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Madam Chair and Honorable Commissioners:

Thank you for this opportunity to comment. I felt it necessary to travel from Nova Scotia, 4 time zones away, to speak to you today because I think it is imperative for you to understand the full range of likely impacts from noise and what the mainstream thinking from independent marine mammal scientists is on the noise issue.

I am an independent marine mammal scientist who receives no research funding from a noise producer nor from an environmental group. I receive my salary from Dalhousie University only. I have been active in the area of undersea noise impacts on marine mammals since 1993. All my advanced degrees (M.Sc., Ph.D., and post-doctoral studies) have been in the field of whale bio-acoustics and communication, and I have been studying whales for over 20 years.

Commissioner Wan's statement on behalf of the California Coastal Commission is fully in line with current scientific thinking and the facts as we know them regarding undersea noise impacts on marine mammals. Commissioner Wan takes a precautionary approach, which is entirely appropriate given both the scientific uncertainty evident in this field and the great potential scale of impact on the marine environment and its inhabitants. It should be remembered that sound travels very efficiently underwater and that most marine mammals, and even marine animals, use sound for all aspects of their lives, including reproduction, feeding, communication, predator and hazard avoidance, and navigation.

To give you a sense of just how far these impacts could reach, the U.S. Navy's Low Frequency Active (LFA) sonar used to detect enemy submarines could affect marine life over an area of about 3.9 million sq. km, an area covering much of the Pacific Ocean. LFA sonar can be heard over a much greater area, but here I am just using levels known to affect whales and fish. Noise from a single seismic survey, used for locating oil in offshore waters and elsewhere, can flood through a region of almost 300,000 sq. km, raising noise levels 100 times higher, continuously for days at a time. Seismic noise from where I am from, eastern Canada, was not only heard 3,000 km away in the middle of the Atlantic, but was the loudest part of the background noise heard underwater. So the range of potential impact can only be described as huge. Add to this the lack of precision and great uncertainty in marine mammal science, where the size of most marine mammal populations can only be estimated to within 40%, and the need for precaution should be self-evident.

[This is certainly the view of the Marine Mammal Commission, recommending “a precautionary approach to management [regarding noise] in the absence of clear information.”]

Commissioner Wan characterized the problem accurately in that our knowledge of the impacts of undersea noise on marine mammals is very incomplete, but almost everything we do know points to reason for concern. This concern extends to the marine ecosystem in general and to population-level effects on marine mammals. We are not just talking about a small-scale effect on a few individuals. There is every reason to believe that impacts could be large scale and considerable. And consistently, the more we look for effects, the more we find them.

- The International Whaling Commission’s Scientific Committee noted “...repeated and persistent acoustic insults [over] a large area...should be considered enough to cause population level impacts.”
- Population impacts are hard to detect in animals as difficult to study as marine mammals, but noise has been thought to contribute to several whale species’ decline or lack of recovery.
- Moreover, in the one case where we do have good long-term baseline population data, one single sonar event apparently eliminated the entire local beaked whale population. Animals were either killed or abandoned their habitat even five years after the event, and haven’t returned yet in any numbers.
- Beaked whale populations seem to be quite isolated from one another, meaning that even one brief and localized noise event can have prolonged and serious population consequences.
- For species like whales, which reproduce slowly, even relatively small effects may cause population declines.
- Beaked whales are the most elusive and poorly studied of all whales, so it is quite possible that local beaked whale populations have already become extinct without our knowledge.

All these statements contrast with the contention made in the National Research Council’s 2005 report that “no scientific studies have conclusively demonstrated a link between exposure to sound and adverse effects on a marine mammal population.” This statement also ignores the basic fact that there have actually not *been* any studies attempting to link population declines with noise.

There have been a number of studies showing impacts on marine mammals from seismic surveys. Humpbacks on their breeding grounds off Brazil have shown an abnormal pattern of stranding coincident with seismic surveys. Seismic surveys have also been implicated in Cuvier’s beaked whale strandings. Critically endangered western gray whales off Sakhalin Island, Russia, were displaced from a primary feeding area by seismic surveys, returning only days after the survey ended. Whales also showed behavioral reactions indicating decreased foraging success. Species such as bowhead whales, sperm whales, blue whales, and several dolphin species have shown avoidance of seismic air gun noise. Humpback whale cows and calves in key habitat were especially sensitive to seismic air guns, avoiding them at relatively low sound levels. These impacts are significant enough to be of concern and to warrant the use of precaution.

The connection between naval mid-frequency sonar and beaked whale strandings is well-established.

- The International Whaling Commission’s Scientific Committee noted that “there is now compelling evidence implicating military sonar as a direct impact on beaked whales in particular”.
- A report commissioned by the U.S. Navy stated that “the evidence of sonar causation [of whale beachings] is, in our opinion, completely convincing.”
- The U.S. Navy itself concluded that for the Bahamas stranding “an acoustic... injury... caused the animals to strand...and subsequently die...”.
- Cuvier’s beaked whale mass strandings were almost entirely absent until the 1960’s, when much more powerful naval sonars began to be used.

Some strandings are disputed in their association with noise, but the overall pattern linking mid-frequency sonar with beaked whale strandings is not. Species other than beaked whales may also strand due to sonars and seismic surveys. A NMFS report from 2005 assessed the marine mammal exposures to mid-frequency active sonar from the USS Shoup in Haro Strait. This sonar was so loud it was even audible in air to humans on shore. It notes that four marine mammal scientists with extensive field experience studying killer whales in the area determined that killer whales behaved abnormally during the exposures. Marine mammals certainly received high noise levels during the event. An unusually high stranding rate of 14 harbor porpoises occurred at around the time of this sonar exposure. Autopsies of the bodies could not find nor rule out acoustic injuries. This does not mean, however, that animals did not strand as a result of the sonar. Whales could be near shore when they hear the noise and simply strand due to panic, dying from the stranding alone with no other injuries evident. Commissioner Wan is quite correct in that all strandings coincident with noise events should be viewed with suspicion, since taking an overly narrow view and requiring irrefutable proof linking the two is not precautionary.

Strandings associated with noise will most likely be underestimated because many strandings, let alone mortalities, go undocumented, as do the associated noise events. The best evidence indicates that whales can die at sea from noise-induced injuries alone, which makes detection even more unlikely since whale carcasses are seldom discovered at sea. For instance, even along a well-populated coast, only an estimated 7% of killer whale carcasses are ever recovered. It is well possible that we are only seeing the tip of the iceberg.

I also support Commissioner Wan’s statement regarding placement of the burden of proof. The Marine Mammal Commission makes a similar point in that “the burden of proof regarding adverse impacts should be placed on appropriate users, rather than requiring the regulatory agencies (and hence the taxpayers) to cover all costs”. Successful implementation of a precautionary approach requires that the burden of proof should reside with the noise producers.

In summary, I can find nothing in Commissioner Wan’s statement that is out of line with current knowledge and facts. Her section on the limitations and hazards of extrapolation is particularly thoughtful, apt, and accurate. I urge the Commission to support her statement.

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