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'It's a wide cluster of noise': experiencing and describing information from environmental sounds

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Abstract

Introduction. Uses and applications of environmental sound recording are expanding rapidly, shaped by demands for understanding and documenting changing climates and resulting in the generation of massive quantities of data. Situations around the creation and processing of these recordings are complex, suggesting numerous information-related challenges. However, little information practices research has directly engaged with sounds or sound recording.

Method. Extending information research around sounds and embodied/sensory experiences, this qualitative study involved data generated from semi-structured interviews, participant observation and discourse materials. Participants were researchers working with environmental sound recording from various fields.

Analysis. Guided by situational analysis, an extension of grounded theory, analysis involved iterative coding, memo-writing and analytic mapping techniques.

Results. Preliminary findings are presented in two themes: noise, as concept and object, is constituted through participants' situated information practices; and identification and description of sounds is tied to subjective/embodied experiences and ways of knowing.

Conclusion. The ways situated knowledge and experiences shape how information from environmental sounds is created, sought and shared blur boundaries between signal-noise and between information activities. Embodied engagements with and descriptions of environmental sounds suggest the complexities of understanding related information practices and highlight the various relationships involved in knowledge production through environmental sounds.

Introduction

As the need to understand and document various environments becomes increasingly urgent, particularly in the face of increasing human activity/consumption and related global climate crises (e.g., Tong et al., 2022), uses and applications of environmental sound recording – audio recording of human and nonhuman sounds and acoustic environments – have expanded considerably (Ritts and Bakker, 2021). Facilitated by increasingly portable and affordable technologies, this growth has resulted in the production of millions of hours of sound recordings and many terabytes of data annually (Gibb et al., 2019). From a focus on the documentation of animal communications (e.g., bird calls), the recording of environmental sounds has expanded to practices of monitoring and recording broader acoustic environments and their habitats and communities. Information from environmental sound recordings is now involved in knowledge production from biology (Wood et al., 2023) and ecology (Choksi et al., 2023) to fields including geography (Turnbull et al., 2022), urban planning (Williams, 2021), and archaeology (Kolar et al., 2019).

Despite this growth, understandings of related practices are limited (Wright, 2017), perhaps complicated by the proliferation of new technologies and increasingly automated processes of recording and analysis (Kohlberg et al., 2024). Research involving environmental sound recording also faces information-related challenges, particularly as quantities of data generated expand and demands for sharing and preservation grow (Parsons et al., 2022). Given the complexity and variety of situations and practices, the recording of environmental sounds may be considered as involving a similarly complex range of information practices/experiences. While examinations of related information practices are increasingly important to understanding and supporting crucial research, information practices-related research has rarely focused directly on practices and experiences around sounds, listening and sound technologies (Stewart-Robertson, 2024).

Background

Sound recording/reproduction activities have been understood as involving and intertwined with embodied sonic skills (Bijsterveld, 2019), interactions with sound technologies, abilities (Thompson and Hagood, 2021), situated practices and listening techniques (Sterne, 2003). Sound, more broadly, has been comprehended as *'both an acoustic event, and a mode of knowledge production'* (Amsellem, 2020, p. 434). Mediated by various technologies (Amsellem, 2021) and conveying important information about places, communities, and activities (Droumeva, 2015; Sueur and Farina, 2015), acoustic environments and listening practices are increasingly varied and complex (Radicchi et al., 2021). While scientific sound recording has been described as rooted in communities of practice (Bruyninckx, 2019), processes of converting experiences of sounds into disembodied data (Droumeva, 2021), removed from contexts (yamomo and Titus, 2021), may also reflect settler-colonial approaches to environments as always knowable and possessable (Kanngieser, 2023). Given the increasing quantity, variety and importance of environmental sound recordings and related activities, holistic understandings of the practices involved are critical.

Information and sound

While some information practices-related studies have identified embodied, multisensorial aspects of listening practices (e.g., Nelson, 2019; Ripley, 2011) and complexities of interactions with sounds/sound technologies (e.g., Freeman et al., 2022; Tattersall Wallin, 2020), information practices research has yet to fully engage with sounds/listening. Studies emphasising embodied/sensory information experiences (e.g., Ocepek, 2018) and research exploring oral or music-related information practices (e.g., Griffin, 2020; Turner, 2010) have yet to directly address interactions with sounds themselves. Such gaps may derive from an emphasis on textual and visual documents in information-related disciplines (Cox, 2019) as well as from challenges around describing and seeking information from sounds themselves (Steele, 2018). Through research exploring the information practices involved in environmental sound recording, this short paper seeks to attend to a broader spectrum of sounds / sound-related practices, extend

embodied/sensory information practices research into less explicitly physical activities/settings, increase attention to non-textual/verbal information interactions and address information-related challenges facing environmental sound recording.

Methodology

Building from an information practices perspective, this study explored how researchers involved in environmental sound recording activities experience, create, seek, use and share information (Lee and Ocepek, 2022; Savolainen, 2008) and how such activities are constituted within situations and in relation to implicated actors/elements, power dynamics, and positionalities (Costello and Floegel, 2021; Gibson and Martin, 2019). The following questions guided this study: 1) How and in what ways do participants seek, perceive, interact with and describe information from environmental sounds? 2) What elements, relationships and experiences are meaningful for participants in the creation and analysis of environmental sound recordings? 3) What kinds of practices and discourses are involved in and constituted by participants' environmental sound recording activities?

Following situational analysis (Clarke et al., 2022), an elaboration of grounded theory, this study also involved relational and situated approaches to sounds and listening (Feld, 2015; Goh, 2017) and ecological/posthumanist approaches to scientific knowledge production (e.g., Barad, 2007; Haraway, 1988; Star, 1990). Researchers were recruited from across Canada and the United States using theoretical sampling. Between February and October 2024, I conducted 31 online semi-structured interviews (55-80 minutes) and eight participant observation sessions (six online, process-focused sessions and two in-person sessions at urban and wilderness locations). While interviews focused on participant experiences, decision-making and information-related activities, observations allowed for broader explorations of the elements and relationships involved in meaning-making and knowledge production through environmental sound recording. Data from extant discourse materials (e.g., sound libraries, websites, technical documents, webinars) were also collected. Concurrent analysis involved coding, memo-writing and analytic mapping techniques (Friese et al., 2021). Each participant was assigned a randomly generated pseudonym.

Findings and discussion

From the broader study, this paper discusses two related themes from the preliminary analysis of interview and observation memos and transcripts: noise, as concept and object, is constituted through participants' situated information practices; and, identification and description of sounds is tied to subjective/embodied experiences and ways of knowing.

Noise as situated information

> *[Recorders 1 and 2] are also detecting noise and only triggering a recording if hearing a certain threshold of high frequency noise. Whereas [recorder 3] is constantly recording. And that's where I go through the data manually and look whether there's a bat. Some evenings, there was a lot of insect noise, particularly at the three base sites. And that possibly masks some. I think on [recorder 2], I would see a wall of insect noise. And I'm like, 'oh, [recorder 1] saw [bats] there.'* - Mattie

From the data, numerous variations on the use of the word/concept of noise were identified. These variations highlight the complexities and situatedness of identifying and describing information from sounds (e.g., Kvsn et al., 2020; Odom et al., 2021). Mattie, a researcher studying bat populations, described discrepancies between how different recording devices capture sounds. Identifying sounds made by bats (largely beyond the limits of human hearing) required targeting certain frequencies for recording and various processes for differentiating those sounds from human and insect '*noise*'. Seeking and creating relevant information from these recordings involved aspects such as manual visual analysis of spectrograms, device settings selecting

what/when to record, frequency characteristics of species vocalisations and features of surrounding environments/habitats. Such practices intertwine the researcher's evolving knowledge and situated relationships (e.g., with recording devices, physical environments, technologies used, etc.) and complicate distinctions between information activities.

> *We would break down each recording into 10 second files. And we would visualise those files in the software … And essentially figure out how many or what species are present in each of those recordings … In these [rural/wilderness location] recordings, it's often hard to draw boxes wherever these birds, or other species, are calling. Because anywhere within a 10 second recording, we could have as many as 12 to 20 species of birds calling at the same time. It's a wide cluster of noise. So what we would do is listen to all that data. And we had a separate spreadsheet where we would mark ones or zeros for every species that we heard or saw in the spectrogram.* - Hollis

For Mattie, based on research goals and choices of technology and recording locations, discerning information sought was a relatively clear process of isolating bat calls from other environmental sounds. For Hollis, studying the complexity/diversity of an acoustic environment, where many sounds/signals potentially provide important information, different choices were required around how recordings were created and analysed. Shaped also by factors such as density of flora/fauna, lack of automated tools for discerning sounds within such density, recording and storage limitations, and labour challenges (i.e., the need for manual processing), information from these recordings was translated into statements of presence/absence and aggregated into broader analyses of the environment. Still, sounds excluded from Hollis's spreadsheet (e.g., human sounds, inanimate nature sounds) became '*noise*', through separating species identified from the wider '*cluster of noise*'. These examples connect to approaches challenging dualisms such as nature-culture, subject-object, or signal-noise in understanding knowledge production through sound (Goh, 2017) while also suggesting the importance of recognising the interrelatedness of information practices, structures/systems, and physical realities (Polkinghorne and Given, 2021).

Embodied descriptions of sounds

> *I went through the spectrogram, and every single sound I found, I would classify, put it in its own recording … But the most important thing is, how would you recognise it when you search for that file? So, just for me to remember which one it was, I use these silly names, like, [singing onomatopoeic word] or [onomatopoeic word], because it's like, [mimicking animal sound vocally]. Or, because it sounded like a brush or like knocks … Then I actually shared [the system] with different bioacousticians. And we found out that we actually called the same sounds with the same name. I find it pretty interesting that we need a system, but we don't really have one.* - Willow

While some researchers expressed few connections to aural characteristics (relying instead on visual and automated analysis), several participants involved nonverbal descriptors and personal associations in reproducing, describing and making meaning from recorded sounds. Willow, studying marine mammals, created personal classification systems based partly on onomatopoeic words or associations with everyday sounds. Meanwhile, Willow also expressed challenges around creating/sharing systems for organising sounds, especially given varying approaches and subjective aural interpretations. Another researcher studying marine mammals, Ida, in describing the particularities around discerning between some sounds (both visually and aurally), vocally imitated the similarities between motor vehicle sounds heard from below ice and bowhead whale vocalisations. Such accounts highlight the ways that deeply personal and embodied knowledges shape how information from environmental sounds is identified, shared and made meaningful (Lloyd, 2023).

> *In my field notebooks, I do a lot of annotating of their sounds just by hearing them. They have one song that we call the Beethoven song. Almost every male and some females sing a version of this that goes [sings Beethoven motif], like that. So you can note that that's different from – we have another one we call the La Cucaracha song that goes [whistles song]. So the pitches of their notes are useful, are right in our hearing range, right where we sing, right where we whistle … I guess I felt an affinity for them singing these musical phrases that match the kinds of frequency ranges that we vocalise in.* - Remi

Other researchers, such as Remi, studying avian communication, drew from cultural and theoretical musical knowledge/associations in analysing attributes of and variations between sounds. Remi's account highlights how meaning-making from such sounds, especially when experienced aurally, is also strongly connected to personal physical attributes/abilities (i.e., frequencies able to be heard/reproduced shape how information is identified and categorised). Such participant accounts suggest the importance of understanding how information practices bring the body, as an information source (Lloyd and Olsson, 2019), into relation with the entirety of elements/actors in a situation. Moreover, they suggest new, broader ways of understanding how information is created and shared aurally/orally (Turner, 2010).

Conclusions

Preliminary findings highlight how engagements with environmental sounds / sound recording blur distinctions between, for example, signal-noise and nature-culture and between information activities. Embodied information experiences and practices appear as enmeshed with individual abilities, technologies, discourses, environments, and human/nonhuman actors, and the need to further address how embodied/sensory interactions are both informative and involved in constituting information practices and knowledge is suggested. Processes of identifying, describing and categorising information from sounds draw from aural, visual, textual and algorithmic modes, suggesting causes of the interpretation and management challenges faced (Gasc et al., 2017; Hui, 2020; Vella et al., 2022) by these expanding areas. Greater attention towards and documentation of the unique skills and elements involved may suggest potential solutions to these challenges. More broadly, findings suggest theoretical challenges arising when sound/information is considered as both an event/object and as something through which knowledge is produced. Subsequent stages of analysis will connect the interview and observation data with the collected discourse materials to further develop holistic accounts of environmental sound recording practices.

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