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## SOUNDING ENVIRONMENTS

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In the winter of 2004, the calls of the Cape Robin, a bird native to southern Africa, were broadcast from speakers concealed in trees in Kitakyushu, Japan. Titled *There's No Place Called Home*, the installation by artist James Webb (2004) was “temporary, unannounced and unaccredited” – so it is unlikely that any local human residents would have noticed. “Like a field recording ‘returned’ or hacked into nature”, the artist’s catalogue reads, “or a cuckoo’s egg laid in the nest of another species, the audio is mixed to seem as ‘real’ or ‘natural’ as possible” (Webb 2020: 85).<sup>1</sup>

Similar interventions by the artist have appeared in many different places over the last two decades: “Calls of non-migratory Nigerian birds broadcast from speakers concealed within the trees of Joubert Park, Johannesburg, South Africa” (2006); “Songs of a Jamaican Becard (*Pachyramphus niger*) broadcast from speakers concealed in a tree in the Royal Botanic Garden Edinburgh” (2021). Noting that bird calls are some of the most recorded sounds on the planet, Webb remarks that he soon became interested in “the very politics of the vocalisations”: “What we might take as being melodic and musical, with received cultural associations of relaxation like a kind of natural Muzak, is in fact a series of mating calls, identity displays, and the staking of territory” (Webb 2017: 52).

The Cape Robin (the South African National Biodiversity Institute explains) is not really a robin; it is actually a chat. The misnomer dates from a colonial era when British naturalists named almost all red- or orange-breasted birds after their own robin redbreast, *Erithacus rubecula*. The robin-chat is now one of the most familiar birds in South Africa, with common names like *Setholo-moru* in SeSotho, *ugaga* in isiXhosa, *umBhekle /uGaga* in isiZulu. As birds mimic cars, so human language echoes the birds. The guttural alarm call (*WA-dur-dra*) gives the Afrikaans name “Jan Frederik”, which matches the rhythm (*JAN-Fred'rick*). As with many other onomatopoeias where birds say their name – cuckoo, grackle, *guguubarra*, kiskadee, *kiewiet*, loon – here the signifier (the “sound-image”) attempts to close the gap with its signified (“concept”), calling out across an interspecies boundary (Saussure 1959: 11).

Audio technology now enables a far more effective way of hacking into the sounds of the world’s avifauna. Webb writes that in making these installations, he was also influenced “by wanting to warp and challenge the often frowned upon ornithological practice of sonic “baiting” wherein an audio recording of a local birdcall is sounded in the vicinity where that



species might hear it and respond, with the hope of it making its visual presence known” (2017: 52–3). This baiting now stretches from the benign to the deadly. Tourists in game parks use smartphone apps to coax shy species out of the bush; thousands of duck and quail are lured to their deaths by MP3 files broadcast by bird trappers in the migratory fly-ways of the Mediterranean.<sup>2</sup> To avoid this unwanted mimicry, Webb conducted research in each location to ensure that the foreign birdsong broadcast was in no way similar to the vocalisations of species living there: “This is a sonic trap for human audiences, not the local birds” (2017: 55).

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How to think with sound in the context of environmental history? The question elicits another, more fundamental one: how to think with sound in a world culture so dominated by the visual? “A concentration on vision as the primary mode of comprehending reality”, writes Nigerian scholar Oyèrónkẹ Oyěwùmí, “promotes what can be seen over that which is not apparent to the eye; it misses the other levels and the nuances of existence” (2005: 14). In his introduction to *Hearing History*, Mark Smith suggests that an increased attention to sound might help “to redirect in some profoundly important ways” what is often a visually oriented discipline, one “replete with emphases on the search for ‘perspective’ and ‘focus’ through the ‘lens’ of evidence, one heavily, if often unthinkingly, indebted to the visualism of ‘Enlightenment’ thinking” (2004: ix).

To give a comprehensive account of how the sonic might figure – or, rather, resonate – within the field of environmental history is an impossible task. One would, after all, have to consider in totality not only one of the five fundamental human senses, but then also those forms of audition which fall above (ultrasonic) or below (infrasonic) the human range of hearing. For as Jonathan Sterne writes, the boundary between vibration that is sound and vibration that is not sound “is not derived from any quality of the vibration itself or the air that conveys the vibrations”:

Rather, the boundary between sound and not-sound is based on the understood possibilities of the faculty of hearing – whether we are talking about a person or a squirrel. Therefore, as people and squirrels change, so too will sound – by definition. Species have histories.

(Sterne 2012: 7)

As do (one might add) glaciers, rivers, volcanoes, littoral zones, echoing escarpments, and prevailing winds. Nonetheless (or perhaps for this very reason), the question of *sounding* environments – where the word is held in mind as both adjective and verb – constitutes a fascinating and multidisciplinary enquiry. It is an invitation to listen across time, and across different kinds of scientific, intellectual, and cultural practice: from the empirical work of acoustic ecologists to the experimentalism of sound art, with detours via the extraordinary creative possibilities opened up by contemporary recording technology, audio software, and the digital.

Relocated birdcalls; the crack and pop of melting ice; spring biophonies and the insect “vibroscape”; drone artists in the tropical rainforest; underwater seismic blasting; the natural and cultural history of whale calls; the diesel combustion engines container shipping; sub-sonic pulses at the bandwidth of the Anthropocene; increasing noise and gathering silence – in the course of this chapter, we listen across these different soundworlds, tracing the



entanglements of human and beyond-human history that they take us into, while also reflecting on what it means to transmute non-verbal soundscapes into the medium of human language. The ability of sound to pass through (and to behave differently in) different bodies, substrates, and environments makes it an intriguing and often surprising way to think through received categories and boundaries, whether “natural” or “cultural”.

Throughout, we suggest that thinking acoustically represents one of the most powerful and destabilising ways of attending (to return to Oyèwùmí) to “other levels and nuances of existence”. As she notes, if visually centric cultures might tend to produce specific forms of ontological and metaphysical hierarchies through the visual sorting of differences, then perhaps more a sonic or multisensory culture might produce – given the fuzzier nature of audio/ontological distinctions, and the omnidirectional properties of sound – what Eduardo Vivieros de Castro describes as a “cosmopolitics”: a world in which many worlds can fit.<sup>3</sup> The sonic imagination, in other words, is one of the most provocative modes for thinking in some way beyond a human-centred world, and a human-dominated history. If our cultural and historical imagination “is mostly disengaged from the sonic tumult we create”, then the act of listening more carefully confronts us with the difficult paradox at the heart of this sensory crisis: that our species as “is both an apogee of sonic creativity and the great destroyer of the world’s acoustic riches” (Haskell 2022: 318).

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To return to the first of our case studies, or listening sites: the out-of-place birdsong in *There’s No Place Called Home*. How might this “sonic trap” suggest the possibilities (and complexities) of the acoustic when trying to extend a sense of environmental pasts, presents, and futures?

When speakers play “non-migratory” Nigerian birds in central Johannesburg, the sounds might evoke much louder questions of human movement and migration across the African continent: of demographic flows and border controls; of the social conflict and xenophobic violence that has often been the result in a “host” country like South Africa. (But only, of course, for the informed listener: for anyone else they would simply be background Muzak). When a Jamaican bird calls in the Botanic Gardens of Edinburgh – or when an Ōma’o (Hawaiian thrush) sings in the Company’s Garden in Cape Town (within earshot of a statue of imperialist Cecil Rhodes) – then the sounds might call to other, trans-continental histories of dispossession, forced migration, enslavement, and diaspora.<sup>4</sup> These are some historical frames in which to hear the work.

But, as Sterne writes, species have histories – and other species have other histories. Encoded in the world’s birdsong (as in all bioacoustic signatures) is also a much longer, pre-human story of organic variation, evolution, and dispersion. So if sounds are fleeting – “ephemeral and light, dissipating as soon as they are made” – they are also, the biologist George Haskell writes, “layered records of history” (2022: 190), even while they leave little or no stratigraphic trace. A soundscape of birdsong, he goes on, is “an accretion built over hundreds of millions of years”: “Sound, made of breath and gone in an instant, can be older than stone” (2022: 190).

As Elizabeth Kolbert (2014) and other writers on “the Sixth Extinction” have showed, this vast natural history of speciation and biodiversity is now being altered or effaced even as it is pieced together and understood (see Chapter 13). What environmental historians call the “Columbian exchange” (the consequences of the Old World/New World collision) and the



onset of colonial and global modernity – these world historical processes result in a speeding up and running backwards of evolutionary time. The geographical separateness that produced speciation and variation (and sonic diversity) – all are collapsed back into a modern Pangea: the single, hyper-linked, super-continent of a 21st-century world. This too seems latent in Webb’s globalised birdsong: the proliferation and dispersion of avian MP3 recordings seeming to stand in for the diminishment, absence, and homogeneity within actual bird populations. A conceptual artwork of the globalised present, the hidden speakers also invoke older, mythic ideas of bird calls as augury, omen, or warning. It was, after all, the prospect of a world without birdsong that Rachel Carson took as the central metaphor in her 1962 work on DDT and pesticides, *Silent Spring*.

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It may seem speculative, or unverifiable, to hear so much in a single sound. But this is one of the challenges that those who attempt to listen to history – whether natural, human, environmental, or all at the same time – must grapple with. That is: the nature of sound as (on the one hand) charged, immediate, embodied, evocative, affective, dense with meaning; but (on the other hand) impermanent, diffuse, non-semantic, unfalsifiable, dissipating, often unarchived and traceless. Sound, writes one aural historian, “is at once the most forceful stimulus that human beings experience, and the most evanescent” (Smith 2004: 28).

In thinking through the suggestive but elusive, often non-referential nature of the sonic, François J. Bonnet (2016) theorises a tension between “the savage sonorous” (those sonic experiences capable of producing a rupture in our experience of the world) and “the domesticated audible” (all the ways in which we attempt to recuperate the ingression of novelty into established schemas and formulae). No matter how much we attempt to domesticate sound, he suggests, its dual nature remains. On the one hand, there are the sounds that leave a trace, or which are properly ontological and can be drawn into our systems of meaning; while on the other hand, all sonic experience contains within it a degree of inexplicability, a hauntological echo that is never quite fully present or, however, completely absent (2016: 3).

In thinking via the acoustic as method, evidence, and experiment, the remaining listening sites in this chapter try to hold this tension in mind, and to comprehend *sound* as both noun and verb: both physical property (a sound) and open-ended process (to sound or sound out, to enquire into or investigate).

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Sound (noun) as something received, recorded, and studied – soundwaves as physical, measurable, passively received, quantifiable – informs scientific method in fields like acoustic ecology, bioacoustics, and soundscape studies. These emerge with audio technologies across the 20th century, from the first bird call recording (an Indian shama on an Edison wax cylinder in Frankfurt, 1889) to the instantaneous sound library of the internet (which now allows you to Google “cape robin”).<sup>5</sup> As these technologies become increasingly powerful and portable, more and more of the biosphere’s found sounds can be archived and studied as field recordings: indicators of ecosystem diversity, health, dynamics, and change. Acoustic ecology (as developed by sound engineers turned ecologists like Bernie Krause) conventionally divides the world’s sounds into biophony (sounds made by living organisms), geophony (sounds made by non-biological natural categories: wind, volcanos, lakes, canyons,

snowfall) and anthropophony (sounds produced by human agency) – and then tries to understand the relations between them.

In 2022, Krause’s touring exhibition “The Great Animal Orchestra” drew on 5000 hours of field recordings made over 50 years, including the sounds of over 15,000 terrestrial and marine species from around the world, many of them since lost or at risk. This is perhaps the most direct use of sound in environmental history, arts, and activism: as indicator of zoological splendour and decline (the aural analogue, perhaps, of the BBC or National Geographic documentary, with its conjoining of Edenic abundance and anthropogenic threat). The format of the exhibition – broadcast field recordings combined with large-scale spectrograms projected on the gallery walls – audiovisually enacts Krause’s “Acoustic Niche Hypothesis” (1987). This suggests that in sites of great bioacoustic density (like the tropical rainforest), different animal vocalisations have evolved to occupy different frequencies (niches) on the sonic spectrum, allowing calls to be heard distinctly without overlap or sonic “masking” – much like the different sections of an orchestra.<sup>6</sup> The theory may be contested, but the work of Krause and other acoustic ecologists draws important attention to listening for the totality of sounds in a given environment, and trying to understand the relations between them: “What seems at first a smothering throng of sound contains within it a spatial structure, a microgeography of sound” (Haskell 2022: 111). Another benefit of using sound as data in this way, Krause suggests, is the rapidity of the method: a fairly short recording of an ecosystem can log a plethora of information, providing a rich archive for tracing biodiversity and how it changes over time (Krause 2018).

Acoustic ecology also posits a difference between hi-fi (high fidelity) and lo-fi (low fidelity) soundworlds, and so opens towards a more phenomenological sense of how human (and other) subjects experience aural “space” – and how the parameters of this space have altered through time and in the wake of industrial and economic revolutions.<sup>7</sup> In a hi-fi soundscape, individual sounds can be heard more distinctly by the human ear, whether in the “foreground” or “background”, such that the “acoustic horizon” may extend far into the distance. In a lo-fi context, sounds overlap, mask, and cancel each other out, reducing the “aural space” of the listener. Where the masking means that an individual can no longer hear the reflected sounds of their own movement or speech, then “aural space has effectively shrunk to enclose the individual, isolating the listener from the environment” (Wrightson 1999: 11). “If the masking of reflected and direct sounds is so severe that an individual cannot hear his/her own footsteps – which is common on the streets of many cities” (Wrightson 1999: 11) – “one’s aural space is reduced to less than that of human proportions” (Truax 1984: 20, as cited in Wrightson 1999).

This points to another dimension of sound research in the context of urban environments: how decibel levels and the encroachment of unwanted or inescapable noise into personal aural space map onto historical geographies of race and class. Cape Town (one of the cities where this chapter was written) presents a typical example of how those living within what urban planners call the “acoustic footsteps” of major highways and the airport are generally those residents who enjoy the least physical and social mobility.<sup>8</sup> The meeting of sound studies with the political sociology of urban environments is a body of work with many possibilities for environmental history and justice, in tracing what might be called the social geography of sound.

Extending the reach of acoustic ecology into the urban and built environment, soundscape ecology (popularised in the 1970s by the Canadian composer R. Murray Schafer) was premised on the idea that “the general acoustic environment of a society can be read as indicator

of social conditions which produce it" (1977: 7). Schafer's work can sometimes read as didactic and nostalgic, generally valuing pre-industrial soundscapes above the undifferentiated "noise pollution" of modernity: "It would seem that the world soundscape has reached an apex of vulgarity in our time" (1977: 4).<sup>9</sup> Nonetheless, as Smith remarks in *Hearing History*, his ideas of localised "keynote" sounds and "soundmarks" remain suggestive in their historical dimension: auditory textures which are the product of a particular combination of geography, flora, fauna, people, and technology at a certain moment (Smith 2004: xi).

In Japan, the "100 Soundscapes" project provides an example of how this kind of listening can also lead to environmental awareness, policy, and protection – and in a way that includes both pre- and post-industrial soundscapes as part of a national imaginary. In 1996, following a public call for submissions, the Japanese Ministry of the Environment designated 100 sounds as part of the nation's cultural heritage, in an effort to combat noise pollution and conserve important elements of the nation's acoustic identity.<sup>10</sup> Some entries from a list of the different soundscapes suggest how the auditory moves across worlds that are often kept apart by a nature/culture binary:

Drift ice in the Sea of Okhotsk	(オホーツク海の流氷)
Cicada chorus droning in Honda-no-Mori Forest	(本多の森の蟬時雨)
Wave sounds and ship whistles at the Kanmon-kaikyo Strait	(関門海峡の潮騒と汽笛)
Water scoop (hydropower) of Onta Sarayama	(小鹿田皿山の唐臼)
Isobue whistling of female divers in Ise-Shima area	(伊勢志摩の海女の磯笛)
Soughing of the wind through pine trees of Oka Castle remains	(岡城跡の松籟)
Bell of Peace in Hiroshima	(広島の平和の鐘)

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Sound (verb) as perception and enquiry – soundwaves as actively made, listened back for, transformed, or transduced into various forms and formats of knowing – is an orientation to the world that stretches from the echolocation of bats and whales to the human sounding out of unseen or otherwise unreachable domains: "to sound the depth of an ocean, the inside of a body, and the furthest reaches of space" (Roosth 2009: 349).

Sound as method and experiment might include everything from offshore seismic blasting (the subject of the next case study, which considers oceanic noise) to the practice of artists and activists who use sound to resist exactly these extractive technologies. In doing so, they attempt to engage socio-environmental questions in ways that often go beyond the dominance (and over-familiarity) of the visual, working with "the combination of intensity and ephemerality" at the heart of listening experience (LaBelle 2010: xvi).

Moving beyond acoustic and soundscape ecology as just evidence gathering, a wider sense of human audition can then be imagined, with sound not only as data or measurable signal but also method, theory, and creative enquiry. As Louro et al. suggest in their survey of "A Sonic Anthropocene", such practices evoke useful methodologies "to environmentally sense ecosystems and register transient power relations ... before they get inscribed into the

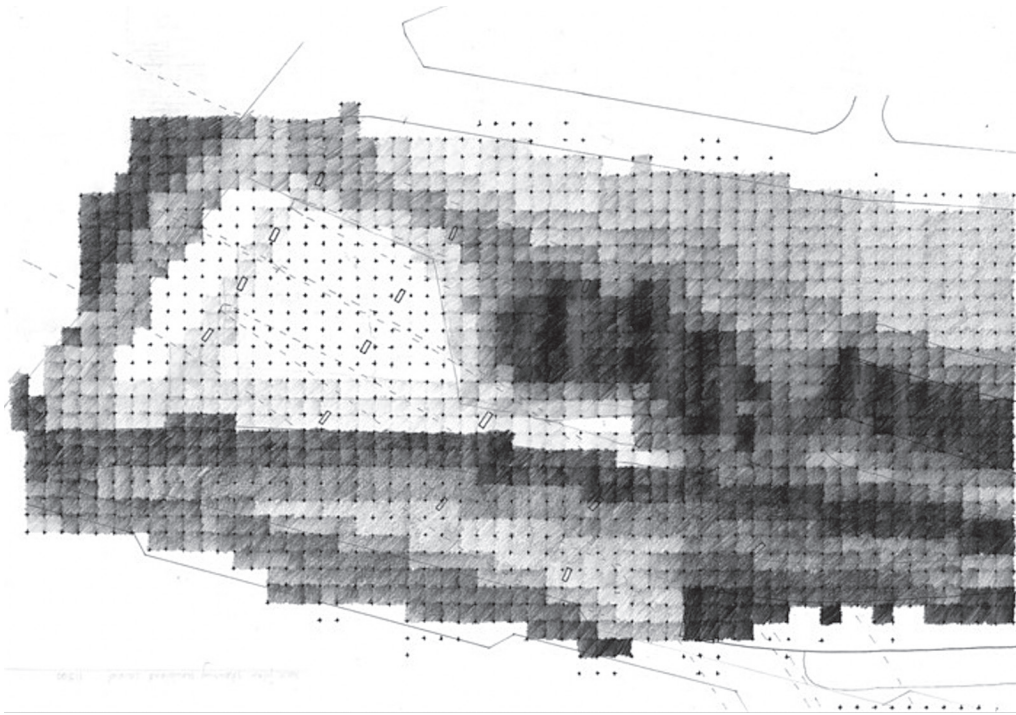


Figure 3.1 Sonic mapping of a site under the N2 highway, Cape Town Foreshore, tracing loudness and softness shaped by the architectural environment. Drawing by Meghan Ho-Tong.

geological strata”, particularly in the context of the climate crisis: “Sound’s omnidirectional quality trespasses all matter, leaving rippled traces, while destabilizing spatiotemporal causal effects and, as such, problematizes ideas of containment and jurisdiction” (2021: 1). Like water and CO<sub>2</sub>, in other words, sound moves across the political or conceptual boundaries which often seek to contain and capture environmental thinking.

To give some examples of the sonic imagination in the work of environmental arts and activism: instead of the repeat photography pictures that are the usual (visual) language of retreating ice and climate change, Kalle Laar’s *Call Me! +43 5254 30089* offers “direct telephone communication with a glacier”: “A microphone on site transmits the sounds of nature directly and unprocessed to the caller. You can hear flowing water of varying intensities, the occasional cracking sound, and other sounds that a living glacier makes according to the seasons” (Laar n.d.). Other parts of the 15-year project (*Hotline*) provide direct lines to international energy companies, German nuclear power plants, or previously unknown pathogens: “The call gives each participant the opportunity to put themselves in a situation that normally remains unreachable and is neglected by the headlines in the daily press” (Laar n.d.).

As Jonathan Gilmurray writes of similar works that feature underwater recordings of glacial ice at the Arctic and Antarctic – for example, Douglas Quin’s *FATHOM* (2010), Jana Winderen’s *Spring Bloom in the Marginal Ice Zone* (2018), Daniel Blinkhorn’s *frostbYte cycle* (2012–2015) – their “microsound aesthetic invites comparisons between the cracking and popping of the polar ice and the sonic palette of glitch music” (Gilmurray 2020: 450). One of the key aspects of all of these works, he goes on, is the way in which sound – which

requires attending to duration – renders the dynamics of glacial melting as ongoing process. Approached from a purely visual perspective, a glacier appears to be “frozen” in time; in contrast, “the sonic dimension of glacial melting facilitates our understanding of it as a dynamic process, happening ceaselessly and progressively” (Gilmurray 2020: 450). To listen to something, in other words, often requires a different, slower temporal frame than simply looking. And so the experiential, temporal duration of an audio work may resonate with the problem of representing the “slow violence” of environmental degradation and injustice (Nixon 2011) in a way that is different to the rapid consumption of images within an online ecosystem engineered for perpetual distraction.

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While these works harness an immediacy and sense of physical connectedness – sound as a “direct line” – other, more conceptual approaches play with the disembodied nature of the aural: its ghostly, echoing, ventriloquised, voice-over or acousmatic potentials. Writing in the midst of the Great Acceleration – the post-World War II economic boom which positioned the United States as dominant world power – Schafer’s ideology of the acoustic is constantly troubled by what he termed “schizophonia”: the separation or “split between an original sound and its electroacoustical transmission or reproduction” (1977: 90). But it is just these kinds of splits and recontextualisations that other sound works draw on in trying to create new aural ambiances, atmospheres, and thought experiments.

“How honest can we be with each other?” asks a voice in James Webb’s *A Series of Personal Questions Addressed to 5L of Nigerian Crude Oil* (2021). The oil is displayed in a glass case, with audio speaker installed above. Time is given between each question for the object to reply, “and for the audience to consider their own responses to the questions and the situation”:

How old are you?  
What was your original form?  
At what stage will we become like you?  
What have you been told about your value?  
Who died for you?  
How does this end?

In the work of ecologist and sound artist Francisco López, the acoustic is conceived not as data or indicator of a given reality; instead it becomes a way of opening up cognition to questions at a beyond-human scale, and to forms of audition not limited to the physical properties of the human ear. Much environmental sound art works to create listening experiences where the distinctions between biophony, geophony, and anthropophony are blurred, and in ways that release sonic thinking from a sometimes moralistic or limiting binary. “I don’t see machines as oppressive”, López remarks:

Many of them produce beautiful sounds and a lot of true industrial “droney” sound environments are really fascinating. My work, however, is not concerned with making any judgements other than the purely sonic. And in this sense, I like machines as much as I like frogs.

(López 1999)



Working with field recordings and found sound in a different way to acoustic ecology pioneers like Krause, López rejects the widespread tendency in nature recordings to try to reproduce the experience of “being in the place”, arguing for something beyond sound as mere representation. The richness of this sound matter in the tropics is astonishing, writes López, but to appreciate it in depth, “we have to face the challenge of profound listening”:

We have to shift the focus of our attention and understanding from representation to being. ... I have no interest in “representing” anything specific with my music. I actually have a strong commitment to do just the opposite; that is, to develop a sonic world that is so devoid of meaning and purpose that it can be completely open for individual experience. A blank phenomenological terrain where everyone is compelled to create and move through.

*(López 1998)*

Here the idea of sound as related not simply to human hearing, but to physical vibration at all manner of different frequencies, might widen the ambit of environmental history, placing it in dialogue with the kinds of multi-species ethnography which seek to render human action as enmeshed with the histories of other beings, species, and agents (see Chapter 2, this volume). If the cochlea places us in “a perceptual box, a space much smaller than the diverse flows of energy in the world” (Haskell 2022: 32), then how to render energy flows beyond the threshold of human perception and understanding into some kind of apprehensible form? Again, here the sonic works less as evidence and more as invitation to widen cognition and orient historical awareness toward the beyond-human, and even the geopolitical.

“This is the history of a sound you cannot hear” – in her infrasonic history of the twentieth century, Roosth tunes into an environmental geopolitics at 19 hertz and under: frequencies below the threshold of human hearing, where our experience of soundwaves shifts from the audible to the palpable, liminal, vibratory, even illusory. Beginning with naturally occurring subsonic markers – from the 1883 eruption of Krakatoa to the Chelyabinsk meteor exploding above the Ural Mountains in February 2013 – she goes on to show how the infrasonic becomes entangled with nuclear and Cold War history. From the 1950s, the monitoring of very-low-frequency events (which travel much further than soundwaves through the earth’s crust) became a way for the United States and the Soviet Union to know if nuclear tests had been conducted by their rivals (particularly after these moved underground in the wake of the 1963 Limited Test Ban Treaty).

Since the 1990s, these monitoring stations (and those established by the later Comprehensive Test Ban Treaty) have increasingly been retooled as instruments for predicting earthquakes, volcanic eruptions, and tsunamis, “refashioning the enemy not as political threat but environmental one” (Roosth 2018: 119). In this regard, she goes on, infrasound might be considered, following sound installation artist Raviv Ganchrow, to be “the bandwidth of the Anthropocene”, because “environmental infrasound exhibits an intermingling of large-scale human industrialized activity with these other earth- and atmosphere-related frequencies” (Roosth 2018: 119; Ganchrow 2015: 194–5).

In the 21st century, the infrasonic remains tinged with an anxious, sometimes paranoid imaginary. What ultra- or subsonic vibrations are we surrounded and affected by? What are the effects of these invisible/in audible but ever-present by-products of global modernity? Hence, widespread anxieties about “vibroacoustic disease”, or the insidious “hum” reported

by people across the world, or the contested illness termed “wind turbine syndrome” (West-Knights 2022). As “a liminal vibration propagating at the cusp of human audibility, ever so slightly below the threshold of human perception”, the infrasonic “invites all-too-human anxieties about the limits of our own capacity to sense and know the environment in which we are embedded” (Roosth 2018: 119).

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“I am not prepared to mourn my coastline” – in her director’s statement for the 2018 sound and video work *Becoming Visible*, Janet Solomon discusses her attempt to represent the acoustic violence unleashed by seismic surveys off the southern African coastline. Launched by the South African government in 2014, Operation Phakisa (to “hurry up” in Sesotho) aims to “unlock the economic potential” of the country’s maritime territories and to develop the “blue economy”. With this comes, Solomon writes, “an escalating and unrelenting push for oil and gas development along the east coast of South Africa” (2018b). The KwaZulu-Natal coastline, she goes on, experienced its highest ever recording of whale strandings during and after a 2016 marine seismic survey looking for oil and gas reserves, a survey granted an extension into the whale migration season.

Working via multi-channel video and sound, *Becoming Visible* seeks to bring home the effects of towed airgun arrays that are used, in conjunction with multi-beam bathymetric sonar, to establish the topography of the sea floor. Such airguns can issue pulses of up to 240 decibels every ten seconds, for 24 hours a day (human eardrums typically burst at 160 decibels). The challenge presented by the work is its invitation for human listeners to comprehend the very different sonic environment of a watery, submarine space. Soundwaves behave differently below the ocean surface (where hydrophones pick up the same level of sound 12

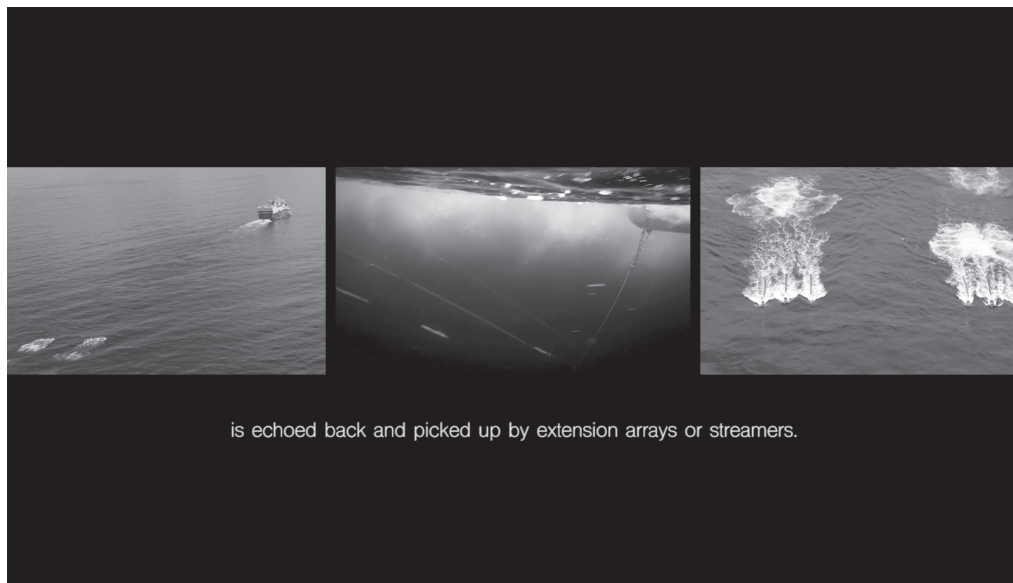


Figure 3.2 Still from Janet Solomon (director) (2018a). *Becoming Visible* (film). Vanishing Present Productions. <https://www.becomingvisible.africa/the-movie/>

kilometres away from sources as from two kilometres away). They are faster, more far-reaching, and less avoidable for marine organisms (who often “hear” with their whole body) even while going (to human ears) largely unheard. How, then, can regulatory frameworks and environmental impact assessments be extended into worlds set apart from or beyond the human sensorium? Who is listening for, or to, our companion species in the oceans?

An intentionally disorienting and visceral work, *Becoming Visible* is best experienced as a multichannel installation: it harnesses our ability to hear many different sounds at the same time in a way that is difficult to replicate in the linear medium of writing. As with *Leviathan*, an experimental 2012 documentary on industrial fishing off the Massachusetts coast, the filmic soundtrack is not “a silent supporter of the image” (Doane 1985: 47), but rather a means of evoking “affective and epistemological confusion” that explores an “assemblage of human, animal and machinic existence” (Kara and Thain 2014: 187, 191). Yet at several points in *Becoming Visible*, those speaking attempt to transmute into language the extreme conditions created when sound as industrial, bathymetric barrage has come to override all sense of sound as communicative. Marine scientist Dr Simon Elwen turns repeatedly to terrestrial, urban metaphors of acoustic extremity in order to evoke the underwater world during a survey:

You can, under extreme sound conditions, end up with gas bubbles in the tissue. It causes gas to vibrate, for want of a better word, out of muscle tissue, similar to shaking a can of Coke. And within the ear, it's similar to humans, you can get damage to the small cells and to the bones. More commonly you'll get things like permanent or temporary deafening: the classic nightclub example when your ears are ringing in the morning. Or it can be a much more subtle behavioural response, animals don't like the sound and move away from it, as you might with a jackhammer. And then masking is quite a big one because cetaceans are a very vocal species. They communicate hugely over quite vast distances with sound, and if that sound is being masked, that's when they have to vocalise louder or vocalise at a different frequency.

(Solomon 2018)

“For want of a better word” – as an aside, it is worth considering how these deep-sea sonar pulses move across different mediums to arrive at this written text. From seismic blasts to soundwaves reflected off the ocean floor, picked up by hydrophones towed in kilometres-long “streamers” by ships, they are then mixed into the soundtrack of a documentary and reimagined via language in similes drawn from human experience – in this case the spoken voice of an interviewee, delivered by fibre-optic cabling and wi-fi to the author of this chapter, then transcribed and typed out for its reader. Working with an awareness of environmental sound constantly returns to these chains of transfer. The material irreducibility of sound coexists with the phase changes between different technological and symbolic mediums that are necessary to convey it and bring it into cultural significance. Perhaps it is the inescapable transduction (to use the technical term) involved in sound engineering, and sonic imagining, that makes the acoustic a compelling way to think experiences beyond the human boundary, and to extend historical awareness into domains beyond the human sensorium.<sup>11</sup>

Seismic blasting, the scientific literature shows, unleashes a cascade of effects on marine life, disrupting the nervous, hormonal, endocrine, and reproductive systems of organisms ranging from cetaceans, seals, turtles, and squid to invertebrates like crabs and molluscs. Yet these seismic spikes are only one aspect of a much larger phenomenon: the rapid and

ongoing increase of oceanic noise as a result of global shipping (perhaps the most dramatic historical change within the biosphere's soundscape across the 20th century). The engine noise of a large container ship is around 190 decibels (the equivalent of a thunderclap or jet taking off on land), which is combined with turbulence from hulls or sterns and the cavitation bubbles that form and implode at the tip of underwater propellers. "If there is an acoustic hell", writes Haskell, "it is in today's oceans" (2022: 292). And as he goes on to show, the encounter between whale "song" and anthropogenic "noise" in the oceans represents a charged and complex encounter between different currents of environmental sound history, one in which a biological enquiry into cetacean biology inevitably becomes entangled in a wider political and cultural history.

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In 1979, the January edition of *National Geographic* magazine came with a page of "flexi-disc" vinyl to be cut out and played. Narrated by zoologist Roger Payne, it contained excerpts from his million-copy-selling *Songs of the Humpback Whale*, released in 1970. The *National Geographic* disc reached ten million more listeners – the largest record pressing in history – and the humpback songs were also etched onto NASA's 1977 gold-plated LP, *Murmurs of Earth*, travelling with the *Voyager* probes into outer space.<sup>12</sup>

Yet even as these whale songs became the "call sign" for emergent environmental movements in North America (see Ritts 2017), their recording history points to a more complex relation between military, industrial, and oceanic listening. The recordings had first been made in 1950s Bermuda by the US Navy, where electronic engineers invented and installed hydrophones to monitor the Atlantic Ocean. Three kilometres offshore and 700 metres down, they hit the "deep sound channel", "the lens formed by pressure and temperature gradients that transmits sounds thousands of kilometres" (Haskell 2022: 292) – and allows whale vocalisations to travel across entire ocean basins. This underwater medium had previously been tapped by military technologies to detect the threat of icebergs and German U-boats; now it was being tuned into the frequencies of the Cold War.

Passed on to Payne, and then becoming some of the most influential non-human-recorded sounds of the 20th century, the humpback whale sounds occupy a cultural niche – or float in an ambient, New Age ether – that is sometimes removed from the history of their own production. If the album was in one sense a landmark of interspecies listening, it was also the product of sonar and echograph technologies which now reach an apotheosis in industrial "fish-finding" and the acoustic violence of seismic prospecting: sound as a means of probing and commodifying the furthest reaches of the biosphere. Listening to whale songs divorced from this context – as solo vocal tracks treated with woozy echo and reverb, isolated from (and perhaps ever working to conceal) the background "noise", in both historical and literal senses – this might risk making them "the aural equivalent of synthetic tranquilizers, manufactured anodynes for the senses" (Haskell 2022: 297).

Solomon's *Becoming Visible* draws attention to the extremity of sonar surveys, attempting to bring into human understanding a dimly perceived and insufficiently regulated aquatic "noise-scape" where industrial technology is making life unliveable within the oceans. But even when the seismic blasts fall silent, the "normal" level of anthropogenic ocean sound shows up an asymmetry, as the global supply chains of modern container shipping impinge remorselessly on worlds beyond human audition. "I have seldom seen or heard whales", Haskell remarks, seeking to make reciprocal links between suburban quiet and oceanic



uproar of container shipping: “But the whales hear me. They are immersed in the sounds of my purchases from over the horizon every day of their lives” (2022: 308).

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In writing this chapter, we have tried to keep within earshot everything from the densely informational soundscapes of bioacoustics to the blank ambiances of drone music and environmental sound art.

Holding together these varied modes of sounding and listening can be challenging, but one helpful linking concept has been acoustemology. This approach, Steven Feld writes, “conjoins ‘acoustics’ and ‘epistemology’ to theorize sound as a way of knowing” and “enquires into what is knowable, and how it becomes known, through sounding and listening” (2015: 12). Feld goes on to emphasise how a sound-based practice can resonate with the kinds of relational, multi-species or beyond-human interdependencies which have proved generative for recent environmental thought, theory, and history:

Acoustemology, then, is grounded in the basic assumption that life is shared with others-in-relation, with numerous sources of action (*actant* in Bruno Latour’s terminology) that are variously human, nonhuman, living, non-living, organic, or technological. This relationality is both a routine condition of dwelling and one that produces consciousness of modes of acoustic attending, of ways of listening for and resounding to presence.

(2015: 15)

To this, one might add: listening for and resounding to absence. In recent years, the dramatic reduction in human and industrial sound during the Covid-19 pandemic – the so-called “Anthropause” – afforded an opportunity for rethinking, or rehearing, the sound of a biosphere that is becoming both noisier and more silent. The unprecedented silence of a global lockdown – both eerie and liberating – permitted a kind of recalibrating of baseline environmental noise on land and in the oceans. For many, it was an invitation to think again about what cities could or should sound like, and how the acoustic textures of ecosystems in the 20th and 21st centuries have changed in ways that are both dramatic but also hard to represent or even remember.

Thinking within a context of declining insect populations, the sound artist Samuel Hertz writes about “hearing loss” (with the stress on the second word) as it relates to the auditory archive of personal and inter-generational memory:

There is already a feeling associated with loss, however not always so clearly articulated through data. This pulse of feeling, however, has the cyclic span of a full generation – an adult’s remembrance of a noisier time: the tactile unavoidability of this chattering and chirping biomass. If we cared to listen, we might hear (or might have heard) this slow disappearance as well – a creeping decrescendo of insect life, or an ever-so-gentle crossfade of biophony into anthrophony and technophony. Hearing absence is a funny thing; it is always harder to hear a hole than an intruder. And because of the longer scales of time involved in these disappearances, the body falls victim to ‘shifting baseline syndrome’ – the almost-too-casual adjustment of the ear to a consistently diminishing bed of sound.

(Hertz 2019)



The challenge for a sound-based environmental history is to listen for such “crossfades” of sound and silence as they unfold in different socio-environmental contexts, and with different valences, blurring the conventional categories of biophony and anthropophony. And also, crucially, to think about how listening in one space be might be (invisibly) related to other sounds in very different places. It is an approach that could then consider – to adapt Jane Hutton’s work (2020) – “reciprocal soundscapes”. To understand, for example, the relation between the stillness of the suburbs and the tumult unfolding in other habitats, like the world’s oceans. Or how the quiet hiss of electric bus transport in one city might be connected with the noise of two-stroke petrol engines in another.

While Rachel Carson’s *Silent Spring* may have led to far-reaching policy changes within her own country, a corollary of this was that chemical pesticides no longer permitted in the United States were still manufactured domestically but then exported and traded globally. It is a pattern still at work today, with biocides ranging from atrazine to neonicotinoids – as well as the high-sulphur diesel often pressed on “developing” African countries with more lax environmental regulation – in a process termed “regulatory arbitrage”.<sup>13</sup> And so the noise of the most polluting internal combustion engines increases in the Global South, even as automotive designers in richer nations engineer the future sound of electric vehicles, so “composing the soundscape of the 21st-century city” (De la Garza 2021). And vice versa: the silence that Carson warned of – a silence that haunts the modern environmental imagination – is then repressed only to reappear elsewhere as an externality: a silent spring exported or displaced to other, “unheard of” places.

We end, then, with the paradox of acoustic riches and diminishment with which we began. On the one hand, new audio technologies are unlocking previously unheard realities in the field of “digital bioacoustics”.<sup>14</sup> On the other hand, human abilities to record and explore acoustic environments coexist with the gathering silence, or lo-fi drone, of anthropogenic action as sensory crisis. The complex and uneven acoustic geography that results – a biosphere where sound and silence are linked via the unevenness and inequities of the global economy – is surely something that any sound-based environmental history of the future would need to listen for.

## Notes

- 1 The cape robin’s repertoire is easily found online. It has a “song” comprised of a sliding down note (“a plaintive, descending *peeeeuu*”, says Wikipedia) intermixed with a chatty, fluting noises; and then an alarm “call” that is low and trisyllabic (*WA-dur-dra* or *TURR-da-da*). It can mimic all kinds of other birds and (as a species now well adapted to living in suburban gardens) has also been recorded impersonating the sound of hooting cars.
- 2 As the Mediterranean’s waters “are fished clean by trawlers with sonar and efficient nets”, Jonathan Franzen reported for *The New Yorker*, “Its skies are vacuumed clean of migrants by the extremely effective technology of birdsong recordings” (2010). Sean O’Toole makes the link to Franzen’s piece in his essay “The Sensory Complex: Hearing the Bird Calls and Auguries in James Webb’s Work” (in Webb 2020: 107–17).
- 3 Throughout sound studies, there is a repeated claim that there is something “Western” (or a subtle preferencing of European modes of being and experience) inherent in the privileging of the visual. At the same time, Sterne cautions against drawing overly schematic boundaries and binaries between the visual and the audible, “a set of presumed and somewhat cliched attributes” that he terms “the audiovisual litany” (2012: 9), and which may work to reassert unhelpful oppositions between “modern” and “traditional” societies.

- 4 The cultures of nature imposed on sites around the world by European colonisation can be read directly off the landscape in a city like Cape Town; here they also infiltrate the soundscape. Rhodes's green imperialism of the late 19th century introduced foreign birds, like European common starlings, to the Cape, attempting to recreate the soundscape of English gardens and woodland. For an account of how bird vocalisations become entangled in questions of aesthetic value within the colonial context, see Low (2016). His work shows how (contra the diffusion model of European expansionism, so often mapped onto natural history), the evolutionary home of songbird species is the Australo-Pacific, a region now understood by biologists as "crucible and exporter to the world of songbird diversity" (Haskell 2022: 172).
- 5 The 1889 recording of a captive white-rumped shama (*Kittacincla malabarica*) was made by an eight-year old Ludwig Koch (who had been given an early Edison phonograph by his father) and is now preserved in the sound archives of the British Library. See Bevis (2019) for an account of the complex and often cumbersome methods of creating field recordings of birds in the early 20th century.
- 6 The metaphor of the "purely biological ambient sounds of our habitats" as something carefully "orchestrated" by evolution is explicit in the first articulation of Krause's theory in 1987 (14). It appeared illustrated by a musical stave, with "cicada" in place of a crossed-out "violin", "coyote" in place of "viola", "bullfrog" in place of "double bass", etc. (Krause 1987: 14).
- 7 Mark Smith's 2011 account of "Listening to Early American Industrialization" is an example of how much sound-based history has turned on tracking cultural and political responses to industrial revolutions, railroads, the machine age, and the internal combustion engine. See also Coates (2005).
- 8 See Twidle's account of Cape Town's N2 highway (2017) and Watkins's enquiry into "Sonic Apartheid: Ecoracism, Apartheid Geographies, and Noise Pollution in Cape Town's Blikkiesdorp" (2019), a research project which entailed residents keeping a Noise Pollution Diary.
- 9 As Timothy Morton points out in his argument for ecology without nature, sound history in the United States has often been linked with a place-based environmental politics, for example in the American West, where campaigns to ban military aircraft and snowmobiles from the national parks are "aided by accounts of what the Rockies sounded like a century before the internal combustion engine" (2007: 95). A certain version of sonic history can then be seen as a symptom of a radical loss of place, but an aestheticised version of place, "as the suffix 'scape warns us': "A landscape is a painting. Soundscape has been framed": "It would be less seductive", he goes on, "to call the sound world a 'noise-scape'" (2007: 95).
- 10 "100 Soundscapes of Japan", Ministry of the Environment. *Archived from the original on 2012-06-08*. Retrieved 18 April 2011. See Wikipedia "100 Soundscapes of Japan" for the list in English: [https://en.wikipedia.org/wiki/100\\_Soundscapes\\_of\\_Japan#cite\\_note-Hundred-1](https://en.wikipedia.org/wiki/100_Soundscapes_of_Japan#cite_note-Hundred-1)
- 11 See Helmreich, who quotes the *OED* definition: "*Transduce*: to alter the physical nature or medium (of a signal); to convert variations (in a medium) into corresponding variations in another medium" (2015: 222).
- 12 In its "100 Most Important Records Ever Made", *The Wire* magazine grudgingly affords *Songs of the Humpback Whales* a place on the list, explaining how it broke with existing ideas and formats of "nature recordings":

Until the release of Roger Payne's now excruciatingly familiar recordings of Humpback whales, the format of sonic entertainment of an extra-human nature tended towards pseudo-science. As one's stylus tracked across the dark vinyl waste of a birdsong long player, the fauna would be caged off in separate bands, to be named and classified by sepulchral voices in weighty "objective" tones. Payne delivered up the first psychedelic bio-acoustic document. His intentions were prophetically conservationist and the project took off with remarkable force. Despite their limited range of sounds, whales continue to sing the call sign of the New Age and Green movements.

(*The Wire* 1992)

- 13 See the *Public Eye* report by Gaberell and Viret (2020), which shows that in 2018, European nations exported 81,615 tonnes of 41 different pesticides banned for use in their region of production. On the international flows and arbitrage of "dirty diesel", see Gueniat et al. (2016) and Hecht (2019).

14 As Karen Bakker shows in *The Sounds of Life* (2022b), coral and fish larvae find their way back home by imprinting on the unique sounds made by the reef where they were born: “Moths have developed echolocation-jamming capabilities to hide themselves from bat sonar. Flowers and vines have evolved leaves to reflect echolocation back to bats, as if they were luring their pollinators with a bright acoustic flashlight” (2022b).

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