STATEMENT OF

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TO THE

HOUSE RESOURCES COMMITTEE

SUBCOMMITTEE ON FISHERIES CONSERVATION,

WILDLIFE AND OCEANS

REGARDING THE NAVY'S USE OF

SURVEILLANCE TOWED ARRAY

SENSOR SYSTEM (SURTASS)

LOW FREQUENCY ACTIVE (LFA) SONAR

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Good day. My name is Naomi Rose and I am the marine mammal scientist for The Humane Society of the United States (HSUS). On behalf of our more than 7 million members and constituents, I wish to thank you, Mr. Chairman and members of the Subcommittee, for inviting me to testify on this panel addressing the US Navy's use of Surveillance Towed Array Sensor System (SURTASS) Low Frequency Active (LFA) sonar. I very much appreciate the opportunity this hearing provides to have all views on this controversial technology presented to this Subcommittee.

BACKGROUND

The HSUS has been involved in the issues surrounding the Navy's use of SURTASS LFA sonar since the existence of this technology first became public knowledge in 1995. Along with the Natural Resources Defense Council and Cetacean Society International, The HSUS has from the beginning followed the Navy's National Environmental Policy Act (NEPA) process, which resulted in the publication of a final Environmental Impact Statement (EIS) in January 2001. I have attended numerous meetings and presentations by the Navy and have participated in numerous discussions and debates on this controversial technology. I also spent three days in 1997 on the Cory Chouest, the Navy research vessel currently carrying the one operational SURTASS LFA sonar system, when it hosted a civilian contingent of interested parties during Phase I of the Navy's Low Frequency Sound Scientific Research Program (LFS SRP). The HSUS submitted extensive comments on the Navy's draft EIS and on the National Marine Fisheries Service's (NMFS) proposed rule for a small take exemption during use of SURTASS LFA sonar during peacetime.

Throughout the NEPA process, The HSUS has consistently pointed out the limitations of any research carried out under the LFS SRP. While this research was a reasonable beginning, it was never designed to adequately inform the NEPA process - the results from the LFS SRP were clearly incapable of providing adequate information to make careful management decisions or to conclude that the use of LFA sonar would have negligible impacts on marine life. A study of far greater scope, both in terms of species examined and years pursued, would be necessary before any solid conclusions regarding significant impacts could possibly be made. Nevertheless, the Navy, NMFS, and some witnesses on this panel have in fact concluded that LFA sonar, operated under the mitigations proposed in the final EIS and proposed rule, is to all intents and purposes risk-free.

It is germane to point out that the Navy (and most scientists) thought the same thing, based on about the same amount of information, about the use of mid-frequency sonars prior to the mass stranding of beaked and baleen whales in the Bahamas in March 2000 as a result of exposure to standard mid-frequency tactical sonars during a routine Naval exercise. The Navy and others have stated that active sonars have been operating for decades in the ocean without harming marine mammals, but this is *not* accurate. These sonars have been operating without any *observed* or *causally-linked* harm to marine mammals. It is quite possible, in fact, that standard active sonars have been harming and killing marine mammals for decades and nobody noticed because nobody was looking - until now.

The bottom-line is simple - we do not know enough about marine mammal hearing (let alone that of fish and invertebrates) and the impacts of loud, low frequency sound on their ears and other organs to conclude that the operational use of LFA sonar would be harmless. Yet this is precisely what the Navy and NMFS have concluded. In fact, we do know enough to suspect strongly that it will be harmful - precautionary management compels us to at least delay deployment of this technology until we have a better understanding of its potential impacts. In fact, all active sonars should be re-examined in light of the growing evidence that their use is hazardous to beaked and baleen whales.

Today I would like to address the following points: 1) concerns with the LFS SRP; 2) the 180 dB criterion for "safe" exposure to LFA transmissions; 3) the comparison of observed impacts on beaked and baleen whales from exposure to operational levels of mid-frequency sonars to potential impacts on marine mammals from exposure to operational levels of LFA sonar; 4) the potential for harmful resonance effects from exposure to LFA transmissions; and 5) concerns with the requirements for monitoring and reporting "takes" in the NMFS proposed rule.

1. LOW FREQUENCY SOUND SCIENTIFIC RESEARCH PROGRAM RESULTS

The LFS SRP examined certain short-term behavioral responses of four species of baleen whales to playbacks of LFA transmissions transmitted at sound pressure levels (SPLs or volumes) greatly reduced from operational levels. In all three Phases of the program, focusing on feeding, migrating, and breeding baleen whales, behavioral responses *were* observed, ranging from short-distance displacement to reduced vocalization rates. While most whales resumed previously observed behaviors soon after transmissions were discontinued, no long-term observations were made of individuals exposed to the playbacks. No whales were exposed to SPLs greater than approximately 155 dB re 1Pa.

The SRP scientists concluded that exposure to low frequency sound below 155 dB did not appear to have any short-term biologically significant impacts on whales. Appropriately for this limited work, this is a limited conclusion. The team cautioned that these results were preliminary and of limited application. In subsequent publications, certain team members indicated some concern about LFA sonar, concluding that behavioral changes

observed during playbacks of LFA transmissions "might affect demographic parameters or [they] could represent a strategy to compensate for interference from the sonar." [(1)] In none of their publications did SRP team members conclude that exposure to operational levels of LFA sonar would have no significant biological impact on cetaceans (let alone all other marine animals). This sweeping conclusion was found solely in the Navy's final EIS (and then copied in NMFS' proposed rule), although the EIS points to the SRP results for support.

None of the LFS SRP playback experiments could disprove an alternative hypothesis - that feeding, migrating, and breeding are so important to blue, fin, gray, and humpback whales that exposure to reduced levels of LFA sonar noise is an insufficient stimulus to cause them to abandon these behaviors. In short, perhaps all the whales in these experiments were negatively impacted - perhaps they were partially deafened - but they nevertheless chose to continue their vital life processes. No one can say if this conclusion is any more or less the truth than the Navy's conclusion that there was no negative impact. If adequate prey are few and far between, predator-free migratory corridors narrow, or safe breeding sites limited, then the introduction of a source of noise pollution, however damaging, may be a minor consideration for these animals. This sort of decision-making, weighing pros and cons, occurs constantly in many species, including human beings. [(2)]

Ultimately, the Phases of the LFS SRP were designed to test a single and simple hypothesis: "It is doubtful that many marine mammals would remain for long in areas where received levels of continuous underwater noise are 140+ dB at frequencies to which the animals are most sensitive." [(3)] The results of the LFS SRP disproved this hypothesis up to 155 dB. Very little else was accomplished and certainly the hypothesis that LFA transmissions will have a negligible impact at 180 dB was not proved (nor was any evidence provided to support it). Science does not in fact prove hypotheses. It disproves hypotheses. Scientists make progress when studying complex subjects by eliminating hypotheses that are narrow in scope, approaching the "truth" incrementally. The Navy's impatience with the scientific process has been apparent throughout the NEPA process, making its claim that its EIS conclusions are based on sound science especially troubling.

Finally, as a representative for The HSUS, I attended the May 1997 meeting in Boston at which the LFS SRP was first substantially discussed. I state for the record that my recollection of how species were selected differs from what is described in the Navy's final EIS and in NMFS' proposed rule. While the group generally agreed that the four baleen species selected were likely to be among the most vulnerable to LFA transmissions, the group also agreed that sperm whales and beaked whale species were of *equal concern*. The sperm whale, in fact, was included in Phase III of the SRP, but in the end no data were collected on sperm whales because none were observed during the study period. Beaked whales were not included solely due to logistical constraints. In addition, the Boston discussion clarified that the four baleen species were selected as much for their accessibility and the likelihood of collecting sufficient data as because they were considered representative models for other baleen whales. Given the subsequent mass stranding of beaked and minke whales in the Bahamas in March 2000, after exposure to active sonars used in routine Naval maneuvers, clearly beaked whales continue to belong on the list of species potentially most vulnerable to LFA transmissions. The evidence from the Mediterranean [(4)] and the Bahamas suggests strongly that SPLs lower than 180 dB for mid-frequency *and* low frequency sounds could have lethal effects on several species

of beaked (and possibly baleen) whales, over a relatively large geographic area. The essential failure of the final EIS or the proposed rule to take these incidents (as well as other beaked whale strandings coincident with naval exercises in the Canary Islands and elsewhere[(5)]) and as-yet-unavailable results from on-going investigations into account when determining if SURTASS LFA sonar will have only negligible impacts on marine mammals violates the "best scientific information available" standard of the MMPA.

2. THE 180 dB CRITERION FOR "SAFE" EXPOSURE TO LFA TRANSMISSIONS

None of the whales in the LFS SRP were exposed to sounds greater than 155 dB. Yet the Navy has determined, and NMFS concurs, that the "safe" exposure level for LFA transmissions for all marine life is 180 dB. This SPL corresponds to a distance approximately 1 km from the LFA sonar sound source; that is, animals approximately 1 km from the transmitting SURTASS LFA sonar vessel would hear the sound at an SPL of approximately 180 dB. I believe not coincidentally, this distance also corresponds to a distance that trained marine mammal observers can reliably spot and identify surfacing marine mammals from a ship whose deck is relatively high off the water.

It is difficult for humans not accustomed to dealing with acoustics to grasp the leap in intensity (not necessarily in perceived volume, but in acoustic energy) from 155 dB to 180 dB. Sounds at 180 dB are almost 1000 times more intense than sounds at 155 dB. From the LFS SRP, we know that baleen whales exposed to low frequency sounds up to 155 dB changed their vocalization rates, deviated from their migratory paths, displaced themselves from one coastal area to another while engaged in breeding behavior, and lengthened their mating songs. These were all observable, short-term behavioral changes. There is no way from these results that anyone can conclude that exposure to sounds almost 1000 times more intense will have no greater effect, particularly if these effects are difficult or even impossible to detect without closer observation (for example, hearing damage) or only become apparent in the longer term. In fact, there is no way to conclude from these results *what* effect such exposure would have on these whale species - to conclude that the effect will be negligible is simply arbitrary.

There are very few empirical data on the impact of low frequency sound on marine mammals above 155 dB. The studies done to date examined species held easily in captivity - dolphin and small whale species and seals and sea lions. The applicability of these results to beaked or baleen whales is completely speculative. The establishment of 180 dB as the exposure level beyond which serious injury or even death is likely to occur in beaked and baleen whales, based on anatomy and other aspects of biology and physics, is indeed only educated guesswork. If the Navy and NMFS are going to rely on speculation to guide their management decisions, then they must do so without prejudice.

3. MID-FREQUENCY ACTIVE SONAR VS. LOW FREQUENCY ACTIVE SONAR

The Navy and NMFS have dismissed as mere speculation the possibility that marine mammals suffering temporary hearing loss may be more susceptible to predation or ship strike because they may not hear predators or ships until it is too late to initiate avoidance. Yet such a speculation is merely common sense. They have also dismissed as speculation the possibility that the mass stranding of beaked and baleen whales in the Bahamas in March 2000 was *not* in fact an isolated event. Indeed this is true - an educated speculation based on some compelling evidence. As noted in other testimony, of the seven now-known mixed species mass strandings involving at least one species of beaked whale, *all seven* occurred in proximity to naval maneuvers. This is a remarkable statistic. Eight out of 49 mass strandings of Cuvier's beaked whale have also occurred in proximity to naval maneuvers, including the stranding along Greece's coastline after a NATO naval exercise testing a low frequency sonar. These correlations are not proof that active sonars kill beaked whales - but the results of the LFS SRP are not proof that LFA sonar is safe either. The seven-out-of-seven statistic is certainly strongly suggestive - suggestive that in the presence of naval acoustic activities and perhaps under specific (but not necessarily uncommon) oceanographic conditions, beaked and baleen whales are impacted in a way that causes them, if land is nearby, to strand and die.

The Navy, NMFS, and some witnesses here today believe that comparing what happened with mid-frequency sonars in the Bahamas to what may happen with LFA sonar is premature and even baseless. I have often heard the phrase "comparing apples and oranges." I believe it is more a matter of comparing two different varieties of apples - in other words, the two situations are different in degree, not kind. In my opinion, what *is* a matter of apples and oranges is establishing a "safe" exposure level for marine mammals (based on mere speculation) of 180 dB while establishing a "safe" exposure level for humans (based on empirical studies of the effect of LFA transmissions on Navy divers) of 145 dB. Interestingly, the 145 dB criterion is based on a 2% "very severe aversion reaction" standard. Thus human divers are protected at a 2% level based on psychological impact (*i.e.,* it is assumed that 2% of divers will be affected psychologically when exposed to 145 dB), while marine mammals are protected at a 95% level based on physiological impact (*i.e.,* it is assumed that 95% of marine mammals will be affected physiologically - will suffer temporary hearing loss - when exposed to 180 dB). Claiming that an exposure level (to anything, whether it is oceanic noise or arsenic in drinking water) that will physiologically affect 95% of individuals is "safe" is counter to virtually all human safety standards, where a 5% "will affect" level is more commonly accepted and used. The Navy and NMFS have selected this far less protective standard for marine mammals despite the fact that marine mammals are more dependent on sound and more likely to be exposed to LFA transmissions than human divers.

4. RESONANCE EFFECTS

The HSUS notes that, despite the recommendations of a number of scientists, there is minimal discussion and no substantive consideration in any of the SURTASS LFA NEPA or MMPA documentation of the

potential for resonance impacts on marine mammals exposed to low frequency sound. These are physical effects that do not necessarily damage hearing but instead cause reverberations in air-filled cavities, tissues, and organs of marine animals - the common analogy is to a wine glass shattered by an opera singer's high C. In fact, in several instances in the various NEPA and MMPA documents, the primary and even sole impact of concern is identified as auditory effects, despite increasing evidence that perhaps the primary impact of concern should be non-auditory effects. As I am not a physicist or a bioacoustician, I merely wish to point to this issue as one of serious and legitimate concern. The Subcommittee can explore this issue further with members of this panel, but The HSUS recommends that members approach additional experts on bioacoustics, oceanography, and the physics of sound in order to receive a full picture of the potential negative impacts on marine life from the resonance effects of LFA and other active sonar transmissions.

5. MONITORING AND REPORTING "TAKES"

The MMPA requires that NMFS set forth regulations on the "requirements pertaining to the monitoring and reporting of [the authorized incidental takes of small numbers of marine mammals]." The Marine Mammal Commission has noted that the purpose of this provision is to verify that the activity in question is in fact having only negligible effects on marine mammal species and stocks. As there are no empirical data on the impact of LFA transmissions on marine mammals at SPLs greater than 155 dB, the impact of exposures between 155 dB and 180 dB is inarguably uncertain, regardless of "reasonable" assumptions, educated speculation, or empirical data using other sound sources, frequencies, and species. Therefore, monitoring marine mammals exposed to SPLs between 155 dB[(6)] and 180 dB is not only legally required but scientifically imperative.

Despite this requirement, the Navy does not intend and NMFS is not proposing to require monitoring or reporting of takes at exposures below180 dB, thus violating the letter and intent of the MMPA. The proposed mitigations are based entirely on the assumption that no takes other than harassment and non-serious injury will occur at exposures below 180 dB. Thus the Navy has requested authorization to take small numbers of marine mammals by harassment and non-serious injury only. By the Navy's (and NMFS') own definition, these takes will occur between 120 dB and 180 dB (0% risk to 95% risk, respectively). Yet there is no proposed real-time monitoring or reporting of impacts of LFA transmissions below 180 dB exposures.

A long-term monitoring program plans to provide annual estimates of the number of animals injured and harassed (for example, through coordinating with stranding networks), but given the lack of monitoring below 180 dB, it is difficult to see how these estimates will be other than pure guesswork. Stranding records are unlikely to provide direct evidence of cause, unless qualified marine scientists are on-site during a stranding event to conduct necropsies on fresh specimens (as in the Bahamas incident; however, this co-

occurrence of a qualified scientist and stranded whales was a highly unusual event). Therefore the Navy will have few or no data with which to comply with its obligation (and plan) to 1) provide actual annual harassment and non-serious injury estimates; 2) verify the estimates predicted from modeling; or 3) verify its assumption (with all the attendant uncertainties) that no serious injuries or deaths will occur between 120 dB and 180 dB.

The Navy's risk analysis assumes that 2.5% of exposed animals will be harassed or non-seriously injured at 150 dB, 50% at 165 dB, and 95% at 180 dB. If these assumptions are valid, there could be extremely large numbers of marine mammals harassed or non-seriously injured by LFA transmissions. However, given that there will be virtually no monitoring of marine mammals exposed to SPLs lower than 180 dB, it will be impossible for the Navy to ground-truth these assumptions. Should these assumptions be invalid and should even greater percentages of exposed animals be harassed and non-seriously injured or any percentages be seriously injured or killed at exposures below 180 dB, the monitoring requirements as proposed will be unlikely or unable to determine this.

In fact, the monitoring program in the proposed rule (specifically the pre-transmission monitoring for the presence of marine mammals and sea turtles) is designed to exclude marine mammals from the predicted "serious injury and death" impact zone within the 180 dB sound field surrounding the LFA sonar sound source. The monitoring is not designed (in violation of law) to record what actually happens to marine mammals within the predicted "harassment and non-serious injury" impact zone between 120 dB and 180 dB. The monitoring program as presented is, in fact, a mitigation measure, whereas the MMPA sets mitigation and monitoring apart as two separate requirements. Therefore, the Navy's (and NMFS') monitoring program will violate the MMPA if implemented as proposed.

CONCLUSION

The Navy and NMFS not only consider LFA sonar safe to deploy operationally, they consider an exposure level of 180 dB for low frequency sound to be safe for all marine life. I cannot emphasize enough that there is NO empirical evidence supporting this conclusion for beaked or baleen whales (or for sea turtles, fish, and invertebrates) and the evidence from studies on other whale and dolphin species, as well as for seals and sea lions, is at best preliminary and of limited applicability, due in part to small sample sizes, the use of sounds that differ in several characteristics from LFA transmissions, and the non-ideal acoustic environment of the experiments. If it is appropriate to apply this limited research evidence in support of a 180 dB "safe" exposure level to species with different hearing capabilities and a sound source with different acoustic properties, then it should be equally appropriate to apply the evidence for negative impacts of sonar use from incidents involving mid-frequency sonars to the operational use of LFA sonar. It is inconsistent and biased to allow apples to be compared to oranges only when it promotes LFA sonar deployment.

The HSUS believes it is premature to conclude that LFA sonar is benign. We believe that the results, preliminary and limited in nature, of the LFS SRP and other research have been over-interpreted and inappropriately applied to all marine species. We believe that there is compelling evidence that operational deployment of LFA sonar, especially in conjunction with LFA-like sonars being developed in other nations, will in fact have significant negative impacts on the marine environment, most of which may not become apparent for years and even decades. We also believe that NMFS' proposed rule is in violation of the MMPA.

I once again thank the Subcommittee for allowing the differing views surrounding this controversial technology to be voiced in this hearing.

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1. [0] Miller, P.J.O., N. Biassoni, A. Samuels, an P.L. Tyack. 2000. Whale songs lengthen in response to sonar. *Nature* 405:903.

2. [0] For example, humans often knowingly remain (with little behavioral modification) in injurious situations, when livelihood or housing demands require (*e.g.,* coal miners risking black lung because the mines are a region's only viable employer; poor families living in marginal neighborhoods with environmental hazards because it is the only affordable housing).

3. [0] This hypothesis can be found on p. 369 of Richardson, W.J., C.R. Greene, jr., C.I. Malme, and D.H. Thomson. 1995. *Marine Mammals and Noise*. Academic Press, San Diego. 576 pp.

4. [0] Frantzis, A. 1998. Does acoustic testing strand whales? *Nature* 392:29. This article concluded that a 1996 mass stranding of beaked whales along the Greek coastline after a NATO naval exercise testing a low to mid-frequency sonar was highly unlikely to be unrelated to this testing.

5. [0] International Whaling Commission. 2001. Report of the Standing Committee on Environmental Concerns, Appendix J. *J. Cetacean Res. Manage.* 3(suppl):255.

6. [0] Monitoring impacts at exposures of 155 dB as a lower limit is a minimum requirement - even better would be to set the lower limit for monitoring below 155 dB, down to the current "safe" level of 120 dB, in order to collect data seeking to verify the assumption that only harassment and non-serious injury occur between 120 dB (0% risk) and 180 dB (95% risk).