

# RIGHT TO QUIET SOCIETY

for Soundscape Awareness and Protection

# NOISE LETTER

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*Happy, quiet New Year!*

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## Rare Earth Sound

The world now sounds different to how it did a century ago

## Noise hurts!

By Claire Asher

We have triggered animal extinctions and climate change, and both have altered the way our world sounds. You can hear the climate changing. As the world warms, the soundtrack of the ocean is shifting. In 2015, a US team of scientists and engineers reported that the loudest sound in some waters now comes from millions of tiny bubbles, which are released by melting glaciers and icebergs. In the fjords of Alaska and Antarctica, average noise levels are now over 100 decibels - louder than any ocean environment recorded before.

This is just one example of how Earth's natural soundscape is changing irreversibly, and human activity is driving the process. Our natural spaces are now polluted with human-made noises. As we change forests into farms and drive species to extinction, we are fundamentally changing how our world sounds. The phenomenon has inspired a new field of research, which aims to monitor the changing melody of our natural spaces. These acoustic studies could revolutionise the way we study whole ecosystems, from forests to coral reefs.

All of the sounds of an ecosystem - from trickling streams to singing birds - add together to form a unique soundscape, a fingerprint of the habitat in its current state. Studying a soundscape is a quick and easy way to get an overview of the health of a habitat. Shrimp snaps are one of the most characteristic sounds of marine ecosystems. But what scientists are hearing is not good. Some soundscapes are deteriorating in an alarming way. Oceans in particular now sound very different. As the noise from melting glaciers rises, the sound produced by some marine species is falling.

For as long as biologists have been studying the seas, snapping shrimps have been creating a din. Each snapping shrimp has an asymmetrical, oversized claw, which can snap shut at up to 60mph. This temporarily forms an air bubble in the water, and when this pops, it forces water out in a high-pressure jet and produces a loud snapping sound. These snaps are thought to be important for communication, as well as to stun prey and scare off predators. Shrimp snaps are one of the most characteristic sounds of marine ecosystems like mangroves and coral reefs. They can travel up to a kilometre through the water. But a study published in March 2016 suggests the shrimp might soon fall silent.

As climate change continues to alter marine ecosystems, we might find our oceans go quiet. Biologists recorded sound at three hydrothermal vents, where carbon dioxide is naturally released into the water. Carbon dioxide forms a weak acid when it reacts with water, lowering ocean pH. This "ocean acidification" is now happening throughout the oceans because of the extra carbon dioxide in the atmosphere. The hydrothermal vents give scientists a chance to study what a more acidic ocean might be like.

## **Thumbs down** on Cactus Club's Coal Harbour location in Vancouver!

Friends reported to us that when visiting said place last fall, the "music" was unbearably loud. They asked for the volume to be lowered, but their request was rejected. Upon calling a different Cactus Club location, we heard the "music" blaring in the background loud enough to make it difficult to communicate over the telephone.

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They found it might sound a lot quieter. Shrimp around the vents snap less loudly and less often than expected, drastically changing the overall soundscape of the ocean. When tested in the lab under elevated carbon dioxide levels, individual snapping shrimp produced half as many snaps as those kept at current levels. Although it remains unclear exactly why it silences snapping shrimp, widespread acidification could have a major impact on coral reef species that rely on sound for navigation. As climate change continues to alter marine ecosystems, we might find our oceans go quiet.

Scientists have divided the acoustic world into two groups. There is "geophony" - which comes from natural processes like crashing waterfalls, the movement of the tides and the rumble of earthquakes — and then there is "biophony", which is produced by living things. Human-made noises have become so ubiquitous on Earth that we have come up with a third category just for them: "anthropophony." In many landscapes, anthropophony dominates, drowning out the sounds of nature.

Studying a soundscape is a quick and easy way to get an overview of the health of a habitat. Human sounds are now found in almost every ecosystem on Earth, and it is rare to find an area remote enough to avoid human sounds entirely. But Michael Scherer-Lorenzen of the University of Freiberg in Germany says that our indirect effect on soundscapes has been even stronger. Sounds are slowly and subtly being lost as habitats become increasingly fragmented, species become extinct, and urban landscapes expand.

This is an idea that Scherer-Lorenzen and his colleagues are exploring as part of one of the most ambitious studies in soundscape ecology undertaken to date. Beginning in September 2015, the researchers have left 300 microphones recording in the German countryside. The aim is to find out how different types of land use affect biodiversity, and how this is reflected in the soundscapes of those habitats.

Scherer-Lorenzen, who is lead researcher on the project, says that combining data from other research groups with their soundscape recordings allows the team to determine how the sounds of an ecosystem are influenced by human activities. "We have a tremendous amount of information about many aspects of those ecosystems, including observations of bats, birds, insects, frogs, mammals, and the vegetation composition and structure," he says. Ultimately they hope the project will allow them to develop an early-warning system for changes in ecosystems due to human exploitation or climate change.

Already it is clear from studies elsewhere that daily and seasonal rhythms in the soundscape can become disrupted when human sounds begin to encroach. For instance, one study in Brazil found that animal calls were loudest during the day in forests close to open-pit mines, whereas wildlife further from mines preferred to call at night. The constant noise from the mines, which is mostly due to the 700 or so trucks that visit daily, increased sound levels by up to 22dB. This forced species that would usually call at night to become more active in the day. There is often a link between the richness of a soundscape and the diversity and abundance of wildlife. Fewer species were recorded at sites closer to the mine, suggesting that, for some species, this noise pollution is too much to bear.

Another study, published in June 2016, monitored the annual timing of bird migrations in the soundscape of Glacier Bay National Park in Alaska, and found that it had shifted significantly during the three-year study. For instance, migration of varied thrush (*Ixoreus naevius*) peaked five days earlier in 2014 compared to 2012. Changes in the timing of events such as plants flowering and birds migrating, have caused widespread concern because of their potential to disrupt key ecological relationships.

Many organisms use sound to navigate, forage, and communicate. As a result, there is often a link between the richness of a soundscape and the diversity and abundance of wildlife in the area. For example, in some Costa Rican forests, 85% of variation in the diversity of sounds was explained by the complexity of the forest structure, and the presence of swamps. In eucalypt forests in Australia, the volume of the soundscape is correlated with habitat fragmentation and overall ecological condition.

Unsurprisingly, anthropophony dominates our urban environments, and the impact of this extra man-made noise on wildlife has been enormous. Biophony like bird song has been shown to decline as urbanisation increases, linked to lower species richness in urban environments. Even those species that remain may have fundamentally changed the nature of the sounds they make. Killer whales have been found to call 1dB louder for every 1dB increase in background noise. For instance, one study comparing great tit (*Parus major*) songs in city and forest environments across Europe, found that the birds tend to sing shorter, faster, higher-pitched songs in urban environments.

## Which is Safer – Tonal or Broadband Reversing Alarms?

Proceedings of Acoustics 2012 - Fremantle

21-23 November 2012, Fremantle, Australia

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### ABSTRACT

Tonal reversing alarms have been identified as a source of noise annoyance to the community (DEC 2012). There has been a drive to replace tonal reversing alarms with broadband alarms. However, there has also been resistance in replacing the tonal with broadband alarms, due to perceived safety concerns. Many owners and operators of heavy vehicles believe that their tonal reversing alarm provides a safety system superior to the broadband alarm. Recently SafeWork Australia (2011a) issued their document *Managing Noise and Preventing Hearing Loss at Work*, within which ISO 9533:2010 is selected as the standard to measure audible reversing alarms on vehicles. In order to address the above safety concerns, the Noise Regulation Branch of West Australia as Department of Environment and Conservation (DEC) studied 21 DEC vehicles with tonal reversing alarms against the ISO 9533 Standard. Also tested were 5 vehicles from the City of Subiaco.

The investigation found that a large proportion of the tonal reversing alarms tested failed to comply with the ISO 9533. Some of the tonal reversing alarms were then replaced with broadband alarms with similar sound power levels. The test results demonstrate that all these broadband reversing alarms are able to meet the requirements of ISO 9533, when properly installed. This study also indicates that broadband reversing alarms are much less annoying at the distances further away (say further than 100 m), where the sound of the alarm is substantially merged in the background noise.

[http://www.acoustics.asn.au/conference\\_proceedings/AAS2012/papers/p126.pdf](http://www.acoustics.asn.au/conference_proceedings/AAS2012/papers/p126.pdf)

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These behavioural responses have been found to track fluctuating noise levels during a single day. This suggests that behavioural flexibility, rather than genetic changes, are enabling some species to adapt better to increasing anthropophony in their habitats.

However, not all animals have the option to change their calls and adapt to noise pollution. One study found that while ash-throated flycatchers (*Myiarchus cinerascens*) are able to increase their call frequency as background noise increases, the closely related grey flycatchers (*Empidonax wrightii*) do not change their calls, while their numbers decline dramatically in urban environments. In marine ecosystems, anthropophony may be having a major impact too. Shipping noises measured in Falmouth Bay in the UK for a July 2016 study fall within the hearing range of several species of marine mammals, such as whales and seals, as well as many fish species, and may be affecting communication and navigation for marine animals.

Previous work has shown that right whales can adapt to noise pollution by making higher pitched calls, and killer whales have been found to call 1dB louder for every 1dB increase in background noise. However, these adaptations come at a cost - increasing noise pollution in our oceans has also been linked to increased stress in marine animals. But while some environments are getting louder, the global picture is that our remaining natural spaces are losing sounds possibly forever.

Bernie Krause, one of the pioneers of soundscape ecology, has been recording habitats around the world since 1968. During his 50 year career he has recorded over 5,000 hours of soundscapes, on land and underwater, in 25 different countries. He estimates his archive contains nearly 15,000 different species and over 3,000 distinct habitats, making it one of the largest natural soundscape collections of its kind. His repeated recordings in the same location, year after year, offer an acoustic record of the ecological impacts that climate change brings. From the temperate forests of North America to Alaskan tundra, tropical forests in Brazil and coral reefs in Fiji, Krause has heard dramatic changes to Earth's soundscapes over the last 50 years.

"Well over 50% of this archive comes from sites now either altogether silent, or so transformed by human endeavour they can no longer be heard in any of their original form," he says. Krause describes his long term recordings in Sugarloaf Ridge State Park, "a site not far from our home in Northern California, where the effect of global warming and resulting drought has created the first completely silent spring I've ever experienced." His first recordings in the park, made in 2004, included a rich chorus of bird song over the background of a trickling stream. But by 2014, repeated droughts and rising temperatures had stripped the soundscape of almost all biophony, and by 2015 only the stream could be heard.

# Calgary noise bylaw gets a rewrite for when bands drop the bass

## **Community standards update will include a bass noise threshold**

By Helen Pike

Calgary's bylaw officers don't give away tickets based on bad taste, but when complaints rolling in have more to do with the genre than the sound thresholds, something's gotta give. The City of Calgary has hired the help of a sound engineering firm to include a "bass" noise threshold to the community standards bylaw. Currently, the city only measures sound on an "A scale" and soon, once data is collected, they will have a reading on the "C scale" to point to when residents complain about house-shaking music.

"We've seen through research and history in past events that the main thing we want to measure is on the C scale," said community standards officer Sgt. Fausto Riccioppo. He describes that as the "bass" thump noise that makes

windows vibrate. "A lot of people, when they complain, it's the type of music...if you don't like the music, you're going to complain. You just don't want to hear that noise, period."

This summer, bylaw officers have been posted at festivals like the Calgary Folk and Music Festival and Chasing Summer to take readings of how loud these music powerhouses go. In adjacent neighbourhoods officers then read how loud the sound is when it gets to residential zones and feed data to the engineering firm. They will do some complex math, look at safe noise science, and come up with a threshold through the analysis. Results will be presented to council in October with a new bylaw drafted and brought to law by 2017.

<http://www.metronews.ca/news/calgary/2016/08/10/calgary-noise-bylaw-gets-a-rewrite-bands-drop-the-bass.html>

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Another example from Krause's collection shows how soundscape ecology has the power to expose environmental destruction that we cannot even see. In 1988 a logging company was given permission to try a new "low-impact" method, known as selective logging, in Lincoln Meadow in the Sierra Nevada Mountains. The belief was that by removing the odd tree here and there, rather than cutting down a whole area of forest, damage to the ecosystem would be avoided. And to the human eye, the post-logging forest appeared superficially the same, but Krause's recordings tell a different tale. "I've returned to Lincoln Meadow 15 times in the last 25 years, and I can tell you that the biophony, the density and diversity of that biophony, has not yet returned to anything like it was before the operation," Krause explained in a 2013 TED Talk.

Sound is a source of data that scientists are only just starting to exploit to its full potential. The key challenge facing soundscape ecologists is big data, Scherer-Lorenzen says. His Biodiversity Exploratories project in Germany will produce over 15.5 million minutes of sound recordings. That is 125 terabytes of data that need to be stored, processed and analysed. "To listen to all these files, it would take 30 years of uninterrupted listening," he says. Instead, measures of acoustic complexity and diversity are calculated by a computer. Developing better computer algorithms to process and interpret this data is a fast-developing field of research. The cost of technology can be prohibitive to large-scale soundscape studies, but projects like this show that by sharing resources, scientists can make high-resolution studies of soundscape ecology more affordable.

We have already changed Earth's soundscape so fundamentally that many ecosystems would be totally unrecognisable to a person living just a century ago. "There are few other critters whose impact on the environment has been so deeply and profoundly destructive [as humans]," says Krause. And, of course, the rise in anthropophony is as bad for human health as it is for wildlife. Noise pollution can cause hearing loss in extreme cases. More commonly, lower levels of anthropophony can lead to increased stress, disturbed sleep, cognitive impairment, and even behavioural changes such as increased aggression. Hearing more natural sounds has also been linked to better mood and improved cognitive abilities in the workplace.

However, although extinction means we risk losing some sounds forever, there may still be cause for hope. A study published in March 2016 reported that one mangrove restoration project was able to restore a healthy soundscape in just three years. Mangroves are home to a rich sponge community, many of which share a cooperative relationship with snapping shrimp. Snapping shrimp are therefore a strong indicator of a healthy mangrove. But when sponges die off due to toxic algal blooms, which are becoming more common due to climate change, the snapping shrimp go too.

To restore heavily degraded mangrove ecosystems in the Florida Keys, in 2010 scientists cloned sponges from healthy mangrove ecosystems and transported them into the degraded ones. By 2013, soundscapes of restored mangroves were indistinguishable from those recorded in healthy, untouched mangroves. Soundscapes offer a powerful way to measure the success of restoration projects like this, and provide a view of the health of an ecosystem not visible to the naked eye. The Earth sounds nothing like it did a century ago, and some of those changes may be irreversible. But there is also hope that it may not be too late to save some of the most unique sounds of our planet.

[http://www.acoustics.asn.au/conference\\_proceedings/AAS2012/papers/p126.pdf](http://www.acoustics.asn.au/conference_proceedings/AAS2012/papers/p126.pdf)

**Brain development of a fetus:** According to Dr. Fred Logan, a developmental psychiatrist in Seattle, a fetus gives jerking movements with the elbow upon exposure to loud, disturbing sound. Sound in the womb can reach 70 dB.

As It Happens, CBC Radio, December 15, 1997

## Cities try different tactics to regulate noise

If you live in Waco, Texas, your neighbour manoeuvring a gas lawn mower in the middle of the night likely wouldn't violate the decibel limit, which is eight times louder than the typical nighttime limit in the United States. The large difference is just one example of the diversity of laws regulating noise throughout the United States. The Noise Pollution Clearinghouse, a national non-profit based in Vermont that gathers noise related resources and advocates for quieter public spaces, compiled a database of noise ordinances for more than 500 of the largest communities in the U.S. The goal is to make it easier for researchers and lawmakers to understand what regulations exist and which ones work the best.

Les Blomberg, executive director of Noise Pollution Clearinghouse, presented his database at the 171st meeting of the Acoustical Society of America, held May 23 through 27 in Salt Lake City. Communities in the database have generally had more than 60,000 residents, and represent about a third of the U.S. population.

Excessive noise is a common complaint from community residents, from the cities to the suburbs, Blomberg said. His initial inquiries suggest that around 3 to 8 percent of calls to the police concern loud sounds. Going forward he plans to more systematically survey law enforcement agencies to determine how often noise ordinances are violated and whether certain wording makes it easier for police officers to enforce the law.

The database of noise ordinances is a good start, Blomberg said, because it displays how exceptionally varied our approaches to noise pollution are. Ordinances include decibel based standards, plainly audible standards, nuisance standards, quiet zones, and restrictions based on zoning, setbacks, time-of-day regulations, and outright bans on some noise sources, such as gas powered leaf blowers. Many communities rely on a combination of regulatory approaches.

The most common approach was a nuisance standard, which appeared in 85 percent of 491 ordinances, and which is usually based on what a "reasonable" person would find offensive.

The interpretation of "reasonable" is left to law enforcement officers and the courts. Decibel levels, which are a standardized measure of sound pressure, appear in 55 percent of noise ordinances in the database. While decibel levels may be a more scientific measure of noise, they're also difficult to enforce, Blomberg said. Police officers must be trained in the use of noise meters and they have to have their calibrated equipment with them to measure sound levels. In some cases, they may not be able to wait long enough to gather the data necessary to say whether a noise source is out of compliance.

For this reason, some communities are updating their laws to simplify enforcement, Blomberg said. For example, in 2005, New York City added a plainly audible noise standard, which states that if a noise source is plainly audible at a certain distance, it is in violation. "All a police officer would need to enforce the law is her ears and a tape measure," Blomberg said. Blomberg said most all of the noise ordinances he's looked at have limitations. Some reveal the priorities of the community.

"Many times the special interests of a community are visible in its noise laws," he said. For example, some communities exempt shooting ranges or church bells from the law. "In Oklahoma and Texas, noise regulations do more to protect oil producers from their neighbour's complaints than they do to protect the neighbour's health and welfare. In Austin, Texas, it's music venues that are protected," he said. Blomberg hopes that the database can serve as a resource to the acoustics standards community, which is currently working on writing a model noise ordinance. He also hopes community members, lawmakers, and businesses will find the database helpful. When it is complete, it will be uploaded to the Noise Pollution Clearinghouse's website at <http://www.nonoise.org>.

Source: Acoustical Society of America

[http://www.sciencecodex.com/cities\\_try\\_different\\_tactics\\_to\\_regulate\\_noise-182911](http://www.sciencecodex.com/cities_try_different_tactics_to_regulate_noise-182911)

## The mystery noise driving the world mad

By Linda Geddes and Ada Proctor

Since the 1970s, many people in cities across the globe have started hearing a strange hum. "It's 11 o'clock in the morning, and I'm suddenly aware of this buzzing, pulsating noise, a bit like a distant drill or angle grinder. But it's not just a noise. It feels like my inner ear is vibrating."

This was journalist Linda Geddes first experience the Hum, a mysterious sound that's plagued residents of the English city of Bristol for decades. Similar reports of inexplicable low frequency sounds can be found everywhere from Kokomo in Indiana to Vancouver in Canada.

It disrupts sleep and destroys concentration; some find the phenomenon so annoying that they feel that it is driving them slowly insane.

Is it the secret sound of military signals? The buzz of power lines? The distant call of ocean waves? As Geddes explains, the Hum may hold a very personal meaning.

<http://www.bbc.com/future/story/20160811-the-mystery-noise-driving-the-world-mad>

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**Repugnant Motorola ad:** *"Raise your Moto Z with JBL SoundBoost in the air. Raise it like you just don't care."*

# The Quiet Coalition Debuts in the USA

On October 1, 2016, members of nine scientific, medical, and legal organizations launched a national umbrella anti-noise group, The Quiet Coalition (TQC), hosted by the non-profit organization Quiet Communities, to advocate for a quieter world. TQC brings together a diverse group of organizations and individuals, each with a unique focus or interest, in the fight against noise. It brings medical, scientific, legal, and other specialized knowledge to the public policy process to advocate for all Americans to make our world quieter, more sustainable, and livable. On December 7th, TQC's website went live.

TQC recognizes that noise is like secondhand smoke, in that it is both a nuisance and a health hazard. Both environmental noise and secondhand smoke involuntarily expose large segments of the public to harmful conditions, increasing their risk of disease. And decades of research show conclusively that excessive environmental noise adversely affects health, learning, productivity, and the environment.

Why have decision makers been so slow to regulate noise? According to a newly published editorial in the American Journal of Public Health by Daniel Fink, MD, Founding Chair of TQC, the answer lies in public policy. "Although known to be a health hazard, noise was treated as an environmental pollutant,

with federal noise control activities assigned to the EPA." These noise control activities were never adequately funded or supported, and federal and local health agencies were left with no meaningful responsibility. As a result, the issue has remained under the radar. TQC intends to change this now.

"The scientific evidence is incontrovertible: noise causes hearing loss and other health problems. We have a responsibility to speak up just as experts did when the dangers of smoking became known," says Fink, adding that "through recent discoveries, the mechanisms by which noise damages auditory cells, the nervous system, and the cardiovascular system, are becoming clear."

TQC Program Director Jamie Banks, PhD, notes that "public health policy to protect the nation's health from environmental noise is long overdue," and declares that "TQC will provide decision makers with the scientific evidence needed to make informed policy decisions."

To learn more about TQC and its mission to protect the public from noise, visit the website <http://thequietcoalition.org>.

*We formed The Quiet Coalition to give one voice to the growing public health problem of environmental noise. We are united in urging governments in America to consider recent and past scientific findings on the health effects of noise. Only changes in public policy can generate the change we need for a quieter and healthier world. - The Founders*

## Loud Enough for You?

### **We're enjoying ourselves to deafness, research shows.**

The sounds of leisure are getting so loud, they can permanently damage your hearing, new research shows. Noise from movies, concerts personal stereos and restaurants is exceeding safety limits. Millions of people are destroying irreplaceable hair cells in their inner ears, but they will not realise it until too late, Britain's Royal National Institute for Deaf People says.

The rise of weekend socialising, combined with audio technology that gets ever more advanced and penetrates daily life to an unprecedented degree, has led to an in-crease in tinnitus, the buzzing in the head that doctors thought would dwindle with the decline of heavy industry. Recent research in the Medical Journal of Australia revealed that listening to personal stereos at high volume for more than six hours a week is, to the ears, equivalent to using a pneumatic drill.

A survey of 1,700 young people conducted by the Australian National Acoustic Laboratories found hearing loss among those under 30 that is normally seen in people over 50 years old. Using a new technique to measure damage to outer hair cells, the study found that those who frequently subjected their ears to loud sound directly from personal stereos suffered as much as industrial workers 10 years ago. France has limited the sound levels of personal stereos.

Anything above 85 decibels increases risk of hearing loss, yet music in nightclubs and at raves can reach 120, according to the Ministry of Sound, a London nightclub. Earplugs have become a clubbing accessory, but hifi technology keeps improving, allowing volume to ratchet upward without distortion. Such Hollywood blockbusters as Lethal Weapon 4 and Godzilla matched the action with 100-decibel-plus soundtracks, equivalent to a buzzing chainsaw beside your head. Armageddon's climax hit 110 decibels.

Prolonged exposure forces the inner ear's hair cells to work too hard and release poisonous chemicals that damage hearing. Recordings by the London Sunday Times at 30 restaurants in London, Birmingham and Manchester found seven with average sound levels above 85 decibels. Stripped wooden floors and other bare surfaces were blamed. At 85 decibels, factories with eight-hour shifts have to offer earplugs to staff.

"Some people call it noise, we call it buzz, atmosphere. And that's why people come," said restaurateur David Loewi.

- News Services, The Province