

MICHAEL STOCKER ASSOCIATES

Designers for Acoustics, Communication & Technology

Donna Wieting, Chief
Marine Mammal Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

Re: Docket No. 990927266-0240-02; I.D. 072699A – Taking Marine Mammals
Incidental to Navy Operations of SURTASS LFA

May 5, 2001

Dear Ms. Wieting,

After attending the April 26, 2001 NMFS hearing on the Navy request for a Letter of Authorization, I would like to amend my previous letter of April 17, 2001 to include more information and perhaps a broader perspective. This letter is informed by a clearer understanding of what the NMFS position is on the Navy request, and Mr. Ken Hollingshead's expressed need to see new concrete information refuting the program. Given the tendency for the NMFS to group responses within the confines of their inquiry, my previous caveats to use reasoning over the existing OEIS evidence has likely been summarily dismissed as outside the scope of the NMFS discussion, or neatly pigeon-holed as being unsupported by scientific evidence.

The intent of this letter is to further impugn the OEIS as a document comprehensive enough to use as a basis of the decision to let the LFAS technology loose in the marine environment. I am attempting this strategy because in Mr. Hollingshead's words, unless I "produce a document as scientifically comprehensive as the OEIS," he is not interested in changing his position. As I don't have the resources to produce a document such as he requested, my only chance of success in the discussion with NMFS lies in chipping away at the credibility of the OEIS.

In this letter I will present some new information, some of which is supported by peer review literature, some of which exists as hard physical evidence in the properties of sound, some of which is supported by easily understandable empirical analogies, and yet others that have not yet been revealed by scientific inquiry, but are founded on existing plausible assumptions. I believe that all of these operating premises are included as supporting evidence within the body of the OEIS.

I should say at the outset, after extended discussions with Dr. Kurt Fristrup, I also have a clearer understanding of how the inquiry models were derived. Within this context, it is easy to understand that the LFAS tests *per/se* may not yield the type of catastrophic results many in the public are anticipating. There is little reason to believe that the subject marine mammals and other vertebrates studied will all jump out of the water or otherwise be catastrophically damaged on encountering the high noise levels of LFAS.

But the ocean is a complex place, and the physics of the technology are extremely complex. With temperature, pressure, current and geographic features as variable and influential as they are in the sea, and our extreme lack of understanding about how animals use these variables in their existence, unforeseen results are to be expected. No one expected the HF/M3 sonar to have such a profound affect on the whales and dolphins involved in the March 2000 Bahamas incident; but with the right combination of events and situations, it did occur. There is just as high a likelihood that some equally catastrophic event will occur with the LFAS technology.

I should also mention that my personal mission is not specifically aimed at stopping LFAS, though I do believe that the LFAS technology could be catastrophically damaging to the marine environment. I see LFAS as being a harbinger of a larger problem or runaway noise generation in the sea. Giving LFAS the "green light" will completely open this noise band up to international commercial, industrial and military exploitation; and while four LFAS vessels may not actually be pinpointed as being the direct cause of environmental and biological catastrophes, it will be particularly hard to finger LFAS when there are hundreds, if not thousands of undersea range finders, modems, seismic exploration tools and who knows what else polluting the sea soundscape with this technology – all because the NMFS said that this was an acceptable noise band to exploit.

I know that both of these issues have been presented before, but I feel that the meta-themes represented in these arguments, while perceivably outside of the specific request in question – are non-the-less a fundamental backdrop that we need to stage the inquiry in. If we don't use these cogent, and sound arguments as a foundation of our decisions, we will reduce the credibility of the inquiry into a set of numbers games with finite, well defined rules. This is an invitation for manipulation and evasive "specsmanship" – hardly a game I want to continue playing.

That being said, I would like to open up my arguments with an oversight in an important numerical model presented in the OEIS. This oversight occurs in section 4.2.7.5 of the OEIS on "biological context." Using the "AIM estimations to help quantify exposure statistics at the stock level." The model examines the impact of one 20 day mission over the 20 years of breeding seasons per the hypothetical animal. The simplified linear equation given in the text is $1 \div (20 \times 4) = 0.0125$.

The obvious problem with this equation is that the 20 year time span of the breeding seasons of the "larger, long-lived animals" should be on both sides of the equation, or omitted from the total animal exposure side, because there is an inconsistency in time window presented. There are at least three missions per year per vessel per area, so there will be a greater intersection of missions per breeding season over 20 years, not just one mission over 20 years. The maximum exposure could forseably interfere with $\frac{3}{4}$ of the subject population's breeding seasons, though due to mobility of both the missions and the populations, the actual number will be somewhere between these numbers. More than likely – using only the mathematical model presented in this section, it will be much greater than the 0.0125 or 1% exposure indicated in the text. This is also true for the smaller short-lived animals, though with a higher percentage of their lives.

The argument that the exposure of three missions per vessel totals 435 hours of sound exposure, and is only equal to 18 accumulated days of exposure assumes that these animals are only subject to acoustical stress during LFAS operation. This mathematical analogy does not consider that the subject population might otherwise be in a stressed state of alert for the duration of the mission – knowing that the presence of a SURTASS vehicle indicates a periodic, unpredictable annoying noise source that interferes with their ability to breed, communicate, feed or locate.

Within this argument lies a serious shortfall of using numerical models to simplify complex living systems. All of the equations presented in the OEIS are linear equations that presuppose a self regulating negative feedback – that “a certain percentage of animals will be affected by a certain degree, yielding a proportional result consistent with the system input.”

The use of this simplified methodology does not integrate the known results of any gain curves which intersect on more than one dimension with other gain curves. A simple analogy to this is that while an animal, or even a population may be “only 5% stressed,” this stress level will intersect with other ongoing, or newly introduced stress levels to some point where the stress gain exceeds the animal’s ability to moderate it. Stress goes into a positive feedback, yielding catastrophic results (mass strandings, anti-social behavior, etc.)

I believe that we could scientifically open up almost any mathematical model presented in the OEIS and bring some non-linearity into them. This would easily yield, or at least indicate a higher probability of unpredictable catastrophic results in the use of LFAS. This is particularly true of the more complicated derivations such as the Acoustical Integration Model, though even the “Risk Continuum” and “Single Ping Equivalent” derivations are easily questionable, given the simplified linear transfer models provided. All it may take for a living system to go into positive feedback – runaway stress – is for one animal, perhaps a key individual, to “blow a gasket” for the whole community group to crash. This could easily set up corresponding reactions in intersecting communities. These informed speculations are not included in any of the mathematical models presented in the OEIS.

I also believe that the use of “trigger point” indicators in the OEIS studies such as temporary or permanent hearing threshold shifts (PTS and TTS,) tissue damage, avoidance behavior and other easily assessable physical or neurological damage is perhaps a bit short sighted. While these are very important benchmarks, they do not address the equally important issue of gradual habitat degradation – something that is more difficult, if not impossible to assess using the scientifically sound models utilized in the OEIS.

I would liken the environmental degradation to the compromise in my habitat if a neighbor – who gets along with everyone just fine – buys a Harley Davidson motorcycle, which he starts up periodically and idles or guns the engine, just to hear it. While we may still get along, and the consequences of his actions do not kill or maim me or my family –

none-the-less, periodically I have to stop conversation, close a window, or somehow move away from the source. This would not be something that would not impact me physiologically in a manner that could be measured, but my baseline stress level is raised up a bit; I snap at my wife 6% more often, I communicate less clearly in my writing, I have just one more beer at dinner... And while I might not be able to pinpoint the introduction of the Harley into my soundscape as the cause of my gradual change in temperament, this element could be the very thing that kicks me over the top. I don't go 7% ballistic with road rage, I go 100% ballistic – all because my neighbor has decided to embellish his life with a little noise; and I don't know why – as I am being handcuffed and carted away for bad behavior; I am not saying “if only neighbor Bob hadn't bought that damn bike...”

I use this metaphor to further expand the non-linear argument against the use of simplified mathematical models. I would also like to introduce the argument that the physiological models used in the OEIS, while comprehensive, and based on the scientific work of those far more qualified to this discussion than me, I believe that these models only partially address the actual perceptual abilities of the subject animals. Specifically, in addressing marine mammals, the only organ of perception included in the models is the ear. PTS, TTS, cumulative exposure levels, auditory bandwidth, minimum threshold stimulation etc., are referenced to the animal's ears only. This ignores the fact that the marine environment is perfectly suited for acoustical coupling between the water and the body. It would be foolish not to include this fact into the OEIS physical models.

We have only a minimal understanding of how the enervation of the bodies of various creatures translates the acoustical energy that impinges on them into neurological signals. We do not know if the enervation is part of the voluntary or autonomic nervous system, whether it activates sympathetic or parasympathetic responses, or some combination of these or even some other neurological stimulus that does not fit into our understanding of how these creatures operate in an environment that we can only make some assumptions about. What is life like at 30 atmospheres? What are these huge nerves that run through the rostrum of Gray Whales? What is the actual physical model of the “melon” on dolphins? Why are the trigeminal nerves in Mysticetes so dang big? None of these physical attributes even enter into the OEIS model, and I believe that they may be more important to the perception of pressure gradients than are the ears.

You could argue that if the LFAS did impinge on these organs in disagreeable ways, the animals would avoid the noise source, and this isn't always the case. It could be that the low frequency energy stimulates an amino-acid response that is required when the animal is sounding, but doesn't need – or perhaps is damaging at other times. You could say that the interference with the song patterns of Humpback whales are just syntactical interruptions of a predictable “song cells,” or you might say that the fabric of all Humpback songs are somehow interwoven across their habitat, and that local interruption only rents the larger fabric of their community, without the individual animal having any willful response. Who knows? You might say that these lines of speculation are not supported by scientific evidence, but you could just as easily say that scientific inquiry has yet to develop the vocabulary to discuss these things.

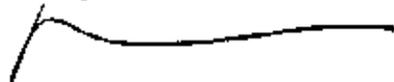
My final argument for the record returns us back to the world of known physics, and focuses specifically on the request for LOA. In the request "Description of Activity" section, it states that the SURTASS LFA signal will operate in a frequency band between 100 Hz and 500 Hz. While this range may be the frequency band of the input signals, it has been shown that the SURTASS signal modulates these tones at a much lower frequency, either by amplitude modulation of a sine-like wave, or by a heterodyne or combination tone affect of sweeping two signals in the stated band against each other. This has the effect of producing much lower frequency oscillations of sound pressure gradients to the order of 0.1Hz to perhaps 15 Hz. This "combination tone" artifact is much lower than the stated operating band and has not been explored as regards to impact in the OEIS. Due to the nature of these infrasonic signals, they have a tendency to travel even farther in water than is indicated in the OEIS. The Parabolic Equation models do not indicate the effects of infrasonic sound, and the infrasonic coupling to the water – and to all organism's bodies in the water – is not presented nor understood as a risk factor.

There are many informed reasons to suspect that long range communication, and navigation of migrating species, as well as territorial signals of non migrating creatures rely heavily on this infrasonic band, and that the affects of masking over these signals might have an even more profound affect on the health of the ocean than periodic, but louder higher frequency sounds.

Given all of these arguments, in the background of my introductory paragraphs, I find it hard to continue justifying the use of this technology. For me, stopping the SURTASS LFA program is only the gateway to a larger problem that we need to address as a nation, and as members of a global community. We need to establish a coherent noise criteria policy for the use of the oceans. This would involve all sources of anthropogenic noise, from shipping, to exploration, to harvesting, to military security. I believe that the NMFS is in a prime place to be the lead agency on this program, and the opportunity to set the record straight is right now, when the SURTASS LFA request is becoming such a high visibility public policy issue. The NMFS could sit on their hands on this, and rubber stamp the Navy request to pollute our ocean soundscape, or the NMFS could step forward to frame the global discussion about appropriate use of the sea.

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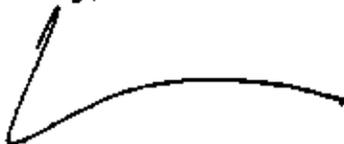
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Sincerely,



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Cc: Joel Reynolds, NRDC

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Marine Mammal Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

Re: Docket No. 990927266-0240-02; I.D. 072699A – Taking Marine Mammals
Incidental to Navy Operations of Surveillance Towed Array Sensor System Low
Frequency Active Sonar

April 17, 2001

Dear Ms. Weiting

As a acoustician and biologist, I am writing to recommend that the NMFS deny the U.S. Navy request for permission to “take” small quantities of marine mammals in the application of their Surveillance Towed Array Sensor System Low Frequency Active Sonar Low Frequency Active Sonar program (hereinafter LFAS.) I have followed the development of this technology over the last ten years. My recommendation is based on a thorough understanding of the program and a well researched understanding of how sound is used by certain whales, dolphins and various species of fish in the ocean.

The idea of “take” in this instance of this application may address directly observable harm and fatalities to certain animals due to the application of LFAS, but does not address the larger, and far more important long term consequences of LFAS rendering the marine environment uninhabitable due to the seriously compromised acoustical setting within which the sea creatures are obliged to communicate, hunt, feed, breed and dwell.

To assume that the impact of the Navy program will only be localized to the generation of the sound is short sighted and narrowly focused; the entire purpose of the LFAS program is founded in the ability of the LFAS signal to travel over long distances. It is accepted knowledge that whales communicate over the same long distances that the LFAS program proposes to exploit. It is beyond speculation that the additional noise of LFAS will have serious impact on these creatures ability to carry on their healthy communication habits.

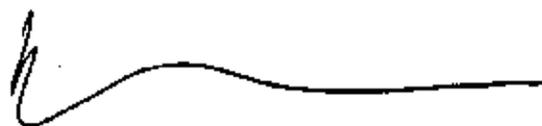
Compromising the quality of the marine environment may not be immediately marked by an increase of strandings or deaths on our shores. Herein lies one of the flaws in allowing the Navy to proceed with the program; we will have little or no way of determining the extent of harm and fatalities caused by the LFAS program. We will be dependant on the Navy’s reports of their own activities, and perhaps correlated data provided by other researchers who may need to account for the decease in their study populations and have only LFAS to cite. (Dr. Kenneth Balcomb’s loss of his Bahamas study group of 50 Cuvier beaked whales since the March 2000 incident is an example of this.)

I would also like to recommend that you not use the U.S. Navy's final Overseas Environmental Impact Statement and Environmental Impact Statement, (OEIS/EIS) as a basis of any decision on issuing an incidental take permit. The Navy OEIS/EIS has been soundly impugned from scientific, legal, public, commercial and environmental quarters, and it seems that the only supporting voices for the document are those scientists and institutions who are financially benefiting from the program.

In light of overwhelming public and scientific objections to the program due to the known harm the technology inflicts on marine mammals, the lack of accountable protective measures proposed in the OEIS/EIS, and the lack of a clearly defined method of determining the level of "take" and other environmental consequences of the program, it would be unconscionable to allow the Navy to proceed with this ill advised technology.

Please listen to the voices of science and reason. Please deny the Navy's application for an incidental take permit in the use of LFAS and associated technologies.

Sincerely,

A handwritten signature in black ink, consisting of a stylized initial 'M' followed by a long, horizontal, slightly wavy line that tapers to the right.

Michael Stocker