Scientific Uncertainty, Evolving Management, and the Emergence of an Ethics of Anthropogenic Noise

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In the fields of bioacoustics and animal welfare, anthropogenic noise has emerged as an important associated issue, and more strikingly, as a controversial management and legal topic. Noise sources spurring new scrutiny include: global shipping, long-range propagation of offshore oil and gas exploration sounds, rural wind turbine noise, and motorized vehicle use on public lands.
But as we all know, Naval active sonar transmission have become the “hot topic” in the effects of anthropogenic noise on animals, and will be used here as a case study to explore the dynamic tensions at play in this issue. You may be able to tell from this cover that the Honolulu Weekly takes a somewhat different approach than The Journal of Cetacean Research and Management…..
In addition to possible effects of anthropogenic noise on animal communication, communication among humans involved with animal research and welfare can itself become strained, due to the diverse priorities of different players: scientific researchers, agency staff, and the public. These groups fall along a continuum in which their areas of focus are distinct, yet also influenced by the others.

I’d like to quickly sketch these distinct perspectives on addressing ocean noise, to shed light on some of the often unspoken tensions between the generally objective, practical considerations driving scientists and agency staff, and the more subjective, emotional, and ethical dimensions of the public’s input.
If acoustic communication is affected by noise:

How and when?

How widespread?

Affect stock viability?

Empathy with animals hearing “un-natural” noise

Is the noise necessary or justified?

Three Worlds

Each of the communities asks very different questions, and it’s important to recognize the validity each perspective, even if from our own perspective, we don’t fully understand the nature of these other questions, or think that they address the most pressing issues.
Scientific inquiry stands at one end of this continuum, investigating the physiological and behavioral “effects of noise,” clarifying what can be said with certainty and what is still unclear or unknown, framing future questions. As ever, progress is methodical and, from the perspective of some members of the public, excruciatingly slow.
At the same time, though, lines of inquiry and funding priorities are significantly affected by pressures related to regulatory, legal, and public attention on noise issues. (eg current push for beaked whale studies)

Scientists have long been calling for more funding for studying ocean noise (most substantially in several OSB reports and the MMC advisory committee), with only modest success outside of specific navy concerns (which have been driven toward noise by the EIS process and legal challenges)

While ethics often inspire a scientist in his or her choices of what to study, the formal record of one’s research must adhere to a strict tone of impartiality.
MEANWHILE, Regulators and managers are charged with crafting practical and enforceable standards for human activity in relation to the natural world, based on current and constantly improving science. Building on the results of disparate and incomplete research, they develop ideas like “acoustic thresholds” and “exposure criteria” as instruments of policy.

The standards constantly evolve, changing over the course of each decade.
As bridges between the public and the scientific community, agency staff are charged with being objective while also responding with some empathy to concerns that are often more emotional or ethically-oriented.

Certainly, agency staff routinely deal with a much broader set of challenges than most research scientists:

- incorporating multiple strands of scientific inquiry, addressing economic and national security factors, and responding directly and comprehensively to public input.
Judges face the unenviable challenge of interpreting these regulations and the underlying science, while having little training in the relevant fields; they tend to focus on process-oriented considerations (eg, NEPA compliance), literal reading of the regulations (eg, Level B harassment), and inferences about standards (eg, “negligible impact”).

I won’t go into detail on the challenges faced by judges as a distinctive yet limited player in this continuum, though they do bear mentioning.
Similarly worth a mention are the noise-making constituencies, including the Navy and the oil and gas industry, which feel their purposes are essential to our society, and so understandably resist new restrictions unless there is clear evidence of inherent harm caused by their activities.
Public Feelings

At the other end of the continuum is the public, injecting subjective—and increasingly, ethical—considerations that confound (and are often deaf to) the attempts of other players to remain concrete and objective.

The public is not trying to be difficult, and is not simply being stubborn in its reactions to the methods and criteria of science—-it is more that the drivers of public concern are not necessarily based on the kinds of objective criteria that scientists and regulators spend their time focusing on, such as simply increasing our understanding, preventing injury, or assuring that populations do not decline.
What do we humans consider “acceptable”? 

While leading environmental groups maintain a respectful engagement with the objective requirements of scientists and the practical considerations of agency staff, an underlying agenda is often unspoken: to push the edges of what humans consider “acceptable” in our relationship with the natural world and other creatures.

I want to stress that I don’t mean to suggest this is a sly trick, but rather as a perspective that can help scientists and agency staff to better understand actions and statements that might otherwise cause frustration if public sentiment is seen simply as “not supported by current science.” The public is playing this “edge-pushing” role, and the science is playing its fact-finding role.
This gets us to one of the nubs: the rights of animals: both sides of this are active: both animal advocates and those who scoff at the idea that animal comfort should even be considered vis a vis, eg, military security.

Yet the very presence of the debate confirms that a new ethics of ocean noise is becoming a real factor for all those addressing these issues.
Perhaps the best framework for understanding this dynamic is the history of the IWC’s moratorium on commercial whaling. When first put in place in 1986, the impetus was clearly scientific, but current resistance to lifting the moratorium is primarily ethical.

((The moratorium did come after 15 years of public concern, both scientific and ethical, not unlike the last five years’ rise of ocean noise concerns.))

: populations of nearly all whale species were in decline, with extinction of many a distinct possibility without intervention. Now, as Norway, Iceland, and Japan push to lift the moratorium on some species, so as to renew their cultural norm of eating meat from historically abundant offshore whale stocks, resistance is nearly entirely ethical. In the intervening years, whales have come to be appreciated as highly intelligent, social animals; for many members of the public, eating whales is a short step from cannibalism, and is simply unthinkable.

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In contrast to the scientists methodically digging into
--physical acoustics (properties of sound, frequency spectrum, propagation, etc.)
--or animal perception and behavior,

who are gradually shedding light on the measurable responses of marine life to introduced noises, the public is operating from a very different perspective.
To many members of the public, extreme ocean noise just seems “wrong,” or at the very least, something we should do only with extreme care and consideration for marine life. The “right” of marine life to undisturbed acoustic habitat is very close to being put on the table, though current legal challenges couch the concern in more concrete terms.
Several widely publicized events in which whales have beached or shown unusual agitation near Naval sonar exercises have stirred awareness of the impacts of human noise, with these dramatic moments building a constituency for subtler changes.

\[ \text{Compelling moments stir public empathy} \]

\[ , \text{ though they may not be really representative of the more biologically important effects of increased ocean noise} \]
During 2008, the huge numbers of marine mammals that may experience behavioral disruption due to active sonar have become a key issue. As the Navy moves forward with its regional EIS process, questions are being raised about the Navy’s resistance to putting any areas within their offshore ranges off-limits to sonar exercises. As you can see, the ranges cover nearly our entire coastline.
A Federal Appeals court repeatedly pointed to 170,000 Level B Harassments projected off California as being clearly more than a “negligible” impact, and an early EIS for Atlantic Sonar training predicts up to 2.7 million Level B Harassments per year, which the NRDC’s formal comments challenged as unacceptable on its face, proof that the Navy should therefore limit their MFA training to smaller areas. A closer look at the numbers suggests that the initial “common sense” response of outrage may in fact have to co-exist with an objective analysis that even these large numbers may have only a modest overall impact. (See acousticecology.org/srSonarFactCheck.html for more details)

And therein lies the crux: this emerging ethics of ocean noise that asks deeper questions about humanity’s right to make more noise in more places is, unlike science and regulatory decisions, not so fundamentally based on specific scientifically significant impacts (though we should also note that as scientists have looked more closely at behavioral impacts of sonar in the last couple years, we see troubling indications of a wide range of vectors of potential impact)

The Federal Appeals Court ruling in February 2008 repeatedly pointed to the nearly 170,000 “Level B Harassments” and seemed to suggest that such numbers are inconsistent with “negligible impacts” and the Navy’s insistence that any harm from its sonar operations is merely “speculative.” Similarly, NRDC’s comments to one of the first Draft EISs to emerge in a series of
The public increasingly questions the current regulatory thresholds, which tend to limit noise-making only when it causes physical injury, with behavioral disruptions nearly always considered temporary and transient, and therefore negligible. Today, subtle behavioral disruption, if affecting many animals, is triggering concerns like never before, among all the players.

And again, we see each group asking its own questions:

- Scientists grope to come up with a way to quantify widespread, minor behavioral changes.

- Regulators define terms in a way that is meaningful to observers, can quantify with models, but harder to communicate the wide range of severity of the harassment.

- Judges see large numbers, cannot easily accept that this is not a significant impact…so impose NEPA requirements, and sometimes also question the mid-field assessments of the Navy.

- Public sees/imagines thousands of cetaceans hearing and avoiding the sounds….and feels it just isn’t right.
In recent years, precautionary regulatory decisions have begun to offer more acoustic refuge to threatened species in which reproductive success is crucial.

NOAA has imposed a limit of 120dB for Bowhead whale cow/calf pairs near seismic surveys—effectively increasing the buffer zone from 1 or 2 km to 20 km or more, and assuring that their behavior is not affected.

In the Atlantic, right whales are getting more protection from shipping traffic, with slower traffic both reducing noise and ship strikes.

And, this brewing controversy over the Navy’s insistence on doing sonar training without geographical restrictions, probably the hardest thing for them to justify.

Ten or twenty years from now it is quite likely that we’ll look back on these first protections from behavioral disruption as harbingers of an evolution in wildlife management that has more in common with today’s ethically-driven public attitudes than many currently imagine.
Our sense of legal rights of animals is gradually evolving: beginning with rights centered on human interest (maintaining sustainable fishing or hunting stocks),
evolving toward rights based on whether animals suffer (Level A and B harassment), toward the idea that species and individuals have inherent rights (to undisturbed habitat, eg, managing for ecosystems, not just individual species viability).
We’re in early phases of the next chapter of this issue.

A constituency is building toward the idea that some areas should be kept as free as possible from human noise so these acoustic creatures can live in relative peace. From this perspective, intense sound should be kept out of areas that are rich in wildlife, even if they are not pristine, not because we have quantified a "biologically significant" level of impact, but simply because “it’s the right thing to do”.

While it is far too soon to really know how these dynamic tensions will resolve themselves into the social or scientific consensus of the future, it is time to make explicit what has been unspoken: that in the evolution of our rules governing noise, as with most environmental policy, the public pushes the leading edges, science fills in what we know, and agencies craft practical standards to bridge the two.
It’s clear that in order to move ahead with a combination of clear thinking and sensitivity to the experiences of other species, we’ll all need to keep listening: to new scientific findings, to each other, and to nature’s messages—both the measurable and those that require sensitive observation and deep consideration.
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NOAA Ocean Acoustics
nmfs.noaa.gov/pr/acoustics

AEI Special Reports
(annual ocean noise science/policy recaps, IWC & MMC noise reports, 
sonar, Navy/NRDC FactCheck, etc.)
acousticecology.org/specialreports.html
acousticecology.org/srSonarFactCheck.html
acousticecology.org/sr_oceanoise2007.html

AEI lay summaries of new research
acousticecology.org/scienceresearch.html
The ethical questions are triggered most clearly by:

--huge numbers of cetaceans hearing un-natural sonar signals or repeated seismic sounds and moving away

--whole regions of the sea being ensonified by shipping noise, raising background sounds and reducing effective communication/acoustic perception zones
Indeed, shipping likely has the most impact on communication because it is far more constant and widespread than sonar, and thus harder to adapt behavior around.

Seismic is in between, fairly steady when present but rather transient.