Encountering Data and Other Non-Humans

A more-than-human Perspective on the Citizen Science Project Artportalen

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Abstract

To tackle the climate crisis and current biodiversity loss, scientists and citizens collaborate through citizen science, which is increasingly implemented in biodiversity research. As a citizen science project, many participants can access and contribute to the Species Observation System Artportalen. Through a more-than-human approach, this study argues that non-human others and data should also be considered influential social participants in such a context. All participants shape and are shaped when encountering each other. These influences affect how environments are perceived by said participants. Therefore, perceptions arising out of the different encounters with non-human others and data are investigated throughout the study. Nine semi-structured interviews with interviewees differently connected to Artportalen were conducted and analysed. The concepts of data journeys and encounters were combined to analyse the interviews. Data journeys follow data travelling between sociotechnical fields. Encounters allow us to shift the focus from solely humans to humans and non-human others. The findings pinpoint four themes: Two focused on an anthropocentric and ecocentric worldview. One theme centred on the most dominant narrative which included both, ideas on progress and care. The last theme revolved around the motivations and interests behind practices, which emerge through varying worldviews. Even though one worldview is anthropocentric and the other one ecocentric, participants switch between them. This indicates that the worldviews' boundaries are dynamic. Moreover, seemingly similar practices often stem from differing motivations and interests, possibly leading to tension and conflicts. Such conflicts can have negative effects on environmental governance processes. The analysed data indicated that Artportalen as a map showcases human datafication practices and interests, rather than focusing on depicting non-human others, such as birds. Nevertheless, through an ecocentric perspective, the focus shifted from datafication processes to experience and curiosity. As Artportalen's data is included in the decision-making processes of environmental projects, a better understanding of underlying perceptions and underlying worldviews by all participants is therefore necessary.

Keywords: citizen science, Artportalen, posthumanism, more-than-human approach, data journeys, encounters, Anthropocene

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Abbreviations

BON	Biodiversity Observation Network
GIS	Geographic Information System
SLU	Swedish University of Agricultural Sciences

1. Introduction

We live in the time of the Anthropocene. This potentially new geological time marks how "[…] human activities had now made their mark on the entire planet" (Eriksen 2015:250). Consequentially, the Anthropocene also indicates the role of humans in the climate crisis and current biodiversity loss. Their mark impacted and altered conditions and processes on Earth to such an extent that the Anthropocene, introduced by Paul Crutzen and Eugene Stoermer in 2000, is reviewed to be an official geological unit (Anthropocene Working Group n.d.). Despite still being in review as an official geological period, the Anthropocene has developed meaning among diverse scientific communities and the term has been broadly accepted or at least discussed (ibid.). In the meantime, the social sciences re-examined or carried forward debates about human responsibility and positionality.

Feminist posthumanities, for example, criticise human exceptionalism embedded in an anthropocentric perspective (Barad 2003; Tsing 2021; Åsberg 2021). In her book "The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins", Anna Tsing adopts an ecocentric perspective by focusing on encounters of humans and non-humans in a more-than-human world (2021). In this context, Tsing focuses on contamination, as "[the] evolution of our "selves" is already polluted by histories of encounter" (Tsing 2021:29). In other words, instead of being self-contained individuals, all beings encounter each other in space and throughout multifaceted histories, leading to diversity. Moreover, contaminated diversity is messy, sometimes enabling fruitful collaboration while being harmful at other times.

Nevertheless, all beings depend on collaboration and contaminated diversities to survive in the Anthropocene. Building on this argument, Tsing criticises "species" as a category and focuses on assemblages of humans and non-humans encountering each other instead (Tsing 2021). Additionally, Tsing argues that the anthropocentric gaze highlights techno-optimistic narratives which can harm environments and the humans and non-humans dwelling in them (ibid.). This leads her to exclude machines and algorithms from her multispecies approach, which, however, has become an important part of how the contemporary world is made sense of.

Massimo Airoldi on the other hand, argues that machine learning systems are also social participants, and take part in the social world (Airoldi 2021). In his book "Machine Habitus – Toward a Sociology of Algorithms" Airoldi applies Pierre Bourdieu's theory of habitus on machine learning systems and explores how they are socialised, and take "[…] part in situated socio-material interactions involving both human and non-human agents" (Airoldi 2021:22). Put differently, these systems shape how humans and non-humans encounter each other (Tsing 2021). Bourdieu defines habitus as "[…] the site of the interplay between social structure and individual practice, culture and cognition" and concludes that "[w]ith their instinctive gestures, sedimented classification schemes and unconscious biases, subjects are neither natural nor unique. Rather, they are the 'product of history'" (Bourdieu and Wacqant 1992:136, in Airoldi 2021:25). Therefore, depending on our socialisation which is highly influenced by our positionality (i.e. class, gender, race), we perceive the world in a certain way and act accordingly. Based on that, Airoldi argues that machine creators socialise machine learning systems. Often hidden, they develop and improve algorithms. Through their code, these systems are programmed how to 'think' and act (Airoldi 2021). Moreover, their decisions which are culturally and politically embedded, are also meshed into this code (ibid.). Machine creators decide upon what data is used for the system's training, and on what parameters, variables, and statistics these systems classify and categorise data and information, influencing datafied aspects of everyday life. Airoldi terms this process as 'culture in the code', implemented by 'deus in machina' (ibid.).

Although Airoldi views machine learning systems as social participants, his discussions about more-than-human relations and agency mostly focus on sociotechnical relations between humans and machines (Airoldi 2021). Other non-human encounters, however, fall short. Tsing, on the other hand, only concentrates on living beings and excludes algorithms as she associates algorithms with the "progress-as-expansion" narrative, which fosters anthropocentric perspectives and practices (Tsing 2021).

It seems as if non-human encounters often include either solely other living beings or machines and data. Based on Airoldi's concept, I argue that machine learning, big data, and other technological actors should be accounted for as social participants, considering that data are not neutral self-contained information entities but part of 'the culture in the code' and embedded in sociotechnical fields. In this thesis, I aim to widen the more-than-human approach, so that human, non-human, and digital agents are included. Moreover, I argue that narratives are entangled with different motivations and knowledge creation (Ekström 2022; Peterson et al. 2022). I therefore aim to investigate in what ways such motivations, values and beliefs are connected to specific narratives. Narratives such as the 'progress narratives' may

lead to various worldviews, which could lead to tensions (see Tsing 2021). For better or worse, these tensions could impact environmental governance and even policy-making processes.

I chose Artportalen as my research field and focus for this thesis because it connects agencies of humans, non-humans, and machines. Artportalen is a well-established Species Observation System in Sweden (Artportalen n.d.). As a citizen science project, private users, NGOs, organisations, researchers, and municipalities can access and contribute to data in the database. Moreover, as municipalities are directly linked to Artportalen, registered observations must be considered when planning projects for instance. Focusing on Artportalen therefore allowed me to investigate assemblages of human and non-human participants encountering each other, leading to possible consequences on environmental governance and policy-making processes. While the data accumulated in Artportalen is used for human decision-making, automated algorithmic decision-making, and even machine learning applications, Artportalen is not a machine learning system per se. It creates a digital environment and possesses various affordances. These affordances enable and limit users' experiences and communication possibilities on digital platforms such as on social media through e.g. buttons, app designs and text length restrictions due to the 'culture in the code' (Airoldi 2021). In the case of Artportalen, affordances are how observations must be registered, what observations are highlighted on the homepage, and what observations are considered sensitive and therefore only accessible with restrictions etc. These affordances, coded and maintained by Artportalen's programmers, form Artportalen's fields and determine the limitations and possibilities of encountering registered observations.

Before moving on to my research problem, the research aim and questions (Sections 1.2 and 1.3), I further introduce Artportalen as my research field (Section 1.1). Chapter 2 lays out the theoretical framework in which this thesis is situated. Additionally, the concepts of encounters and data journeys are presented which are integrated into my method as an analytical framework. A discussion of Thematic Analysis as my method of choice (Chapter 3), is followed by my analysed results in Chapter 4. The thesis ends with a concluding discussion (Chapter 5).

1.1 Research Field

The Swedish species observation system Artportalen is a platform to register observations of non-human encounters such as plants, specific animals, and fungi (Ekström 2022). The Swedish Species Observation Centre (*Artdatabanken* n.d.), which maintains Artportalen, is located at the Swedish University of Agricultural Sciences (SLU) in Uppsala, Sweden. It operates in the name of the Swedish Environmental Protection Agency (Ekström 2022; *Species Observations | SLU Artdatabanken* n.d.). Aiming to help conservation efforts as a platform and database, Artportalen is used by municipalities, NGOs and environmental organisations and agencies in matters concerning nature protection and environmental governance. Additionally, as a citizen science program, the public, volunteers, and organisations can collect and examine data for Artportalen. Hence, Artportalen is an extensive long-term database for Sweden's fauna and flora (Ekström 2022). Accessing sensitive data, however, such as information about 'red-listed' or protected species, is restricted and only handled privately (D. Peterson et al. 2023). Therefore, only a few participants have real-time access to sensitive data. Depending on credibility and trust, some actors earned access through their professional positions. Others may request such information e.g. for research projects which are then transferred manually (ibid.).

With over 80 million registered observations per year, Artportalen is one of the biggest biodiversity databases in the world and influenced the development processes of similar databases in other Nordic countries (Kasperowski & Hagen 2022; D. Peterson et al. 2023). In the context of biodiversity citizen science, Artportalen's participants are diverse and engage in multifaceted information practices. These varying data practices depend on the participants' expertise and learning processes. They also rely on diverse materialities and tools, and how the produced data are envisioned to be used (Ekström 2022). The diversity in participants and practices then leads to varying metadata – as some information must be included in every registration, additional information varies greatly (Ekström 2023). Such opportunistic data requires constant negotiations regarding the data's validity and trust between (key) participants (Kasperowski & Hagen 2022; Ekström 2023). Artportalen therefore is a platform where diverse actors encounter and are encountered by each other. Human participants all have different ideas about what Artportalen ought to be. These ideas sometimes align with each other or clash. The varying stages of access indicate that datafied observations are distributed unequally.

Looking at the bigger picture, Artportalen not only provided data for research but was increasingly subject to research. For example, Peterson et al. (2023) investigated the underpinning visions and ideas of Artportalen's foundation and

how these differed from other biodiversity infrastructures such as the Global Biodiversity Information Facility, also known as GBIF. How the 'particular' observations travel between various institutions and social relations, fostering or weakening trust and interpersonal relationships, was researched by Kasperowski & Hagen (2022), and how non-human observations travel as data by Peterson et al. (2022). Ekström investigated participants' information practices, underlying motivations and how trust reinforced the validity of the opportunistic data (Ekström 2022, 2023). Additionally, he researched the socio-material aspect of registering observations and its influence on information practices (Ekström 2024). Finally, Jönsson et al. (2024) investigated registration inequalities within Artportalen as a citizen science platform. All these insights help to situate my research on encounters of humans, non-humans, and data in the context of Artportalen.

1.2 Research Problem

As previously mentioned, the Anthropocene highlights the human species' impact and responsibility regarding current crises, such as climate change or biodiversity loss. Entangled with society and everyday life, technology is either understood as a possible solution or seen as a threat.
Crist and Kopnina for example, criticise techno-positivist notions and state that "[…] the pitch for technological fixes sustains human exceptionalism by foregrounding humanity's supposed strong suit as the saving grace" (Crist & Kopnina 2014:391). Hence, techno-positivism reinforces anthropocentric narratives and only treats the crisis's symptoms instead of its causes (ibid.). Tsing's not including technological encounters in her multispecies approach may stem from her critical stance towards such techno-positivism. Nevertheless, society nowadays depends on data, digital information, and digital infrastructures.

Artportalen, for instance, plays an important role in the development of restoration- and species protection laws. Species, such as protected and invasive ones are datafied, which heightens their salience and urgency in fields like law or ecology. Often datafied observations are used to either justify, condemn or foster human actions towards nature, environments and non-humans dwelling in them (Ekström 2022, 2023; Kasperowski & Hagen 2022; Peterson et al. 2022). By focusing on the creation of trust, other encounters or ways of encountering are sometimes lost. Moreover, Artportalen is primarily understood as a tool with biased data (Jönsson et al. 2024).

Researchers of Artportalen are implying that such biased data needs to be identified and mitigated (ibid.). However, following Airoldi's argument, in this thesis I view such "biases" as culturally interwoven—a complex outcome of

multiple past and present encounters of humans and digital and biological non-humans (cf. Airoldi 2021; Tsing 2021).

In that context, two implications arise. First, all agents, human and non-human must be included. In other words, it should be emphasised how encounters lead to contaminated diversity. Moreover, a widened more-than-human perspective should be applied to include technological or digital non-human participants. Regarding Artportalen, this requires an expansion from human participants to focusing on humans and non-humans, including data.

Second, contaminated diversity means to shape and be shaped through encounters. How encountering datafied observations and other non-human participants influence our understanding of environments should not be underestimated. Such influences play a role in world-making processes and dominant narratives which in turn shape (data) practices. Both inquiries affect policy- and environmental governance processes. Moreover, they must especially be considered in times when technology and citizen science are increasingly entangled and gaining prominence (McClure et al. 2020; Berti Suman & Alblas 2023).

1.3 Research Aim and Questions

To explore the previously mentioned inquiries about how agents encounter and are encountered by each other and what that means for our understanding of environments, I combine two concepts: The concept of encounters and the concept of data journeys. Data journeys focus on the movement and socio-material aspects of data emerging through different data practices and assembling at different sites (Bates et al. 2016). Together with Tsing's understanding of encounters, my use of data journeys aims to shift the focus from an anthropocentric perspective towards other more-than-human social participants. Focusing on Artportalen as a research field therefore allows me to examine multiple multispecies encounters in a digital infrastructure and citizen science context. These contexts also enable me to consider possible influences on environmental governance or biodiversity concerning policy-making processes. Concretely, my one overarching and two complementary research questions are:

RQ1. How does the transformation of more-than-human encounters to datafied observations influence how the environment is perceived?

RQ2. What dominant narrative about the environment is connected to and reproduced through data in Artportalen?

RQ3. How do people decide which encounters to report as observations in Artportalen?

I conducted, transcribed, and analysed nine semi-structured interviews to respond to these research questions. The interviewees are all differently connected to Artportalen and engage with the platform in varying ways. They approach Artportalen through science, politics, organisations, work with Artdatabanken itself or through hobbies such as birdwatching. Participants collect and create data by registering their observations or working with already existing data. Often, however, interviewees would do both.

Before introducing the method in Chapter 3, the theoretical framework of the thesis is presented in Chapter 2.

2. Theoretical Framework

This study is situated in a posthumanist perspective. Here I embed (post) humanism in times of the Anthropocene to provide an understanding of my starting position. This introduction of the theoretical framework is followed by a presentation of two key concepts I applied throughout my data analysis (Sections 2.1 and 2.2).

Assuming that "[…] various types of human activities (gender, art, language, and science) are always technical, social and always already material: part of emerging or existing ecologies", Åsberg explores the current challenges and opportunities of feminist posthumanities (McClure et al. 2020; Berti Suman & Alblas 2023).

The idea of the human, or the "universal man" as the master and conqueror of non-humans and nature has proven to have failed (Tsing 2012, 2021; Åsberg 2021). Moreover, emerging from colonialism, imperialism, and enlightened thinking it has fostered anthropocentric perspectives and narratives that are present to this day (ibid.). According to Åsberg, feminist posthumanities aim to respond to these perspectives by constantly breaking boundaries (e.g. by refusing divisions between natural- and social sciences "doing" nature or culture, or by merging theory with art and practice), and by redefining the role of non-humans, technologies, materialities, science and knowledge creation (ibid.). Feminist posthumanities, therefore, try to embrace what is uncomfortable and precarious in our times, rather than shying away from it (Tsing 2021; Åsberg 2021).

One example is Karen Barad's essay "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter", where they oppose Cartesian dualism with their concept of agential realism (Barad 2003) [1]. Drawing upon Niels Bohr and Donna Haraway, Barad argues that the observer and the observed are inseparable. Instead, the entities of agential realism are phenomena, which are "[…] *the ontological inseparability of agentially intra-acting 'components'*" (Barad 2003:815, italic in original). By using the term intra-action instead of interaction, Barad emphasises that instead of preexisting entities, embodied concepts only

[1] While Barad is commonly addressed using she/her pronouns, their presumably self-authored faculty profile states the use of they/them pronouns (cf. UC Santa Cruz | Faculty Profile n.d.).

emerge through agential intra-actions within phenomena (ibid.). Challenging the fixed agency of humans and non-humans, Barad states the following:

> Agential intra-actions are specific causal material enactments that may or may not involve "humans." Indeed, it is through such practices that the differential boundaries between "humans" and "nonhumans," "culture" and "nature," the "social" and the "scientific" are constituted. Phenomena are constitutive of reality. Reality is not composed of things-in-themselves or things-behind-phenomena but "things"-in-phenomena. The world is intra-activity in its differential mattering. It is through specific intra-actions that a differential sense of being is enacted in the ongoing ebb and flow of agency. (Barad 2003:817)

In other words, agency is constituted in a dynamic world as boundaries, such as "humans" and "non-humans", are constituted through intra-action. Following Barad's agential realism in the context of Artportalen proposes that the (human) observer and the (non-human) observed are indivisible. For instance, there is no clear boundary between a birdwatcher and the observed bird. Both observe and are simultaneously observed by each other. Through their intra-action boundaries and agency are constituted. Moreover, in citizen science, constituted boundaries between the "social" and the "scientific", including ideas about knowledge creation and expertise are constantly negotiated. Such negotiations lead to Artportalen's multilayered and dynamic sociotechnical fields.

Anna Tsing also opposes Cartesian dualism, especially the connected idea of self-contained individuals and progress narratives (Tsing 2021). Frames of modernisation and progress, she argues, lead to a linear perception of history including a narrow view of the possible future (ibid.). Embedded in politics, science, and economies, progress fosters human exceptionalism. Tsing argues that:

> Progress is embedded, too, in widely accepted assumptions about what it means to be human. Even when disguised through other terms, such as "agency," "consciousness," and "intention," we learn over and over that humans are different from the rest of the living world because we look forward—while other species, which live day to day, are thus dependent on us. As long as we imagine that humans are made through progress, nonhumans are stuck within this imaginative framework too. (Tsing 2021:21)

Instead of following such progress narratives, a focus should be set on "patches of livelihood" which emerge in the forms of "assemblages" (Tsing 2021:132). Assemblages embody multiple histories and emerge from diverse encounters, allowing to explore other possibilities than progress and scalability and to concentrate on effects without any prior assumption of their existence (Tsing 2021). Similar to Barad's concept of intra-action and phenomena, Tsing asserts that "[…] ways of being are emergent through effects of encounters", emphasising the indeterminacy of such transformations (Barad 2003; Tsing 2021). Rather than focusing on Artportalen as a "tool" to foster narratives of progress, the emphasis

here lies on its entangled encounters intra-acting with each other. Moreover, datafied observations registered in Artportalen should be considered as both, possible encounters and a transformation of past encounters.

To focus on more-than-human encounters intra-acting in Artportalen and the connected meaning-making processes in times of the Anthropocene in the analysis of this thesis, the concept of data journeys was used alongside encounters which is presented in the following Sections 2.1 and 2.2.

2.1 Data Journeys and the "Flattened Bird"

The concept of *data journey* helps to investigate how data travels across and between different sites of data practices (where data is produced, processed, distributed, and used) which are embedded in time and space (Peterson et al. 2022). Focusing on the movement of data between these sites highlights the socio-material aspects of data. It showcases how they are geographically and temporally connected to various knowledge infrastructures (Bates et al. 2016).
It is important to note that these 'sites' are often not necessarily fixed physical locations. 'Sites' in that context also include locations embedded in time and diverse viewpoints or perspectives that emerge through different forms of knowledge creation and situated backgrounds (Leonelli & Tempini 2020).

Highlighting the materiality of data, Bates et al. argue that data can be defined as "material-semiotic things" as data are always bound to materiality (in the form digital data storages up to their electromagnetic signals) and are "[…] the product of a particular set of practices" (2016:3).

By contrasting the concept of data journey to the idea of 'data flow', Bates et al. (2016) point out some further important aspects: The places where data journeys are not to be understood as 'self-contained' but influenced and formed through their social relations. Moreover, instead of a coherent movement from A to B as a concept of "flow" may indicate, data journeys are not always effortless. Rather, data journeys are characterised by their "[…] disjointed breaks, pauses, start points – and 'frictions' (Edwards, 2010, in Bates et al. 2016) – that occur as data move […]" (Bates et al. 2016:4; Leonelli & Tempini 2020).

Considering data as a social agent, it encounters different audiences for diverse purposes, which one can notice well in a citizen science project (Leonelli & Tempini 2020; Airoldi 2021; Ekström 2022). Furthermore, when data moves it is often transformed, even 'thinned' (Porter 2020). In the book chapter "(Inter)national connections: Linking Nordic Animals to Biodiversity Observation Networks", Peterson et al. showcase such transformation by following a data journey in the context of Artportalen (2022). What started as an observation of a

lapwing through one's full senses becomes a "flattened bird" through filters, ready to travel through computers and networks (ibid.). To be able to travel not only between said audiences but also between various biodiversity observation networks (BONs), Artportalen's databases "[…] copy, borrow, and feed information back and forth to each other" which overall leads to an accumulation of data (Peterson et al. 2022:293).

Tracing the journey of a digital lapwing, Peterson et al. highlight how many actors are involved and how much "time, knowledge, skills and tools" the journey requires – from the needed hardware provided by the SLU IT department, which is entangled with high costs and funding, to people's works concerning such data journeys: Not only the connections between the knowledge and information infrastructures are relevant but operation managers, and people involved in e.g. software updates and other skills or materiality constituting the BONs (Peterson et al. 2022). Yet even though materiality is still intertwined with moving data, the movement also influences how its 'truth' is understood, as it is constantly de- and recontextualised (Kasperowski & Hagen 2022; Peterson et al. 2022). In the case of Artportalen, travelling datafied observations have different meanings depending on differing contexts, given that meaning and truth emerge through the intra-actions of the datafied observations when encountering other participants in the field.

Even though the concept of data journeys takes the movement, friction, and sociomateriality of data and the relation to and transformation of non-humans such as 'digital birds' into account, its emphasis lies on data practices by human actors (Bates et al. 2016; Peterson et al. 2022). Encountering the bird itself falls in the background. Focusing on encounters between humans, non-humans, and data allows a widened lens and shift away from human agency, as I outline in the next section. By combining the concepts of encounters and data journeys, humans, non-humans, and data are all considered social agents.

2.2 Encounters

The idea that humans and non-humans exist as self-contained individuals has influenced science, particularly in the twentieth century (Tsing 2012, 2021). Tsing posits that two disciplines in particular strongly encouraged this narrative during that time: neoclassical economics and population genetics (Tsing 2021). She argues that despite not having much in common, these two disciplines both incorporate the idea of "[…] the self-contained individual actor, out to maximise personal interests, whether for reproduction or wealth," which ultimately transformed modern knowledge (Tsing 2021:28). Although non-human interdependence is recognised

through concepts like ‘symbiosis’ or ‘mycorrhiza,’ this recognition is seldom applied to humans (Tsing 2012).

Tsing continues her argument by stating that this narrative of humans being self-contained actors leads to the ignorance of contaminated diversity (Tsing 2021). Contaminated diversity emerges from the transformation through encounters and is historical, particular, and relational (ibid.). The encounters that constitute contaminated diversity are indeterminate as it is impossible to predict how humans and non-humans are transformed through them (ibid.). With the example of fungi, Tsing illustrates how interspecies relationships may be life-saving or life-threatening, and sometimes somewhere in between (Tsing 2012). In any way, neither humans nor non-humans are ‘pure’ and no matter how much humans try, they will never be able to ‘master’ or even ‘erase’ this fact (Tsing 2012, 2021).

On the contrary, “[in] order to survive, we need help, and help is always the service of another, with or without intent” (Tsing 2021:29). Helping each other does not only apply to humans and animals but includes other non-human entities as well. Tsing exemplifies this by writing that in the case of a sprained ankle, an encounter with a stick can assist when walking through the woods (ibid.). This would lead to being “[…] an encounter in motion, a woman-and-stick” (Tsing 2012:29).

Nevertheless, Tsing excludes machines and algorithms from her concept of encounters and contaminated diversity, connecting algorithms only to narratives of “progress-as-expansion” (Tsing 2021:28). Following the reasoning of ‘the culture in the code’ (Airoldi 2021) I argue that technology like machines, algorithms and even data should be included when considering encounters. As humans encounter big data and algorithms in everyday life, they thoroughly shape the way how the world is perceived and interacted with. Algorithms on the other hand are trained with ‘biased’ data through culture and the positionality of the programmer and at times trainers who often are people unaware of playing a part in the process (Airoldi 2021). Humans, however, are not the only ones influencing and being influenced by algorithms and technology. Non-humans encounter technology in many different ways, too, for example when being assessed, registered, and studied (Ekström 2024). This impacts not only data practices and ultimately humans’ worldviews but also non-human worlds.

As mentioned previously, datafied observations in Artportalen are transformed past encounters. These “flattened” encounters, now data, travel within and beyond Artportalen, ready to encounter and be encountered again in their transformed state. The concept of encounters allows me to consider more-than-human intra-acting

agents instead of focusing only on human actors. Data journeys then allow me to examine how datafied observations travel across and between various sites, and where intra-acting encounters may assemble.

For instance, the vulnerability of an endangered species is marked as “red-listed” when registering its encounter in Artportalen. With its mark, this datafied encounter may travel less than entries of common species because it can only be shared manually and fully viewed through special access grants. Although every user of Artportalen can see a mark on the map, the location of this endangered species is concealed. As illustrated in my results, such “travel restrictions” of datafied observations lead to different meaning-making processes and sometimes even to tensions connected to environmental policies (see section 4.3).

3. Method and Data

To explore my research questions (see section 1.2) I followed a qualitative research design which allows the researcher to "[…] focus on individual meaning, and the importance of reporting the complexity of a situation" (Creswell & Creswell 2018:41). In line with Barad and Tsing, my understanding derives from a realist perspective (Barad 2003; Tsing 2021). This perspective allows me to focus more on overlapping and messy 'world-makings' through practices rather than agential or nature-culture dichotomies (ibid.). Returning to Barad's words, "[the] world is intra-activity in its differential mattering. It is through specific intra-actions that a differential sense of being is enacted in the ongoing ebb and flow of agency" (Barad 2003:817). The human is therefore deprived of any special status when it comes to 'world-making' (Tsing 2021).

I conducted nine semi-structured interviews throughout my thesis project (see 3.1). I had the opportunity to interview participants who maintain Artportalen, professionally work with Artportalen as a database, or incorporate Artportalen in their birdwatching hobby. Semi-structured interviews allow the researcher to be flexible while still making sure to cover relevant topics based on interview guides (Bernard 2018). As I interviewed people with different connections to Artportalen (see Table 1), I prepared slightly different interview guides, based on their position towards the database. Moreover, following my research design and method, I prioritised "[…] gaining an in-depth exploration of each participant's story, not a uniformly structured account" (Braun & Clarke 2022:11). Instead of sticking to a set interview structure, I flexibly used my interview guides to delve deeper into arising topics.

Section 3.1 discusses the data-collection process. The method of this work, reflexive thematic analysis, is outlined in section 3.2. Also, the importance of reflectivity is pondered. Finally, section 3.3 addresses the data analysis process.

3.1 Data Collection

Five interviews were conducted online and four in person. The selection of the participants was based on their various relations to Artportalen to explore different

perspectives. Interviewees often engaged with Artportalen throughout their work by using the lists of red-listed species, long-term datasets or Artportalen as a map. Moreover, it is important to note that most interviewees use Artportalen for work as well as privately. Interviewees often used datafied observations in their profession, such as environmental planning. They also registered their non-human encounters, such as invasive species, as data during their free time as part of the citizen science project. Although both aspects were covered throughout the interviews, the primary connection is illustrated in Table 1.

Table 1: Interviewees' connection to Artportalen

Interviewee	Connection to Artportalen
P1	Working at a Swedish Municipality & with GIS (Geographic Information System).
P2	Researcher, engages with Artportalen's data.
P3	Birdwatcher, engages with Artportalen as a hobby.
P4	Working at Artdatabanken.
P5	Working at the Swedish Forest Agency (*Skogsstyrelsen*).
P6	Working at Artdatabanken.
P7	Working at the Swedish Agency for Marine and Water Management.
P8	Working at a Swedish Municipality & with GIS (Geographic Information System).
P9	Working at an NGO, focusing on environmental protection.

First, I contacted participants related to Artportalen via stakeholder mapping. I then collected participants via convenience- and snowball sampling. I started the process by reaching out to potential participants who were easily accessible (Braun & Clarke 2022). The process was continued by asking participants for potential other interviewees fitting my case. Interviewees were contacted through E-Mail and Facebook groups.

Interviewing participants for research requires specific ethical considerations (Robson & McCartan 2016). To ensure informed consent, a consent form was provided in addition to SLU's guidelines regarding data protection. Moreover, every interviewee was anonymised throughout interview notes, transcripts, and the final work. When quoting interviewees, I used the letter "P" for "person" and the number of the interview. All transcripts are also saved in that manner.

3.2 Reflexive Thematic Analysis

I analysed the data using reflexive thematic analysis as my method. Thematic analysis methods are used for "[…] identifying, analysing and reporting patterns (themes) within data" (Braun & Clarke 2006:79). Known for being flexible, thematic analysis can be embedded in various research designs, be inductive or theory-driven and can fit different epistemological and theoretical approaches (Braun & Clarke 2006). Hence, unlike similar pattern-based qualitative methods, thematic analysis is not connected to a pre-existing theoretical concept (ibid.). However, to use thematic analysis one must make one's theoretical position clear. Only through disclosing assumptions and decision-making processes during the research, the needed transparency can be reached (ibid.). I chose this method for its flexibility as it allowed me to analyse my data along two concepts, encounters, and data journeys, from different fields.

Considering data, reflexivity is also needed. Themes do not simply 'emerge' from data but are created through one's engagement with the data (Braun & Clarke 2021). Hence, one dataset does not hold one particular analysis but multiple possibilities which are dependent on the researcher's choices, positionality, and the research design (Braun & Clarke 2022). The researcher therefore should reflect upon their positionality throughout the whole project (e.g. the process of data generation, coding and theme creation) (Braun & Clarke 2021). I decided to use first-person narration to highlight the role and subjectivity of the researcher.

I used notes for my reflection process in the form of interview notes, general notes during the thesis process, and memos throughout my coding process. As a researcher, I create meaning with participants through interviews and influence every step of my thesis project through choices, assumptions and my (academic) background. For instance, my background in Cultural and Social Anthropology shaped this project, from the way I conducted interviews and wrote up my notes, to theoretical influences. This leads me to the limitations of my study. Limitations emerged through time constraints, the scope, and decisions I ultimately had to make, such as not following an ethnographic approach. Especially the semi-structured interviews would have been elevated through participant observation. Data journeys and encounters are often explored through ethnographic research as

well, as ethnographic methods provide beneficial flexibility and room for in-depth research of the chosen field (cf. Tsing 2021; Peterson et al. 2022). In this way, the researcher would not only observe participants' discursive, sociomaterial practices but also their doings and experiences. They would encounter encounters, ultimately becoming part of the intra-action. This could lead to fruitful insights and interesting levels of reflection. Yet as relevant as following traces, encounters and narratives is, such explorations are not easily "scaled up", if possible. As Tsing states, the "[…] ability to make one's research framework apply to greater scales, without changing the research questions, has become a hallmark of modern knowledge" (Tsing 2021:38). These expectations cannot be fulfilled with the approach I chose.

3.3 Analysis Process

I chose a theory-driven approach for my data analysis by combining the concept of data journeys and encounters to account for all social participants in Artportalen.

Following data journeys is complex; it is sometimes impossible to track their movement. As data and their journeys are highly contextualised there is no 'one approach fits all' to standardise how to examine these journeys. Leonelli nevertheless identified six factors that come into play when using the concept of data journeys as a methodological frame (Leonelli & Tempini 2020). I now summarise the factors I was able to incorporate throughout my analysis. I further explain how I connected these factors to encounters:

- *Focusing on non-linear, multiple narratives*:
  Data journeys branch out in multiple ways and directions. They embed, connect, and relate to various data practices, including different conceptualisations, goals, and skills, which are non-linear. Connecting data journeys to how social participants encounter, and are encountered by each other highlights various practices, motivations, and perspectives. Seemingly similar practices can stem from opposing perspectives, as reflected in Sections 4.1 and 4.2.

- *Engaging with practitioners*:
  For further contextualisation of the practices and to fully grasp the interconnected skills, techniques, and goals, it is important to engage with the data practitioners to reflect on the practices embodied to understand their interpretations and wider concerns and attitudes or lack thereof. When considering encounters too, flexibility throughout the interviews provided room for diving deeper into the participants' interpretations and engagement with Artportalen. However, ethnographic research could have provided deeper insights into their practices. This will be further explored in the concluding discussion (Chapter 5).

- *Meddling with other disciplinary lenses*:

  Even though one always comes from a specific discipline with its methodological and theoretical perspectives, multi-disciplinary approaches to investigate data journeys are helpful if not needed to widen one's horizon to understand the multiple dimensions of data journeys. Philosophical and social science perspectives play a role in considering the various perspectives at play when talking to various data practitioners. By aiming to connect a multispecies approach with technology as a social participant I have encountered perspectives from Cultural and Social Anthropology, Sociology, STS etc. which align with a more-than-human and posthumanist lens.

- *Attention to reflexivity*:

  One's position regarding data journeys depends partly on one's positionality (including one's skills, preferences, aims, and institutional positions) and partly on the data one investigates. Reflecting upon these positions and making them clear and transparent are therefore necessary. This aspect also aligns with the reflexive thematic analysis and my method of choice, as discussed in Section 3.2.

Whereas my process was influenced by these theoretical concepts, the coding process was based on phases of a thematic analysis. Braun and Clarke defined 6 phases: Familiarising with one's data, the generation of initial codes, searching for themes, reviewing these themes, defining and naming these themes and producing the report (or in this case, writing the thesis) (Braun & Clarke 2006:87).

To fully familiarise myself with the data, I transcribed each interview manually. I then used MAXQDA 24 for the coding process. The created themes are presented in the following Chapter.

4. Results and Analysis

By analysing my data as previously described, I identified four themes which I called 'Gridded Nature' (4.1), 'Nature Without a Grid' (4.2), 'Knowing is Seeing, is Caring' (4.3) and finally, '"Funky Birds": Motivations and Interests' (4.4). Both themes in sections 4.1 and 4.2 introduce worldviews regarding nature, environments, humans, and non-humans, which ultimately influence one's perception and practices. Connected to them is section 4.3 which introduces the most dominant narrative pervading throughout each worldview. Finally, section 4.4 focuses on motivations and interests leading to specific actions which are embedded in sections 4.1 and 4.2 as well. In the following sections, all themes are defined and presented. Examples are given to illustrate and highlight important aspects of each theme and their connection to data journeys and encounters. Instead of following data journeys linearly, however, patchy storylines of encounters and contaminated diversity lead to each theme.

4.1 'Gridded Nature'

Inspired by the interviewees' relation to maps and the map function in Artportalen I coined the first theme 'gridded nature' as nature is seen through the gaze of a map. Interviewee 1 who works at a municipality explained to me: "*I work with making maps. And making maps basically includes that you have [a] certain information that you want to display*" (P1:10). Maps divide landscapes into grids, where in the case of Artportalen non-humans are included as information in form of data-points. On Artportalen's start page, one can find a map of Sweden where registered observations are shown as entries, which can be filtered by species groups. Datafied encounters therefore are to be determined and can be included, excluded, or filtered. This data-focused perspective on landscapes and past datafied encounters between human and non-human agents constitutes the 'gridded nature' theme.

The theme is present throughout all interviews. The interviewees perceive nature as something to categorise, quantify, count, map, and collect (P1-P9). Non-human encounters dwelling in nature are to be inventoried, be it for their protection, out of interest, or as part of a gamification process. Therefore, nature is mostly understood as something 'outside' of culture containing non-human others that can be observed

and registered in a database such as Artportalen. On one hand, the movement of datafied encounters across and beyond Artportalen is welcomed as the need to inventory is highlighted. On the other hand, interviewees do not reflect upon the meanings that emerge when such travelling data is encountered leading to contaminated diversity. An anthropocentric perspective is dominant in this theme, putting humans in focus whether it is about encountering other humans, nature, or non-humans. Technology and algorithms are understood as "*tools*" (P1; P2; P3; P4; P5; P6; P8). This indicates that intra-actions between humans, non-humans and data are also not accounted for. However, the 'gridded nature' theme is not self-contained. Many diverse encounters, stories, spaces, temporalities, and materialities are interwoven in a 'gridded nature'.

'Gridded nature' appears as a "*mode*" or gaze that people embody (P1; P2; P3:4). With that gaze, one focuses on particularities and often only encounters of specific or rare species are registered as observations in Artportalen. Registering such encounters is then the reason to take trips or walks for inventory purposes. Species and communities are determined, counted, and transformed into data during these outings. After ensuring whether a species is present applications such as *Checklista* make it easy to report on the spot (P2; P3; P6). If the aim is to "*look at the big picture*", species are treated as "*proxies*" wherever possible that are connected to fitting environments and habitats (P7). Even though Artportalen is understood as a tool and data storage, non-human encounters are handled as future data points. Hence, in that context data journeys neither start through encounters with non-humans nor reach their endpoints as results of e.g. research. Situated somewhere in between, insights of past observations are followed by new observations, which again lead to more insights. This created a feedback loop of datafied observations aligns with Tsing's understanding of progress narratives within science. Considering the dominant narratives of progress, it is necessary to follow the reasoning behind these practices. For example, some interviewees expressed their hope that people would perceive their environment more holistically as they may understand nature better when quantifying it (P1; P2). Interviewee 2 makes this clear by stating that:

> "I would say that maybe [Artportalen] should impact the- How that it's not just experiencing like: "Oh I'm out in the nature" but also you try to quantify the nature- -which- […] doesn't have [a] bad or good side, it's just- hopefully that makes people more aware of nature and realising that there is more than species but there is like […] population[s] in the wetlands not just the species present. I don't know how to dive [into] that but it's just- Hopefully, it helps people to see it as [a] more holistic way" (P2:6).

Even though it seems as if the focus lies on specific aspects of nature, interviewees assume to build a holistic perspective by connecting singular parts. Moreover, they hope that this understanding then is shared with others. Desires to quantify non-

human encounters which here results in their digital datafication is not a recent trend but stems from a well-established tradition.

Inventorying nature has a long tradition in Sweden. Interviewee 6 even called it the "*Linnéan tradition*" (P6). Artportalen serves as an "*extension*" of the practice, filling some practitioners with pride and replacing personal data collections and notebooks placed at bird towers (P3; P4). This tradition aligns with the rationale that was adopted since the Enlightenment in which nature and non-human others play a passive role that provides resources when tamed.

Old materialities connected to practices of observing are therefore replaced with mostly digital files, their material aspects 'hidden' for most people.

Many people report for their pleasure, following their passion embedded in a long tradition, to map their environment, or to communicate with other like-minded people (P3-P9). This leads to diverse reports as "[…] *people will report differently*" which creates difficulties (P2:2; P5; P8). Such opportunistic data is valid yet incomplete or incohesive. The data must be "cleaned" or flattened in a long process, transformed, or connected with other datasets. Artportalen is filled with data but often data travels and transforms for the cost of more detailed information. Diverse data indicate diverse practices which can be a hindrance for data to travel smoothly.

Not only do researchers struggle with incohesive data, but people working on city development, forestry, or restoration projects do, too. Cities grow, roads are built, and forests are used by their owners—requiring data about what might potentially be protected. "Gridded nature" plays a big part in any law inquiries and development projects. Be it for species protection in the context of EU laws regarding red-listed species, or future clear-cutting projects. And "[…] *as soon as money is involved it can cause a lot of trouble in people's lives*" (P5:6). To validate any project, nature, environments, and habitats are mapped and gridded. When protected species and clear-cutting projects meet, it is crucial to know exactly on which side of the border the species can be found. Datafying and mapping non-human encounters can therefore determine the future of non-humans' habitats. Mapping registered observations additionally exceeds professional practices, affecting one's overall understanding of nature.

Engaging with or creating mapped data influences people's practices beyond their work because "[…] *that's what we nerds do*" (P2:3; P1; P5; P6; P9). However, as P5 explained:

> "[…] when you are sort of [a] beginner with using maps, you tend to look too much at the map. And eventually, you realise that the map is only a picture of reality. And the reality is all around you. It's always, if there- In all maps, there will sometimes be a mismatch between the map and the reality" (P5:4).

Considering this, what is the map of Artportalen revealing? Even though it is handled as a map of datafied non-human encounters, Artportalen is an anthropocentric map made by humans (P5). It shows where humans are encountering nature, with aggregated findings close to cities and universities. It reveals how humans trace non-humans they consider particularly interesting and thus worthy of datafication, as illustrated in section 4.4 (P1; P3; P9). Finally, it discloses human actions to either validate their arguments or to prevent projects in the name of the law (P1; P2; P8; P9). This tension between mapping humans, nature, and non-humans leads to constant negotiations when using Artportalen as a map. Yet 'thinking through a grid' is not the only way to encounter the world. Section 4.2. presents an alternative worldview which differs from but is closely connected to the 'gridded nature' gaze.

4.2 'Nature Without a Grid'

I detected another perspective that is closely related to the 'gridded nature' theme I presented in 4.1. which I defined as 'nature without a grid'.

'Nature without a grid' is another "*mode*", this time however constituting an ecocentric perspective. As an alternative to putting humans in the centre, ecocentrism highlights the importance of non-humans, humans, and their environments. As Interviewee 9 puts it: "*The human being has put ah, her, or himself on the top of it. Of everything. And thinks we are something else. But we aren't*" (P9:13). Encounters with nature, humans and non-humans, or data, in this mode, differs from the previously described mode. Being in nature here is paired with another form of curiosity that is not as focused. It is more about 'just being' and actively trying to take a break from technology (P1). In the words of interviewee 1: "*I would maybe see more the beauty of it? Like, of a bird or like, I would see the beauty of nature like, as a whole more, you know? And I wouldn't maybe focus so much just on a specific bird*" (P1:5). Even if species are detected, one lets one's thoughts wander instead of focusing on each of them individually (P1; P2). Here, experience is in the foreground, or as Interviewee 3 puts it: "*You feel the nature more than you think about it*" (P3:4). Interviewee 3 told me that in this "*mode*" registering observations in Artportalen is not a goal to strive for which makes one more "*more open-minded*" for "*meeting animals*" or other non-humans (ibid.). Instead of fostering their competitiveness by comparing their listed datafied encounters with the lists of others, interviewees often encounter nature alone or with their family (P3; P4; P5; P6; P9). When it comes to online and offline communities, their connection and shared interest are emphasised which also influences how data from nature and non-human encounters are shared and distributed (P3; P4; P6). Facebook and other social media platforms enable sharing pictures and experiences to connect and bring joy to locals or to connect with like-

minded people who share the same interests in specific species or practices (P3; P6). Artportalen's map fades to the background while other affordances, such as the shared news of research projects with datafied observations, become more salient.

Artportalen as a platform is consequently also treated differently. It is encountered and cared for as well and perceived to be more than the sum of its parts (P6). Reflecting on Artportalen, interviewee 6 who works at *Artdatabanken* told me that "*Artportalen and [its] community. It has passed a level that you can't change, ahm, the way of it. It's too established*" (P6:14). Their biggest fear for Artportalen in the future is funding — not funding to change its core but to care for it since *"it's a living thing. If you don't manage it, it will die*" (ibid.). While fundings are reduced more databases like Artportalen are created. However, relating Artportalen to other databases, interviewee 6 remained optimistic and stated that:

> "Aggregations of data get more and more important. Also, from other sources that have more specific purposes in data collection. So that is also one thing that will be more and more of in the future. So Artportalen will just be one part of a family. [B]ut Artportalen as a community will probably last for a very long time. [T]he database will be, so to say, part of something even bigger" (P6:16).

In place of treating Artportalen as a mere tool to reach one's goals, it is understood through its community and entangled connection between humans and other databases, including multiple data practices and offering spaces where data can travel between, in and out of.

Considering the rationale of the theme, 'nature without a grid' leaves room to critique the 'gridded nature' theme by building on curiosity and experience: Interviewee 8, working at the municipality with environmental planning mainly concerning urban development projects, told me that:

> "[…] when we present "Yeah, here we have some species that are protected" or something. We need to basically follow the law and that's kind of a boring way to work with nature. Because you can't go in here because we have the law. We should have hope that it could be more: "Yeah, here we have interesting, important areas that we shouldn't build on" (P8:8).

Rather than declining development projects through reasonings based on law, which in that context is often related to negative implications, it would be better to raise awareness of the area's rich diversity and more positive connotations. Contrary to focusing on datafication processes, this call for curiosity emphasises why non-human encounters should be digitalised in the first place: namely to strengthen the bond between humans and non-humans in general.

The theme not only allows for critique but also for emotions such as worrying and mourning. These emotions can be identified when talking about people's hopes and fears regarding the future of nature, environments, and non-humans. For

example, interviewee 7 worried that "[…] *if you move the baseline on species and you- and you get much less expectation. You don't see the birds anymore. But then of course you didn't see any birds last year either so it's- it's no problem*" urging that "[…] *you need to see good places sometimes, to understand what you- what you already have lost*" (P7:6). Humans often seem to become used to rapid environmental changes and accept them as their reality. I had a similar discussion with interviewee 2 after the official interview. We compared how landscapes we have grown up in have changed over the past years, realising that many non-humans such as bugs and butterflies have 'disappeared'.

> Landscapes "[…] changed from individual and *messy environments* to more homogenous places. In this talk, [interviewee 2] mentioned that *wilderness*, *nature,* and even urban areas mean something completely different to younger generations as these parts have changed so rapidly in a short amount of time. Yet these meanings are essential in what we envision how our future ought to look like" (P2, interview notes).

The worry that accepting landscapes with fewer non-humans dwelling in them due to distinction and environments lacking biodiversity will be accepted as a new "*baseline*" creates a different urgency to inventory nature than Sweden's long tradition (P2; P7; P9).

Finally, the themes outlined in section 4.1. and 4.2. do not oppose each other but are multifaceted and at times complementing one's worldview. Interviewees often switch between them, which makes both themes dynamic. For instance, interviewee 3 told me the following:

> "And when I talk to other people- they haven't that reference to the nature that connects them, a h - they connect to other things, of course. Maybe relations and, ah, other things that make meaningful patterns for them. But for me, it's- the nature is kind of a background to everything that I experience. So, ah- Yeah. Sometimes I feel I'm not only in the cultural- I'm not only in the human world. I also- it's in the nature" (P3:6).

For the interviewee, defining and quantifying nature and focusing on particularities leads to an enriched experience and more meaning while just experiencing nature relates to being "*more open-minded*" (P3). Even though they emphasised the nature and culture dichotomy, I find that both themes exceed their boundaries, and create blurred lines when it comes to perceiving nature, environments, and encountering non-humans. For instance, interviewees argued that the datafication of nature may lead to a more holistic understanding of nature and environments as more knowledge leads to an overall better understanding. A holistic approach was at times more related to practices I identified within the 'gridded nature' theme than when focusing on connections and experience, like in the 'nature without a grid' theme (P1; P2; P3). The need for a deeper understanding of nature and biodiverse environments aligns with the narrative presented in section 4.3.

4.3 ‘Knowing is Seeing, is Caring’

The reasoning that knowledge leads to deeper caring is reflected in the dominant narrative detected throughout all interviews. I have called this narrative ‘knowing is seeing, is caring’. In other words, to fully care about non-human and nature encounters one must be able to properly see them. Seeing and noticing one’s surroundings is made possible through one’s knowledge of nature and species.

Like the theme described in section 4.1., this narrative can also be traced back to Carl von Linné. As interviewee 3 stated: “[…] *nowadays, I think, knowledge about nature starts with naming*” (P3:6). The idea that determining species dwelling in nature is a starting point stems from narratives developed during the Enlightenment, which is an integral part of Sweden’s history and tradition. Interviewee 6 explained to me that *“[…] after Linnéus [it] was more and more a tradition that it was important to know species. And as- We have the starting point with Linnéus and all of the books that he has done and […] many other Swedes [have] done on floras and faunas and such”* (P6:11).

However, interviewee 3 reflects on various other kinds of knowledge. Before the “*Linnéan tradition*”, people knew about non-humans and nature, “*maybe even more, in some ways*” (P3). Yet these practices of utilising plants, fungi and non-humans as medicine and food do not fit today’s linear narrative and are therefore rejected. Still, knowledge is not necessarily science-based but connected to talent or fun (P4; P9). Nowadays quantifying nature is required to ‘see’ and to understand. Only ‘seeing through inventorying and knowing’ extends the personal limitation of perceiving nature as “*a green blur*” (P1; P6; P9). But no matter how hard some people may try, they remain “*species blind*” (P4; P6).

Artportalen’s data can support creating a deeper understanding of nature and biodiversity for individuals and communities not only by its lists of datafied observations but also through the news feed on the start page, where news about projects and research which are conducted with Artportalen’s data are summarised. This then also creates knowledge and may even provide insights about species one has not thought of before (P9). Nevertheless, as datafied information does not always travel freely, such knowledge is not universally accessible.

Increased knowledge and understanding lead to more caring about the “*values of nature*” (P1; P2; P4; P8). This seems less straightforward when one traces the endpoints of data journeys.

To illustrate, interviewee 5 told me the following:

> “[…] sometimes we had opinions from people owning forests that if you- to be able to take like, into account what species you need to protect you need to be allowed to get the information what's there. Of course, it's- If it's a secret, there's a very specific bird here. It's very important

> that you protect it. But you don't tell the landowner. It's very difficult for him or her to take needed caution, of course" (P5:8).

Not all data is accessible to everyone (P2; P4; P5; P6; P8; P9). 'Not knowing' therefore can create tension between different interests and motivations, ultimately leading to conflicts. As mentioned previously in section 2.1, restricted journeys of datafied observations can lead to clashing meaning-making processes. In such situations, feelings of frustration arise, either because one does feel overlooked by the environmental policies in place, or because one feels hindered from following these policies. Yet besides the mentioned potential for conflicts, knowledge creation through datafication harbours concerns and aspirations for the future.

When thinking of the future of Artportalen, knowledge creation, truth and AI are considered as key aspects. Interviewee 4 considered the implications of data journeys leading to what humans understand as truth, especially when using AI systems, by telling me that:

> "[…] information is just duplicated in the system […] so it gets a truth- It's […] generating new information from the- There is more amount of information. And then it gets more and more true. So, you don't really know what it is, is the original data and what is just, ahm- because they are sort of produced from the small amount of data [that] are produced" (P4:10).

This could then be "*a little dangerous*" (P4). Despite that, they continued their reflection by telling me that this process of creating what is understood to be true essentially was the same as publishing books and articles: "*[W]ith books and everything like that it worked in the same way also. You produced something in books when no person has written this, but okay, then everyone cite[s] this. And, ah- After some time it becomes its truth. But it was very little information from the start actually*" (P4:10). Yet the process, which seems similar, changed through the acceleration of data that is produced. Exponentially growing data and AI working like a black box make data journeys untraceable and the process more complex.

Agreeing with interviewee 4, interviewee 6 highlighted another concern regarding Artportalen and AI. As AI systems must be trained with data, they rapidly improve when enough data and time for the system to learn is provided (P6). Even so, AI's abilities often decline after some time and analysed datasets since their processed data often includes mistakes which are picked up. In the words of interviewee 6:

> "[Identification apps were] really bad when they started because [they] have no- so few pictures. But then it gets better and better and better. But then [t]hey started to decline again. Because there was- started to be more and more crap among the pictures. Because they were depending on that all those reference pictures [to be] right identified. But if someone [said]

that: Okay, this is this species. But it wasn't. Then the algorithm started to make more and more mistakes" (P6:13).

The quality assurance of reports uploaded to Artportalen through the databases' verification process is still conducted by humans and will be for a while (P4; P6). Nevertheless, interviewee 4 hopes for Artportalen's technical aspect in the form of AI integration to be developed (P4). They suggest implementing AI to find unsound reports "*in a more effective way*" instead of only relying on algorithms in the verification process (ibid.). Many different understandings of Artportalen's role and tasks are present which all are interwoven into Artportalen's data. As the number of registered observations in the system is rising "*exponentially*" it is crucial to try to grasp why people are participating (P6). By no means exhaustive, section 4.4. presents some motivations and interests related to the practice of registering.

4.4 "Funky Birds": Motivations and Interests

Motivations and interests are the driving force of practices relating to collecting observations as data and the final theme I address in my results section. Whereas motivations give people a reason to carry out practices or, for instance, participate in projects, interests in this context indicate why one focuses on one aspect over another. Different motivations and interests can lead to seemingly the same practices, and one person often acts on multiple motivations and interests simultaneously.

Building on the previously discussed narrative, being more aware of and caring for the environment leads to collective action. Instead of being dependent on paying people in expert positions for services such as conducting inventories, "*everyone can do it*" (P1; P2; P3). Everyone can take part in inventorying local areas which can help to start restoration projects (P2). Additionally, these inventories can support communities when requesting financial aid from official institutions for such projects (ibid.). Some people go as far as to use Artportalen as a form of environmental activism. As interviewee 2 told me: "*I am aware that a lot of times, people that want to protect the forest from being cut, they [then go] there and look for specific species and they report in the Artportalen*" (P2:7). In that way activists utilise Artportalen to fight against urban development or clear-cutting projects by trying to reframe specific areas. Most of the time such actions are detected and prevented. Quality assurance is conducted by a network of specially certified people who focus on "*spotting anything unusual*" (P4; P6). In these instances, motives and practices clash as do understandings of these natural areas. This leads to tension and conflict, occasionally even discussed in public media (P5). Nonetheless, Artportalen "*[…] is a very important tool to unify the community*" (P2). A sense of

community and collective action often is the main motivation to register observations. But it is not the only motivation that has been defined.

Many people also become motivated by comparing their lists of registered observations with others. Interviewee 9 told me that: "*Some people want to be high on the list just to know they are high on the list. That's important to them*" (P9:8). Interviewee 3 checks Artportalen multiple times a day to see what others have been up to (P3). In this context, Artportalen's *Checklista* is a gamified element, meaning that it enables a game-like notion regarding registering non-human encounters as observations to the database. Like some games, it fosters comparison and to some extent competitiveness between users. Comparing each other's lists also comes from tradition. Initially, part of birdwatching, keeping track and connecting through these lists are an integral part of the hobby (P9). As birdwatchers developed Artportalen and initially did not see it as the big citizen science project it became, lists were included to continue this practice just for fun (P6). Another interest stemming from the birdwatching tradition is 'tracing' rare species throughout the country, either by checking registered observations in the database or 'following' the bird in hopes of encountering it (P2; P3; P5; P6; P9). As in section 4.1, it becomes evident that although Artportalen is then used as a map to trace the bird, it ultimately traces humans tracing non-human others to datafy and list their encounters.

Lists on Artportalen also help to keep oneself accountable. Interviewee 3 told me: "*I always also try to register all the bird species [of] the year. So, if I know it's a common bird, I haven't reported yet this year. Then I will report it*" and that they are trying to report all species "*every ten times or something*" (P3:3). Many interviewees told me about the importance of registering all encountered species during one trip, or at least aiming to do so (P2; P3; P4; P6; P9). However, only interviewee 2 seeks to achieve this in practice (P2). Based on my interviews, I identified three areas of interest about non-humans that determine whether people register the encounter as an observation or not. The decision in favour of the registration often depends on the non-human's rarity, looks, or behaviour. Almost all interviewees emphasised that rare species are far more likely to be registered in Artportalen (P1; P2; P3; P4; P6; P9). Interviewee 6 told me: "*Even if it's most part of what's in Artportalen is rather common species. But it's a much more focus on reporting rare species*" (P6:7). This underlines Artportalen as a map representing human practices over non-human dwellings in an area. Species are not only more interesting when they are rare, but their looks also play a significant role. Species looking ordinary are less interesting and more likely to be dismissed (P1; P4). However, the species' behaviour may attract one's notice, sometimes leading to a broader focus. Interviewee 2 told me the following: "*[If] it looks like the fly is very interested in the […] substrate on fungi or something like that, and then you can*

always dis- […] is this a host for species? Using it, or something like that. Then it becomes interesting also" (P4:4). Encountering species during an encounter can shift one's focus from particularities to entanglements.

Lastly, another motivation to be active in Artportalen is the feeling of "*making a difference*" which blurs the boundary between scientific research and practices related to fun and interest (P2; P3; P9). As interviewee 2 put it: "*[Artportalen] kind of motivates people to be more engaged when it comes to nature and science, [and] it's one of the motivations for the hobby*" (P2:4).

However, some tension between "*data for science*" and "*collection for fun*" can be detected. There are different perceptions and ideas of what research and science ought to be and who is allowed to contribute. Interviewee 3 highlights the importance of hobby enthusiasts, emphasising that one should not share their reports on Artportalen if "*[…] it was only for researching*" (P3:8). At times, people who see themselves more as birdwatchers doing it for "*fun and passion*" are uncertain of their skills as soon as the practice is framed as research. Interviewee 9 told me that:

> "[…] often, they are people that are: "Oh! It's a research. That's tricky. I don't know if I'm good enough." Then I show them what they have done in, for example, Artportalen. This is- are all your observation[s] in this area. If I put them together and bring out some good data. We can see trends. We can analyse your data to make some good conclusions about those species in this area. You already have done it, please go out and do it this amount as well" (P3:10).

Expert status is renegotiated when experts are not the only ones taking part in inventory projects. In such projects, diverse and at times implicit understandings of one's legitimacy taking part coexist. It seems as if the definition of experts is yet to be revised. Hence, such roles emerge through the intra-actions of various agents encountering each other. Through these intra-actions, agency and boundaries come into being. However, in citizen science, such boundaries are not always understood and agreed upon in the same manner, as the example by interviewee 3 shows.

5. Concluding Discussion

In Chapter 4 (Results and Analysis), four themes were introduced and presented. While the 'Gridded Nature' and the 'Nature Without a Grid' theme (4.1 and 4.2) are linked with how the world is perceived, 'Knowing is Seeing, is Caring' reveals the most dominant narrative about the environment (4.3). The theme '"Funky Birds": Motivations and Interests' intertwined interests and motivations with the previously mentioned themes (4.4). Additionally, it reveals motivations behind practices, leading to specific actions. None of the themes have clear boundaries. On the contrary, they are complex and dynamic. Figure 1 illustrates their relationship and showcases the connections to my initial research questions.

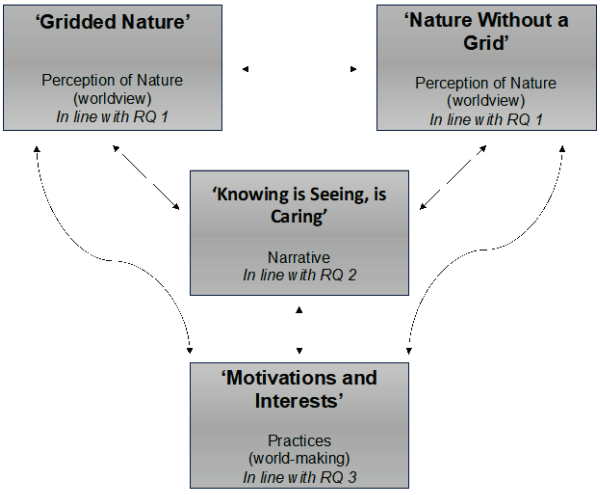

Figure 1: The themes' relation to each other and the research questions

In the 'Gridded Nature' perspective, databases such as Artportalen were understood as tools. Embedded in an anthropocentric perspective, the nature "out there" ought to be quantified and controlled, including its non-human inhabitants. One focus lay on maps and mapping. As the analysis shows, such maps were maps of humans, encountering or tracing their environments. While data movement was welcomed and datafied non-human others "flattened" to do so, little was reflected on the emerging meanings when such data is encountered (cf. Peterson et al. 2022).

In ‘Nature Without a Grid’ the focus shifted from an anthropocentric to an ecocentric perspective. Humans were not the focal point anymore and nature was to be experienced. Artportalen as a digital space where humans and non-humans encounter each other was more important than its map function. Both themes inherited similar yet diverse practices, emerging through varying perceptions of the world. The emphasis on datafication processes changed to curiosity. This curiosity emphasised the importance of humans and non-humans encountering each other, leading to contaminated diversity (Tsing 2021).

The ’Gridded Nature’ and the ‘Nature Without a Grid’ themes showcased how worldviews impact how the world is perceived and what meaning-making processes can emerge when encountering the environment. Both themes were dynamic and constantly negotiated as interviewees switched between their ways of reasoning. They were both also influenced by embedded narratives and practices.

The dominating narrative, ‘Knowing is Seeing, Is Caring’ bore aspects of both previously mentioned themes. The narrative highlighted a possible outcome when data journeys are restricted: Unequal access to data caused frustration and tension between participants. In line with narratives of progress, alternative ideas of knowledge creation and historical entanglements were excluded (Tsing 2021). Additionally, ideas of progress supported the implementation of AI in citizen science (cf. McClure et al. 2020). However, as machine learning systems are socialised through ‘the culture in the code’ some concerns arose, especially in the context of data and “truth” (Airoldi 2021).

Various practices are connected to different interests and motivations. The last theme, ‘Funky Birds: Motivations and Interests’, discussed what encounters were deemed interesting enough for datafication. Such interests and motivations also influenced the possibility of taking environmental action and Artportalen’s affordances such as the integration of lists for gamification purposes. Finally, this theme presented one possibility of how boundaries are negotiated through intra-actions (Barad 2003).

In my research problem Section (see 1.2) I mentioned two implications that must be addressed. The first implication called for a widened more-than-human approach, that includes technological and digital agents and data. Accounting for all participants influences how nature, environments, and other agents are perceived and encountered. The second implication emphasises how encountering these agents shapes narratives and practices. Such influences then affect citizen science and environmental governance processes, especially in times of the Anthropocene. By no means exhaustive, I will now discuss both implications considering my analysed results (Chapter 4).

The Linnéan tradition extensively shaped how relations to non-human others and their datafication were understood and handled. The strive to name, inventory and datafy the environment indicated a hierarchical and anthropocentric perspective on environments and nature. Such hierarchies cause divisions between nature, culture, human, and non-human, sorting every agent or place into self-contained entities (Tsing 2012, 2021). Humans differ from other agents as they are constantly moving forward in the name of progress (Tsing 2021). In line with Tsing's understanding of progress narratives, 'Knowing is Seeing, is Caring' also rejected alternative narratives and histories (ibid.). This was illustrated by the rejection of alternative nature perceptions, differing knowledge creations and picking a 'starting point' for modern knowledge within the Linnéan tradition (4.3). Striving for ever more data in the form of datafied observations to the point of a positive feedback loop also aligned with the anthropocentric progress idea. Interestingly, such data did not have a clear starting- or endpoint but were nested somewhere in between encounters with non-human others and future encounters (4.1). Moreover, as indicated in the analysis (see sections 4.1 and 4.4), Artportalen is a map of humans. Artportalen is often considered to be only a map of non-human participants, such as animals, plants, and fungi, dwelling in their habitats. This study instead shows that Artportalen's map reveals which encounters humans consider meaningful and where humans trace such encounters which are then transformed into data. Nevertheless, as my study shows, an ecocentric perspective was also apparent. Artportalen as a map and tool changed into Artportalen as a platform for a passionate community. With a focus on experience and curiosity, encountering nature and non-humans was prioritised over progress (4.2). Datafication processes in themselves lost their salience and were understood as support for such curiosity. Within the Anthropocene, curiosity is essential to break out of anthropocentric narratives and to shift the focus towards a more-than-human world (Tsing 2021). Surprisingly, neither the anthropocentric nor the ecocentric worldviews accounted for the emerging contaminated diversity when encountering non-human species. As previously discussed, contamination takes place through shaping and being shaped when agents encounter each other (Tsing 2021). When humans, non-humans and data meet, boundaries and agency come to matter through intra-actions (Barad 2003). However, how non-humans such as birds may be influenced through being inventoried and datafied has been neglected to this point.

Additional research on how Artportalen and citizen science shape non-human species, not only their habitats, could lead to fruitful insights. Likewise, a focus on intra-actions within the context of Artportalen could be implemented in further research as rising boundaries and agencies through such intra-actions may determine how e.g. the expertise is defined and carried out (Barad 2003). Finally, since maps are an integral part of citizen science and policy making (cf. Berti Suman & Alblas 2023), future research could follow up on the focus of

Artportalen's map from the proposed perspective and explore the meaning of an anthropocentric map on how humans encounter non-human others.

Data journeys also provided some interesting insights into how encounters of humans, non-humans and data affect citizen science and environmental governance. Considering AI, data could no longer be followed. As data would accumulate exponentially and AI operates like a black box, the complexity of data journeys would increase to such an extent that they become untraceable (Berti Suman & Alblas 2023). Although the integration of AI in citizen science offers some improvements, e.g. in efficiency (cf. McClure et al. 2020), some concerns must be considered when implementing AI in a project such as Artportalen. First, as machine learning systems 'learn' inductively, their socialisation would not only depend on *deus in machina* but on every registered and datafied observation (Airoldi 2021). That means Artportalen as a machine learning system would also learn from wrongly determined observations, which could lead to declining accuracy. Second, as Artportalen's data are opportunistic, trust had to be established through and between specific key participants (Kasperowski & Hagen 2022; Peterson et al. 2022). Creating trust in that way would not be possible when using AI to verify datafied observations, which could ultimately harm the project.

Lastly, frustration and tensions rose when data journeys were restricted or even ended. This may lead to conflicts between different participants of the citizen science project. Within environmental governance, it is therefore necessary to explore what interests, motivations and meaning-making processes lay behind practices that appear similar. For instance, caring for the environment meant utilising Artportalen for environmental activism for some, and focusing on research for further insights for others. If differing meanings are considered, conflicts could be mitigated. Moreover, this may lead to a better collaboration of all social participants.

To wrap up, considering the climate crisis and the rapid diversity loss, an overall urgency was detected (4.2). Especially the decreasing biodiversity of former "messy" environments caused worry. Yet it is this "messiness" of diverse environments that is needed for humans and non-humans to survive (Tsing 2021). This study can only briefly discuss some strengths and weaknesses of approaches to consider for combatting the crises of the Anthropocene. In the end, it depends on the collaboration of humans, non-humans and technology encountering each other, leading to contaminated−and messy−diversities.

References

Airoldi, M. (2021). Machine Habitus: Toward a Sociology of Algorithms.

Anthropocene Working Group (n.d.). http://quaternary.stratigraphy.org/working-groups/anthropocene/ [2024-02-05]

Åsberg, C. (2021). Ecologies and Technologies of Feminist Posthumanities. Women's studies, 50 (8), 857–862. https://doi.org/10.1080/00497878.2021.1981328

Barad, K. (2003). Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter. Signs: Journal of Women in Culture and Society, 28 (3), 801–831. https://doi.org/10.1086/345321

Bates, J., Lin, Y.-W. & Goodale, P. (2016). Data journeys: Capturing the socio-material constitution of data objects and flows. Big Data & Society, 3 (2), 205395171665450. https://doi.org/10.1177/2053951716654502

Bernard, H.R. (Harvey R. (2018). Research methods in anthropology qualitative and quantitative approaches. Sixth edition. Rowman & Littlefield.

Berti Suman, A. & Alblas, E. (2023). Exploring Citizen Science over Time: Sensing, Technology and the Law. Sustainability, 15 (5), 4496. https://doi.org/10.3390/su15054496

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3 (2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Braun, V. & Clarke, V. (2021). Can I use TA? Should I use TA? Should I not use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches. Counselling and Psychotherapy Research, 21 (1), 37–47. https://doi.org/10.1002/capr.12360

Braun, V. & Clarke, V. (2022). Conceptual and design thinking for thematic analysis. Qualitative Psychology, 9 (1), 3–26. https://doi.org/10.1037/qup0000196

Creswell, J.W. & Creswell, J.D. (2018). Research design: qualitative, quantitative, and mixed methods approaches. Fifth edition. SAGE.

Crist, E. & Kopnina, H. (2014). [Introduction]: Unsettling anthropocentrism. Dialectical Anthropology, 38 (4), 387–396. https://doi.org/10.1007/s10624-014-9362-1

D. Peterson, J., Kasperowski, D. & van der Wal, R. (2023). Bringing Together Species Observations: A Case Story of Sweden's Biodiversity Informatics Infrastructures. Minerva (London), 61 (2), 265–289. https://doi.org/10.1007/s11024-023-09491-2

Ekström, B. (2022). A niche of their own: variations of information practices in biodiversity citizen science. Journal of Documentation, 78 (7), 248–265. https://doi.org/10.1108/JD-07-2021-0146

Ekström, B. (2023). Thousands of examining eyes: credibility, authority and validity in biodiversity citizen science data production. Aslib journal of information management, 75 (1), 149–170. https://doi.org/10.1108/AJIM-10-2021-0292

Ekström, B. (2024). No rose on this one?: Citizen science field excursion negotiations at the Great Alvar. Nordic Journal of Science and Technology Studies, 12 (1). https://doi.org/10.5324/njsts.v12i1.5860

Eriksen, T.H. (2015). Small places, large issues: an introduction to social and cultural anthropology. 4th edition. Pluto Press. (Anthropology, culture and society)

Jönsson, M., Kasperowski, D., Coulson, S.J., Nilsson, J., Bína, P., Kullenberg, C., Hagen, N., van der Wal, R. & Peterson, J. (2024). Inequality persists in a large citizen science programme despite increased participation through ICT innovations. Ambio, 53 (1), 126–137. https://doi.org/10.1007/s13280-023-01917-1

Kasperowski, D. & Hagen, N. (2022). Making particularity travel: Trust and citizen science data in Swedish environmental governance. Social studies of science, 52 (3), 447–462. https://doi.org/10.1177/03063127221085241

Leonelli, S. & Tempini, N. (2020). Learning from Data Journeys. Springer International Publishing AG. 1–24. https://doi.org/10.1007/978-3-030-37177-7_1

McClure, E.C., Sievers, M., Brown, C.J., Buelow, C.A., Ditria, E.M., Hayes, M.A., Pearson, R.M., Tulloch, V.J.D., Unsworth, R.K.F. & Connolly, R.M. (2020). Artificial Intelligence Meets Citizen Science to Supercharge Ecological Monitoring. Patterns, 1 (7), 100109. https://doi.org/10.1016/j.patter.2020.100109

Peterson, J., Kasperowski, D. & van der Wal, R. (2022). (Inter)national connections: Linking Nordic animals to biodiversity observation networks. 288–302. https://doi.org/10.4324/9781003082798-25

Porter, T.M. (2020). Most often, what is transmitted is transformed. Springer International Publishing. 229–236. https://doi.org/10.1007/978-3-030-37177-7_12

Robson, C. & McCartan, K. (2016). Real world research: a resource for users of social research methods in applied settings. Fourth Edition. Wiley.

Species Observations | SLU Artdatabanken (n.d.). SLU.SE. https://www.artdatabanken.se/en/species-observations/ [2024-04-29]

Tsing, A. (2012). Unruly edges: Mushrooms as companion species. Environmental Humanities, 1, 141–154

Tsing, A.L. (2021). The mushroom at the end of the world: on the possibility of life in capitalist ruins. First published 2015. New paperback printing, 2021. Princeton University Press.

UC Santa Cruz | Faculty Profile (n.d.). https://philosophy.ucsc.edu/. https://philosophy.ucsc.edu/faculty/index.php?uid=kbarad [2024-05-02]

Welcome to Species Observation System - Artportalen (n.d.). https://artportalen.se/ [2024-04-24]

Popular science summary

We live in the time of the Anthropocene. This means that human actions have impacted Earth to such an extent, that it has left a permanent mark on the planet. Currently reviewed as a new official geological time, the Anthropocene leads many scientists to think about the implications of such an impact. Some social science scholars argue that it is important to consider that humans are not the only ones living on the planet. Rather, they share the world with many other animals, plants and fungi. To tackle the crises, humans must also include non-humans in their thinking and work together for possible solutions.

In biodiversity research, big databases have become increasingly important: biologists and ecologists strive to collect data on animals, plants and fungi to investigate how the climate crisis influences them. Various people work with scientists together: e.g. birdwatchers, environmental organisations, and NGOs register and collect data on non-humans in nature. This is called "citizen science". One such citizen science project in Sweden is the database Artportalen. Artportalen is special because it is not only used to collect data, it is also connected to municipalities which use the data in decision-making processes for building- and development projects. Thus selected individuals working for municipalities or organisations have real-time access to check for endangered species in proposed building project areas.

In my thesis, I chose Artportalen as my research field. I argued that we should not only focus on animals, plants and fungi as non-human others but on data as well. Data, such as the registrations in Artportalen, affect how we see and make sense of the environment. Data is never neutral. People register non-humans for various reasons (e.g. as a hobby or, for research), and they do so in different ways. Additionally, participants have different ideas about what Artportalen is supposed to be and to be used for. This then can lead to tensions and conflicts in governance processes. My second interest in my thesis, therefore, was the practices and stories connected to Artportalen and how they connect to our understanding of the environment.

I conducted nine interviews with people connected to Artportalen; they either work for the database, are birdwatchers, biologists or work for a municipality, organisation or NGO. For my analysis, I used two concepts: "data journeys" and "encounters". Data journeys focus on how data travels across and between various

sites. Encounters emphasise how humans and non-humans, including data, meet. My results indicate, among others, that although humans and non-humans meet through Artportalen, we know little about how these encounters influence non-humans such as birds. They also show that, although we treat Artportalen's map as a map of non-human others, it highlights more how humans move through nature and what they find interesting enough to report. Artportalen therefore is a map of humans. Considering how data travels, my thesis indicates that tension and conflicts can arise when data journeys come to a halt; or access to data is restricted. Both results can influence environmental governance processes. Overall, humans and non-humans must collaborate to conquer the crises of the Anthropocene.

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