a virtual meeting at your earliest convenience to discuss the serious issues concerning beaked whales that are raised by this proposed rulemaking. For further discussion, please contact me at NRDC (mjasny@nrdc.org).

Very truly yours,



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