IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

THE GRAY WHALES, et al., Plaintiffs,	)	No. C-03-_____
v.	)	
DONALD L. EVANS et at., Defendants	)	DECLARATION OF MICHAEL STOCKER

I, Michael Stocker, do hereby declare as follows:

1. I am an acoustician by trade and a member of the Acoustical Society of America.

2. I have been focusing on marine bio-acoustics over the past ten years.

3. I am also a naturalist and biologist by avocation.

4. I am concerned that the high intensity sonar broadcasts planned by Dr. Peter Tyack to "study the impact of noise on cetaceans" as indicated in the "Scientific Research Permit to Take Marine Mammals", Permit No, 981-1578-03, Amendment No. 3 will indeed impact marine mammals, but in ways that are not accounted for in the procedures or methodology of the experiment. Exhibit 1.

5. It appears from the "Sonar Validation Studies" submitted by Dr. Tyack to the Office of Naval Research and to the California Coastal Commission that the true purpose of the test is to determine what received noise levels in the specified frequency range of 20 kHz – 40 kHz will cause an avoidance behavior by the subject animal. "Sonar Validation study of whale-finding sonar" attached to this declaration as Exhibit 2.

6. While avoidance behavior may indicate a degree of self preservation in the subject animals, we have no way to determine if that avoidance behavior occurs at a simple

annoyance level, or if it occurs due to pain, indicating a high potential for organ damage.

7. If we refer to the U.S. Occupational Safety and Health Administration criteria for workplace exposure levels, we find that hearing damage in humans due to high level noise exposure occurs at levels far lower than what induces avoidance levels in humans – necessitating these very exposure level standards for the protection of human hearing.

8. It would be prudent to assume that there is a correlation between organ damage levels and avoidance levels in marine mammals somewhat akin to these impacts and behaviors in humans.

9. In his application for the original permit in this matter, Dr. Tyack acknowledged "that there may be some circumstances where animals remain in areas with no obvious sign of behavioral disruption, even though the sound exposure may affect their hearing." Application for a Permit for Scientific Research and to enhance the survival or recovery of a stock under the Marine Mammal Protection Act and the Endangered Species Act dated May 10, 2000 at 30, Exhibit 3

10. Dr. Tyack's experiment is based on circumstantial observations in a limited area and during a limited time in the course of the animal migration; no provisions are made to determine if the subject animals suffer intermediate or long term damage as a result of exposure to the test noise.

12. The potential for compromised breeding or birthing success, compromised social and parenting contact, and long term hearing damage are not accounted for, or even mentioned in the experiment, leading me to see the experiment only as a fairly crude determination of tolerable noise levels in situ without regard for the long term welfare of the subject animal.

13. Using avoidance behavior as a sole measure of acceptable noise levels itself falls short because it assumes that the threshold of acceptability is just below avoidance levels.

14. This assumption does not take into account that annoyance levels well below avoidance levels may induce stress the subject animals, further compromising their ability to withstand other environmental and biological threats.

15. The Gray whale species have been migrating down the western coast of this continent for at least for six million years.

16. We might surmise from this that any stimulus extreme enough to cause them to deviate from this route – if even by a few kilometers, would indicate a serious disruption of their normal behavior likely to induce stress.

17. Statements made by William T. Hogarth of NMFS in his letter to Jonathan R. Lovvorn and Kimberly D. Ockene indicate that he is not concerned with exposing these animals to frequencies in the range of the test because "Gray whales cannot hear 40 kHz sound. …[and] ..might be able to barely hear 16 kHz." Exhibit 4 at 2.

18. I am not a cetacean audiologist, but it would seem to me that there is an inconsistency between Dr. Hogarth's statement and the stated purpose of Dr. Tyack's experiment; if the Gray whale cannot hear in the experiment frequency domain, it stands to reason that they would not perceive it as a threat worth avoiding.

19. There is no acknowledgement by Dr. Hogarth or Dr. Tyack of the evidence that Gray Whale calves make clicks in the range from .01 to 20 kHz. Marine Mammals and Noise, Richardson et al., Academic Press, San Diego, 1995, p.162.

20. While the question is still unanswered definitively as to whether the Gray Whale calves' hearing extends to the 20 kHz range as well, a reasonable case can be made that

evolutionary theory and information theory would support such a conclusion, i.e. the calves are making sounds that are part of their communications repertoire and, therefore, something that they can hear in response as well.

21. Dr. Hogarth's identifies the range of Dr. Tyack's broadcasts as taking place in the 16 to 40 kHz range. Exhibit 4 at 2.

22. Assuming that the calves communicate and hear up to 20 kHz, then the overlap of the broadcasts at 16 to 20 kHz creates the potential for interference in communication and physical impacts in hearing.

23. There is the additional possibility that the clicks are made within a communications regime where the 16 to 20 kHz aspect of the click is a substantive part of the communication such that high intensity broadcasts in that range could mask or interfere with complete communication.

24. Furthermore, Dr. Tyack states that, if no aversion response is found at the frequencies used, he will broadcast "sounds of a lower frequency." Exhibit 2 at 5.

25. The broadcast frequency and intensity of those "lower" broadcasts and even the type of sound generator to be used is left completely undefined. Id.

26. Dr. Tyack will, therefore, intrude even further into the .01 to 20 kHz range of the Gray whale calf clicks.

27. Assuming that hearing sensitivity decreases at the outer limits, the greater the broadcasts overlap the frequencies used by the calves for communication and/or hearing, the greater the likelihood of the Gray Whales hearing the broadcast.

28. Given that these higher frequencies are more prevalent in the calves, it is safe to assume that these frequencies have some bearing on calf-mother communication and

identification.

29. The greater the likelihood of the Gray Whales, particularly the calves, hearing the broadcast, the greater the likelihood of biological impact.

30. Given the rapid decline in the number of Gray Whales and the even greater decline in the number of Gray Whale calves in the last two years, any biological impact or interference with communication is a matter of grave concern

31. Just because the Gray whales do not exhibit clear avoidance behavior when subjected to frequencies that do overlap their hearing range, this does not mean that the harassment is not stressing the animals in manners not noticeable by the standards set by the experiment.

32. It is well known that exposing humans to high energy, high frequency sound induces a heightened sense of anxiety, even when these frequencies are outside of the range of what is considered audible to humans.

33. This state of anxiety does not typically induce avoidance behavior in humans, and is not usually even noticed except in a decrease in anxiety level when the stimulus is removed.

34. It would stand to reason that this same organic response may exist in other species as well.

35. This brings up an additional concern; in the event that the Gray whales do not noticeably respond to the experiment frequencies, there will nonetheless be other animals in the testing range which, while they are not the subject of the target testing, will be exposed to high noise levels.

36. While the hearing frequency range of many mystcites is believed to be largely

centered below the experiment frequency range, the odontocites typically hear in a range centered right in the experiment frequency range.

37. It is likely that any odontocites exposed to the levels centered in their hearing sensitivity range will suffer in some manner, if not just by way of increased noise floor in their communication and hunting frequency regime.

38. With the exception of the maximum number of permissible "takes" of each of these animals listed in Table 1. of the "Scientific Research Permit," no provisions are made to determine if, how many of, and to what degree the listed animals are harassed in the course of the California Gray whale "target strength" term of the experiment.

39. Representative of this are the Harbor Porpoise (*Phocoena phocoena*) that is small in size (not a strong sonar target) and typically only rises to the surface for brief moments to breath.

40. Even when these animals are in relative abundance, seeing them is rare due to the short time that the individuals appear at the surface.

41. This animal is listed as a "No repeat take" animal, with a total permissible take of 50 animals by playback.

42. Given that their allusivness makes them difficult to monitor, I will confidently state that these animals are likely to be "taken" in excess of what is permissible during the California Gray whale "target phase of Dr. Tyack's experiment.

43. It is likely that few of these animals will even be noticed while the researchers are focusing on pods of migrating Gray whales.

44. This same caveat applies to other animals included on Table 1 of the permit that may not appear in the test area and may be avoiding biologically significant feeding or

community behaviors due to the interruption of the California test.

45. The impact of this type of intermediate range avoidance behavior is not accounted for in the experiment except in terms of intermediate range self-preservation avoidance in response to “signal ramping.”

46. Due to this type of interruption-response relationship, biological stress to many animals will occur even when they are not specifically being observed.

47. I can draw analogies to the human stress response to a triggered car alarm that will not shut off – inducing stress and anxiety in everyone within earshot, even when the car owner is oblivious to the annoyance of others.

48. I can only assume that similar gaps in procedure are evident with other species and in other geographical areas of the test.

49. Regardless of where these experiments are conducted, Dr. Tyack proposes to observe behaviors within a small geographical area, without respect for the fact that these animals live a majority of their lives outside of this very narrow area of impact.

50. While the dominant risk assumptions are made in the context that the impact only occurs in this narrow slice of the animal’s life and thus present only a small risk to the animal, the larger question of how this disturbance will present itself over the larger biological context of the animal’s life is not answered.

51. Finally, as regards to the Gray whales that are the primary focus of the California target test; these populations are seriously misrepresented by Dr. Tyack as being “at or above carrying capacity,” (Exhibit 2 at 2), when the fact is their population is dropping dramatically.

52. I understand that one criteria for preparing an environmental assessment for an

activity that would normally not require one is the degree to which the effects of the action are highly uncertain or involved unique or unknown risks.

53. The Tyack experiment on the Gray Whales certainly fits that category.

54. I believe that there are many questions that should have been addressed before this project received approval.

I declare under penalty of perjury that the above information is true and correct.

Dated this ____day of _____, 2003 in Marin County, California

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Michael Stocker
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