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Listening to Insect Agency: Reconsidering Relations Through Ecological Sound Art

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ABSTRACT

Insects are vitally important to the survival of life on earth. Yet, in many western societies, humans have become quite averse to insects, and this is exacerbated by a narrative of fear, avoidance, and elimination. If we are to act on utilitarian evidence alone, insect decline caused by anthropogenic impacts makes it critically important to improve our relations with our insect kin. In this paper, we argue that listening to insects – and speculating as to how they listen – can move us towards relations based in curiosity, respect, and a recognition of their value. We present two works of ecological sound art that focus on cryptic insect sounds beyond the limits of human hearing ability: HVAC (2022) and Formiphony (2020). By foregrounding cryptic sound, we emphasize the vast unknown sound-worlds of insects in our shared environments. Through this expansion of our listening, we can recognize insect agency as expressed through decisions concerning their sonic relations. These works have been presented in performance, exhibits, lectures, radio, and albums, bringing a broad audience into conversation about our relations with insects.

1. INTRODUCTION

Ongoing shifts and declines in insect populations [1][2], are of critical concern for all species, since insects are vital to ecosystem function [3][4][5], and without them life on earth would decline precipitously [6]. Insects are essential as soil engineers [7], seed dispersers [8], pollinators [9], herbivores [10], and interact in a myriad of predator-prey relations [11]. If we are to rely on anthropocentric rationale alone, insects' critical roles should be ample evidence to pay more attention to them. However, many western societies have become averse or indifferent to insects in our shared environments, which is evidenced by exacerbated pesticide use, a socialized narrative of fear and avoidance, and a legal system that deprioritizes their protection [12]. We are interested in how we can shift our relations with insects in our daily lives through listening. We suggest that ecological sound art [13] can prompt listeners to pay more attention to insects, and to acknowledge and respect insect soundscapes that are beyond our sensory reach.

This paper presents two ecological sound works that feature insects prominently: "HVAC" (2022) and "Formiphony" (2021). These works focus on cryptic insect sounds that are beyond the limits of human hearing ability without the use of technology.[1,2] By bringing cryptic insect sound to the foreground, we are emphasizing how much we do not know about the parallel sound-worlds of insects in our shared environments. These cryptic sounds include substrate-borne vibration, ultrasonic sound, quiet sounds, and sound that is spatially inaccessible (such as inside nests). Following the advice of sound artist Pauline Oliveros, we are "listening at edges" [14], using technology to push the limits of our hearing. Listening in this way can prompt us to auralize (sound in the mind) [15] about these beyond-human soundscapes, recognizing that which is beyond our sensing, and thus challenging underlying assumptions we might hold about the abilities and agency of insects. We reference Salome Voegelin's concept of "sonic possible worlds," in this consideration of the capacity for listening to affect social change: "…in its invisible mobility, in its sticky and grasping liquidity there is something that augments, expands, and critically evaluates how we see the world and how we arrange ourselves to live in it" [16]. Featured compositions are available at http://www.lisaschonberg.com/WFAE23.

2. METHODS

2.1 Location

The compositions "HVAC" and "Formiphony" were produced as part of ATTA (Amplifying the Tropical Ants), an interdisciplinary research project on ant acoustic communication in Manaus, Amazonas State, Brazil. ATTA is a collaboration between entomologists Érica Marinho do Vale, Fabricio B. Baccaro, bioacoustician Tainara Sobroza, composer Lisa

[1] We acknowledge the diversity of human hearing methods and abilities. The sounds categorized as "cryptic" in this paper are beyond the limits of the hearing ability of the authors.

[2] We choose to use the word "cryptic" rather than "hidden" because of its significance in entomology – to refer to species that are camouflaged in the leaf litter habitat, and to species that are difficult to distinguish taxonomically.

Schonberg, and technician Anthony Brisson. Research for "HVAC" and "Formiphony" was conducted in tropical forest habitats in and near Manaus, including Adolfo Ducke Reserve and the forest fragment surrounding the Federal University of Amazonas (UFAM). Field recordings were made between July 2018 and August 2021.

Instrumental performances for HVAC were recorded by Schonberg during a music residency at Pioneerworks in Brooklyn New York in December 2021. HVAC was composed during this same period at Pioneerworks.

2.2 Equipment

Field recordings of insects were collected using multi-track recording, with microphones spatialized within the focal insect microhabitat. We used contact microphones to record substrate-borne vibration, including the C-Series (by Jez Riley French), a Korg CM-300 clip-on microphone, and a contact microphone attached to a sheet of thin metal (by Chloe Thompson). The contact mics were paired with a HOSA MIT-129 impedance adapter. A pair of MikroUsi Pro condenser mics (by Lom Audio) was used to record inside nest entrances, and a Geofón (by Lom Audio) was used to record low-frequency vibration in soil substrates. Microphones were input into a Zoom F4 or Mix-Pre6 II recorder. A Dodotronic Ultramic384K and Ultrasonic software on an Ipad was used for capturing ultrasonic sound. Music composition and editing of field recordings were done using Ableton Live, Max/MSP, and Audacity software.

2.3 Presentation

"HVAC" has been presented in performance by the band Antenna (featuring electronic musician Senem Pirler and percussionists Leah Bowden and Lisa Schonberg), and as a 4-channel speaker performance. For performance, Schonberg drafted scores that employed traditional and graphical approaches to outline a structured improvisatory form. It is also available for free streaming and purchase on the online music platform Bandcamp.com. "Formiphony" was commissioned by BBC Radio3 for the program *Slow Radio* in 2020 *and* was presented to the public over radio broadcast and on the BBC website. Both works have been presented at in person and online lectures in Brazil, the United Kingdom, Germany, Canada, the U.S., and Portugal.

3. "HVAC"

The works discussed in this paper include, rather than hide, anthropophony, positioning humans as actively engaged in emergent ecologies [17] where we are participants, rather than dominate nature as intruders, controllers or spectators. Insects are considered equal agents in these ecological relations. Multispecies scholar Eben Kirksey has written in depth about the adaptable ant genus *Ectatomma* that can thrive in a wide variety of habitats – an "ontological amphibian...constantly moving among worlds, always exploring lines of flight that might lead somewhere else" [18]. I extend this notion to the leafcutter ant genus *Acromyrmex* in the composition "HVAC," which features sounds recorded from within an *Acromyrmex* nest on the UFAM campus in Manaus. The composition features stridulatory sounds[3] made by the ants, and the humming of air conditioners from nearby campus buildings. The founding queens of the two colonies featured in "HVAC" established their nests in the vicinity of these buildings and their persistent mechanical sounds; the resulting vibratory soundscape within the nest can be considered one of insect agency, rather than human intrusion.

The arrangement and treatment of the field recordings highlights the sonic character of the ant sounds, rather than obscures it; the ant signal amplitude is applied to a sin wave for additional emphasis on the patterns of their communication. The air conditioning sound is given equal consideration and is just as prevalent in the piece. The instrumental components, of voice and drum, were improvised my myself and musician Jane Paik, respectively, in direct response to the ant sound, to the HVAC sound, and then to the combination of the two. This improvisation was an attempt to mimic these two sounds in a gesture of relating, of placing ourselves in this soundscape. Drums and voice are ideal instrumentation for this task for their flexibility in denoting rhythm, mood, and timbre. What affects does the juxtaposition of these sounds have on the ants' daily lives? What effect can the recognition of this soundscape have on listeners of this work?

4. "FORMIPHONY"

"Formiphony" puts the sound of ants in the foreground of a 13-minute soundscape composition that takes us from dawn through evening in Adolfo Ducke Reserve in Manaus. Ants are amplified and juxtaposed with the dominant soundscape of this tropical forest to portray their sound in more accurate proportion to their intrinsic value and roles as ecological agents. The composition includes sounds from over a dozen ant species, including locomotion of several army ant species, percussion sounds from antenna and mandibles, biting of microphones and cables, and various forms of ant stridulation. Some stridulatory recordings had a significant ultrasonic component and were played back at a lower frequency to bring them into an audible range; other stridulation sounds were treated similarly to bring more textural and dynamic detail into focus. Returning to the concept of the ontological amphibian, sonic agency often enables ontological flexibility among ants and their associates; ants are known to use stridulation for nestmate recruitment, alarm signals, defense, and nest repair, and

[3] Stridulatory sound is produced by the stridulatory organ: a scraper that moves across a ridged surface when the ant moves her gaster (abdomen) in an up and down motion. These vibrations are sensed by ants through the vibratory substrate with specialized organs on their legs and antenna.

in the case of leafcutters, to steady leaves during cutting [19]. Many myrmecophiles (ant associates) that live in symbiotic relations with ants mimic ant stridulation to communicate with them [20]. While listening to "Formiphony," we can speculate on further possible relations between these soundscape actors.

We recognize that emergent soundscapes of insects include anthrophony, and include sounds heard while listening for ants – a machete, radio, voices, and lawn machinery. By presenting this speculative soundscape from the perspective of an unspecified invertebrate, this work prompts us to consider how invertebrates sense biophony, geophony, and anthropophony. Through this reconfiguration, we can speculate as to how insects might assert their sonic niche according to circadian timing, spatialization, timbre, rhythm, and frequency. The ant sounds were recorded over a range of microhabitats: in/on/under soil, vegetation, leaf litter, pavement, and nests.

5. DISCUSSION & CONCLUSIONS

Although much of the insect sound-world remains unknown to humans, entomologists have revealed much fascinating information about their sounding and listening [21][22][23]. Through the making of ecological sound art, composers and sound artists can reveal further information about insect acoustic communication. These artists can engage in rigorous research informed by ecology, yet they are not limited to the infrastructures of scientific method and communication. The two works in this paper have been presented publicly through radio, performance, lectures, installation, and web-based streaming, reaching broad audiences even under the limiting circumstances of the Covid-19 pandemic. Through our interdisciplinary collaboration, our work has also had impacts in the scientific community, having been enthusiastically received at conferences such as the 2019 Myrmecological Meeting (Belo Horizonte, BR) and the 2022 the Joint Annual Meeting of the Entomological Society of America (Vancouver BC).

Perhaps a productive first step in improving our relations with insects is noticing them, and as we argue in this paper, listening to them. In this consideration of our critical relations with insects, the argument that insects should be recognized for their intrinsic value is unfortunately a radical idea in most western capitalist societies. The two works discussed in this paper, "HVAC" and "Formiphony" prompt audiences to listen and receive new information about insects, with a focus on ants – a relatively approachable group. By presenting insects in the foreground, emphasizing their agency, speculating about insects' listening positionality, and simultaneously positioning humans as equal soundscape participants – not directors or intruders - we are encouraging listeners to reevaluate their assumptions about the insects in their own environments.

Ecological sound art is by definition a political artform [24], and when presented publicly, has the potential to subvert social narratives concerning insects by challenging notions of anthropocentrism though listening. Listening can prompt others to listen as well, and perhaps collectively we can push against the dominant feelings of fear and anxiety around insects. Perhaps, we can move towards that discomfort in what Hildegard Westerkamp has called the *disruptive nature of listening* [25] – in listening to and with insects.

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