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Mardi Hastings and Bob Gisner
Office of Naval Research

Re: ECOUS Follow-up

May 20, 2003

Dear Mardi and Bob,

Thanks so much for hosting the recent ECOUS conference; the event met and exceeded my expectations and was obviously a product of clear and judicious planning. I was honored to be among such an august group of scientists and researchers and was able to "break bread and mend fences" with folks I have otherwise been cast in adversarial settings with.

While I know that some folks from the conservation community were unable to attend for various reasons, there were a few of us included. I also know that most biologists work from a deep appreciation of bio-diversity so the conservation message was evident, if not entirely thematic at the conference. It was the collegial setting which allowed for open dialog between the various perspectives on the ocean noise issue, and for me this accounted for the success of the meeting.

This all being said, my "take home" material helps me set my priorities in my mission to decrease the impact of anthropogenic noise on the ocean environment. While this was the expressed intention of almost everyone at the conference, we are all driven by intersecting priorities as well, complicating the risk factors that we apply to our actions. Herein lies all of the contentions we have. It is also where the playing field can get a bit bumpy.

Hal Whitehead framed this discussion quite well in his presentation "Learning from the LFA fiasco: Whither the credibility of Marine Mammal Bioacoustics." His message about public perception may have sounded damning to the ONR, but he was not in my view attempting to recast ONR priorities, rather he was stating the obvious: The World public has a deep distrust of U.S. Military environmental policies and actions. This mistrust is substantiated by the clear impact that military actions have on the environment, along with the military's insistence that they are "good environmental stewards," which seems disingenuous in light of the record.

Of course ONR can easily point to this very conference, representing millions and millions of dollars spent on marine bio-acoustics – all in an effort to mitigate the impacts

of U.S. Navy operations, as a measure of their commitment to the environment. While this would be true, looking at it from where I sit, funded by my own paltry resources and occasionally by the benevolence of some environmental concern, it is clear to me that the ONR priorities are focused more on U.S. Navy exposure than on the overarching need to preserve the acoustic viability of the ocean environment.

This is evident in the meteoric rise in beaked whale research, very close on the heels of the animal's appearance in the press. While I understand that crisis management drives most actions in our modern world (and I also deeply respect and appreciate the work being done in this field) the "surprise" appearance of the beaked whales in the Bahamas in March 2000 could have just as easily spawned precautionary studies and research into low impact sonar and telemetry technologies. It could have also spawned a broader inquiry into the overall effects of anthropogenic noise on the environment, not exclusively on the cetaceans that we have qualified as sound specialists or public liabilities.

To be fair, one of the broader responses to environmental impacts supported by ONR involves the extensive funding to develop computer supported models of the marine environment. While these are fabulous platforms that allow us to understand the dynamics of noise in the operating environment, I am concerned that incorporating "animats" into these platforms at this early stage will lead to some potentially dangerous practices. This is due to that fact that the 'virtual animals' are extremely primitive at this point, constructed out of statistical behavioral studies and limited audiograms derived from sparse or incomplete information.

In no way do I want to impugn any of the excellent work done by the scientists involved in cetacean bio-acoustic research, but any of these folks will admit to the dearth of information, let alone the hazy understanding that the collected information represents. But as incomplete as these models are, there is an orthodox acceptance of the audiograms, which are derived solely from captive animal behavioral studies, some wild animal avoidance behaviors and physical characteristics of the ossicles and cochlea of dead animals. Deficiencies in these models are occasionally filled in with the known characteristics of the hearing organs of terrestrial animals.

I believe that this hearing model is a gross simplification of the hearing mechanisms in cetaceans. As I suggested in my presentation, the ocean is predominantly a wet environment, and secondarily it is an acoustic environment. Unlike the terrestrial environment, ocean animal's acoustical compliance is more closely matched to their surroundings. Given this opportunity, it is unlikely that the only hearing mechanism of cetaceans resides in the tympana and middle ear. Roger Payne indicated that there is likely an acoustical coupling through bone conduction into the bulla. This feature was never mentioned in the presented models, though we have known that it has some active auditory role for some time. I also suspect that there is a strong role in the trigeminal nerve system in the mysticetus particularly due to its unusually large relative size. While Heather Koopman presented a paper on the acoustical behavior of mandibular fats in toothed whales, her work has also not yet made it into the models.

I am also concerned that TTS is used as a threshold of acceptable exposure with these animals, and not some more subtle and less annoying benchmark. I would hate to have this same criteria applied to residential noise ordinances. Even if cetaceans are only living protein-concentrated biomass units that respond to external acoustical stimulus, temporary damage to their hearing capabilities would definitely produce stress in the organism that is not quantifiable through hearing performance alone.

While all of the above frames the limitations of the animals, the cognitive problem with animals concerns me much more; once the animals are incorporated into the model platform, they are accepted as “whole.” By unifying all of our data, along with our assumptions and our statistical envelopes into a complete avatar, the folks who run the models can only assume that the models are complete (with perhaps some operational caveat of it being “only a model.”) Nonetheless the models will be run, risk determinations will be made, operations will be executed, and when the bodies start showing up (or not showing up) the operators will be able to say “...well, we ran all of the models...” and by that time we will not be able to recover the alarming indicators.

The conference revealed for me the priority that ONR places on specific animals and classes of animals. While cetaceans, particularly charismatic cetaceans are important organisms, they are not the only critters in the sea. It was an unfortunate surprise that as we were meeting, *Nature* came out with two articles on catastrophic fisheries depletions; the decline in global distribution of predatory fishes (tuna and billfish) and the depletion of the Atlantic cod stocks. The *Nature* articles attribute these situations to industrial fishing practices, but I suspect that anthropogenic noise also plays some role.

We may never have a chance to find out what this role is, but the embarrassingly inadequate suppositions about fish used in the LFA/SURTASS OIES is indicative of an irresponsible set of assumptions the ONR is using to drive their funding priorities, and the Navy is using to drive their actions. This document modeled all fish in the sea based on the goldfish and the oscar, with an avoidance study on the only marine species (rockfish) in a pen that was less than ½ the wavelength of the source signal. If we are making global impact risk assumptions with this paltry information, we are looking through the wrong end of a high-powered telescope at an interaction that will have dramatic impact on all life on the planet, including wealthy humans.

The priority that ONR places on fish was also represented in the conference, wherein a very low percentage of the few fish presentations were sponsored by ONR.

Of course the Navy is specifically interested in the impacts of their operational sonar and active ordinance on animals that they obviously come in contact with (made obvious by their embarrassing appearance on the shore). Herein lies a clue to the “dysfunctional” paradigm that Hal Whitehead pointed out: All ONR funded research is framed in the context of US Navy priorities. It appears that the Navy views the ocean as a strategic body of water inhabited by a number of animals that have emotional value to the public, and some degree of economic value to various industries (who are largely left to fend for

themselves) in an increasingly regulatory world. I qualify this statement as my perspective, but I feel it is substantiated by the record and is also shared by the concerned public whom I encounter in the course of my work as a conservation advocate.

Enough “finger wagging;” I would not have had so much fodder for my diatribe except for the hospitality of ONR. It is easy to be a nay-sayer without proposing solutions, and while I have not been asked for advice, I will nonetheless offer it: Hal Whitehead proposed that the marine bio-acoustic and environmental research be split off to a separate organization. I feel that this is a great idea. He suggested this shift for perceived “conflict of interest” reasons, but I feel that this strategy would also help broaden the research priorities out to include issues that are not set by the U.S. Navy. If this “independent body” was funded by the existing applicable ONR budget, and also supported by research fees and funds from other ocean stakeholders, it would broaden out the research mission to include aspects of the sea that have heretofore received little attention. It would also spread the stewardship of the sea out to other users, hopefully cultivating an understanding of interdependence between global military, industrial, commercial, public and animal uses of the ocean.

I feel that in this context, a rigorous examination of ocean uses and practices would be helpful. This would help establish ocean noise criteria for all areas throughout the sea, much in the manner that noise criteria is used in commercial, industrial and residential human habitations. These noise criteria are not laws, rather they are effective guidelines upon which policy can be crafted. We do have enough information to begin this process, which should have enough flexibility to adapt and modify the criteria as conditions change or as more data is found.

I hope that this letter serves our common concerns to some extent. I would be glad to discuss any of this if you feel that my perspectives are helpful. Meanwhile, thanks for the opportunity you, and by extension the ONR – provided for many of us to show up and meet on common ground.

Sincerely,

Michael Stocker