Chapter 2:
METHODS

This book attempts to trace the scientific process from the initial preparations for a field trip for data collection to the processing of the data in university offices, and the development of models of the world that are created as facts through this process. In this way, I weave together material from my empirical work, which combines data from my fieldwork, with the biologists' archives that I was given access to, and my theoretical framework. I aim to highlight that which is often invisible in scientific research by following a rigorous empirical approach. I position this work in the methodological framework of anthropology and ethnography, discussing how humans make sense of the world through scientific work. I do so by attending to the not-yet-stable – the work-in-progress – and thus the processual, practical, and performative, rather than by primarily attending to stabilised scientific knowledge. This chapter sets out to provide an overview of the research design and its philosophical underpinnings, along with details of the procedures, data collection and analysis processes that took place.

Two research projects are combined in this study: the biologists' study of the social behaviour of the birds, which serves as the case study, and my ethnographic study of the biologists. Whereas the biologists use methods that are considered

exact (in a scientific sense) to study and document the behaviour of the birds, I use *soft,* qualitative methods in my ethnographic study. I address the sensory aspect from two perspectives: on the one hand, it is an ethnography about the role of the senses in biological research; on the other, I conduct my research through sensory attunement,[1] which will become visible in the empirical accounts of this study.

I study the visual traces and the raw field material of the research process. The analysis considers how such traces and materials help to categorise and structure information, taking account of the aspects that are filtered out from raw data to publication, and the transformations the visualisations undergo to arrive at the final images and represent new knowledge. The biologists and the birds are especially visible in the raw field material of the biological study; however, for publication they must be obscured. What is left are inscriptions that refer to them. In this book, I bridge the gap by bringing the biologists, the birds, and their environment back into the discourse, thereby revealing the processes that produce scientific knowledge.

Following the method of a 'patchy Anthropocene',[2] I combine disciplines in an experimental way for a critical analysis of the dynamics between the human and non-human, adding complexity rather than reducing it. In this way, I attempt to interweave the social sciences with the natural sciences to overcome dichotomies and divides. Understanding this ethnography as 'patchy' allows for 'attending to specificity without being parochial'.[3] It highlights the openness of the research and its experimental approach, as well as its incompleteness of knowing. Rather than providing

1
Sarah Pink, 'Doing Sensory Ethnography', in *Doing Sensory Ethnography,* 2009, 7–23, https://doi.org/10.4135/9781446249383.n2.

2
Anna Lowenhaupt Tsing, Andrew S. Mathews, and Nils Bubandt, 'Patchy Anthropocene: Landscape Structure, Multispecies History, and the Retooling of Anthropology: An Introduction to Supplement 20', *Current Anthropology* 60, no. S20 (2019): S186–97, https://doi.org/10.1086/703391.

3
Ibid., 187.

a seemingly exhaustive narrative 'from above', I reveal different perspectives by collecting (rather than hunting for)[4] 'patches' of stories that facilitate a reimagining of the sciences by taking in a partial perspective from below.[5] 'From below' opposes the so-called 'god's perspective' from above. Haraway associates the 'from above' view with a *neutral* scientist, a *modes witness* that quietly and invisibly observes nature from outside. However, a perspective from below also yields observations and creates different power relations that question rather than affirm hierarchies. 'From below' positioning is not outside the world it aims to study but rather situated within it; it is earthbound. Acting from below also means thinking from an entangled and involved perspective, becoming part of the research, and taking this *being part of,* and thus also being able to take on response-ability[6] seriously.

By attending to the body and senses, this ethnography explores how we might change the perspective in the sciences from a seemingly uninvolved practice 'from the outside' towards one of physical and sensory engagement, by collecting stories about the environment and bringing them together. By making these stories accessible, this endeavour also addresses questions concerning the ontological gap between nature and culture, between human and non-human, and between subjects and objects.[7]

4
Ursula K. Le Guin, 'The Carrier Bag Theory of Fiction', *The Ecocriticism Reader: Landmarks in Literary Ecology,* 1996, 149–54.

5
Cf. Haraway, 'Situated Knowledges'.

6
Haraway, *Staying with the Trouble*. In Haraway's discussion of the concept of the 'god trick', she continues that one is response-able only from a situated perspective that is grounded within the world rather than above. This plays on the duality of the meaning of being responsible for the stories that create worlds (in this case, the scientific results), but also having the ability to respond, thus creating a dialogue rather than a monologue 'from above'. Ultimately, response-ability is a question of ethics, whereas ontologies refer to questions of being, and epistemologies to questions of knowing. Situated knowledges aim to bring these together as 'ethico-onto-epistem-ology' (cf. Barad, *Meeting the Universe Halfway,* 90) instead of treating them as separate entities.

7
I refer to the term 'object' to describe the Siberian jays as the research *objects* of my case study. However, I argue that the boundary between the Siberian jays as *objects* and *subjects* is fluid and not always clearcut. Hence, where suitable, I also use the term 'research subject' to refer to the birds.

Before I elaborate further on my methodological approach and framework, I discuss the perception that anthropology 'borrows its tradition of modern fieldwork from biology (Stocking 1953) and developed from this its own robust methods for studying human worlds'.[8] This view indicates commonalities between the methods of data collection in field biology and anthropology that deserve attention.

In this case, both evolutionary biology and ethnography can be considered field sciences. Similar to design, there are thus parallels between the scientific processes I describe. I do not aim to juxtapose the two, but rather to use them to reflect on my own practices. These moments of self-reflection appear as *patches* throughout the text, mostly at the end of the chapters. As these parallels became apparent to me only during the analysis of my data, I did not collect data on my own methods while collecting data on the biologists. Instead, the patches are retrospective reflections drawn from the analysis that reveal how insights gained from studying knowledge production in evolutionary biology can contribute to social anthropological methodology.

This text draws on my fieldwork experiences, guided by grounded theory and built on participant observations,[9] as well as the analysis of the biologists' field materials gathered either directly during fieldwork or by studying their archives. Over the past five years, I accompanied Michael and his group of evolutionary biologists in their scientific process, collecting my ethnographic data during two field trips (in the spring of 2015 and 2020) to their study area in Sweden, complemented by several prepara-

8
George W. Stocking, 'The Ethnographer's Magic: Fieldwork in British Anthropology from Tylor to Malinowski', in *Observers Observed: Essays on Ethnographic Fieldwork,* 1985. As cited in: Nils Bubandt, Astrid Oberborbeck Andersen, and Rachel Cypher, 'Introduction. Rubber Boots Methods: Outline for a Multispecies Study of the Anthropocene', in *Rubber Boots Methods for the Anthropocene,* ed. Nils Bubandt, Astrid Oberborbeck Andersen, and Rachel Cypher, Doing Fieldwork in Multispecies Worlds (University of Minnesota Press, 2022), 1–36, http://www.jstor.org/stable/10.5749/j.ctv2h43983.4.

9
Kathy Charmaz, *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis* (London: SAGE, 2006); Danny L. Jorgensen, *Participant Observation: A Methodology for Human Studies* (Thousand Oaks, CA: Sage Publications, 1989); Karen O'Reilly, *Ethnographic Methods* (New York: Routledge, 2005), https://doi.org/10.4324/9780203864722.

tory and follow-up visits to their offices. Some of the most important encounters were informal conversations during laboratory visits and online meetings that focused on the progress of their research. I dedicated most of my ethnographic attention to the sensory and bodily practices of the biologists during the production of scientific output. I focus particularly on how the employment of visual tools, such as binoculars, manual note-taking, and video cameras, influences the scientific practices of observation, data collection, and knowledge production.

I shadowed one biologist each day during the two field studies, recording my observations in my field notebook and supplementing them with photographs. The biologists attracted the birds and observed them, took blood samples, gathered body data, ringed them, and conducted experiments; they recorded observations on the birds' *proximate and ultimate causes of cooperation* (cf. footnote 14 in Chapter 1) using partially formalised procedures (protocols, notebooks, sound and video recordings, side-notes, sketches, and maps) to document their data. The role of tools, media, and the formal-aesthetic decisions made throughout the process of knowledge production about birds is not of interest to the researchers and receives little to no epistemological attention. The sensory practices and bodily knowledge that accompany data collection, and thus the research process, in the natural sciences is neither reflected nor formalised. This knowledge is filtered out and disappears from the study discourse and findings. Examining data-collection practices makes it possible to study how cognitive and epistemic aspects of sensory and bodily engagement, along with their material results such as sensory capacities, notation techniques, and visual skills, contribute to scientific knowledge production and maintain their visibility.

I spent much of my time actively participating in the biologists' fieldwork, which allowed me to understand the individual

steps of their research and follow the practices that produced scientific facts. Imitating the biologists and assisting them as a pseudo-biologist allowed me to follow their thought processes and gain a more profound understanding of their work. As part of my participant observation during their daily fieldwork, I gained insight into their drafting techniques and – mainly visual – data-collection practices in the field. Insights were gained into the acquisition of data-collection skills; how these skills are used differently by the biologists depending on skill, experience, and habit; and how their drafting techniques affect their fieldwork practices.

This approach took place alongside conversations and qualitative interviews that often occurred during fieldwork, particularly when waiting for the birds and navigating the study sites. Living together in the field station – and thus witnessing each step of the fieldwork routines, which involved preparation and reflection in the mornings and evenings – and sharing spare time provided many opportunities to exchange and gain further information. In addition to this, I spent much of my time listening to the interlocutors – the biologists – arguing, planning, and discussing their fieldwork. This provided insight into how the biologists decide on a method, their individual perspectives on them, and how they work with different kinds of visual data.

As the biologists mainly work independently in the study areas, I was able to accompany each of them for several days on both of my field trips with Michael and his team. This allowed me to gain insights into their individual working styles, and their knowledge and familiarity with fieldwork and their profession in general. I noticed differences and grew to understand the nature of formalised and predetermined practices, in contrast with practices that take place at the biologists' discretion. In addition, I gained insights into how new biologists learn to conduct fieldwork for the

first time. During the data evaluation in the field camp, I observed how the team collaboratively thought, communicated, and worked based on their raw data and organisational materials. I learnt about the drafting methods employed from data collection to publication, how scientists process and digitalise their datasets, and what role different kinds of images and image production play, for instance, as representational images, operative images[10] or mnemonics. The following section introduces the evolutionary biologists' archived dataset, which I was fortunate to be given access to, and which provided a rich source of data for the study.

Archive

To follow these filtering processes and translational steps, I refer to a dataset and archive provided by the biologists in my case study. The evolutionary biologists working with Michael on Siberian jays draw on data that date back to the 1950s. Back then, Swedish school teacher and ornithologist, Folke Lindgren, began studying Siberian jays in his garden behind his house in Arvidsjaur, expanding his study site over time as birds started to disappear here because of wood logging. From 1952 to 1988, Lindgren gathered data on the birds, later monitoring up to 15 bird territories containing one bird *family* each. Lindgren was the first person to become curious about the unusual family life of these birds.

My dataset comprises more than 50 notebooks, several folders with datasheets, hard drives with video material, and digital records. These complement the field data I collected in notebooks and diaries, and through audio and video recordings. I compiled excerpts from this archive to trace the relevant

10
Martina Merz and Inge Hinterwaldner, 'Neue Bilder, Modelle und Simulationen: Zwischen Repräsentativität und Produktivität', in *Handbuch Wissenschaftssoziologie,* ed. Sabine Maasen et al. (Wiesbaden: Springer, 2012), 303–16.

processes and to identify the role of individual practices beyond the obvious. Thus far, this archive has been used only for biological analysis. Bringing this material into the field of design- and anthropology-informed STS research can provide valuable insight into scientific knowledge production from a practice-based perspective and make the process of scientific knowledge production visible.

By doing this, I expand on theories on drafting and writing in scientific knowledge production[11] by focusing on their practical aspects. Moreover, I do not refer to historical material but rather to research practices as they are currently performed in behavioural studies in evolutionary biology. Last, the use of visualisation has been widely reflected in anthropology and the social sciences,[12] allowing for its juxtaposition with the way in which visualisation and scientists themselves have been reflected in the natural sciences. Therefore, this expands the methodological discourse in the natural sciences by focusing on the specific practices and bodily, sensory, and implicit knowledge associated with scientific methods.

11
See, e.g., Nicolas Gansterer, *Drawing a Hypothesis: Figures of Thought,* ed. Gerald Bast (Wien/New York: Springer, 2011); Hoffmann and Wittmann, 'Introduction: Knowledge in the Making: Drawing and Writing as Research Techniques'; Karin Krauthausen, 'Vom Nutzen des Notierens, Verfahren des Entwurfs', in *Notieren, Skizzieren. Schreiben und Zeichnen als Verfahren des Entwurfs.,* ed. Karin Krauthausen and Omar W. Nasim (Zürich/Berlin: diaphenes, 2010), 7–26; Karin Krauthausen et al., *Notieren, Skizzieren. Schreiben und Zeichnen als Verfahren des Entwurfs,* ed. Karin Krauthausen and Omar W. Nasim (Zürich/Berlin: diaphanes, 2010); Omar W. Nasim, 'Extending the Gaze: The Temporality of Astronomical Paperwork', *Science in Context* 26, no. 2 (2013): 247–77, https://doi.org/10.1017/S0269889713000057.

12
See, e.g., Gemma Anderson, 'On Drawing as a Way of Knowing', in *Drawing as a Way of Knowing in Art and Science* (Bristol/Chicago: Intellect, 2017), 3–27; Andrew Causey, *Drawn to See: Drawings as an Ethnographic Method* (Toronto: University of Toronto Press, 2017); Emma K. Frow, 'Drawing a Line: Setting Guidelines for Digital Image Processing in Scientific Journal Articles', *Social Studies of Science* 42, no. 3 (2012): 369–92; Haidy Geismar, 'Drawing It Out', *Visual Anthropology Review* 30, no. 2 (2014): 97–113; Anna Grimshaw and Amanda Ravetz, 'Drawing with a Camera? Ethnographic Film and Transformative Anthropology', *Journal of the Royal Anthropological Institute* 21, no. 2 (2015): 255–75; Michael Guggenheim, 'The Media of Sociology: Tight or Loose Translations?', *British Journal of Sociology* 66, no. 2 (2015): 345–72; Hoffmann and Wittmann, 'Introduction: Knowledge in the Making: Drawing and Writing as Research Techniques'; Claudia Mitchell et al., 'Picturing Research', in *Picturing Research* (Rotterdam: SensePublishers, 2011), 1–16, https://doi.org/10.1007/978-94-6091-596-3_1; Michael Taussig, 'What Do Drawings Want?', *Culture, Theory and Critique* 50, no. 2–3 (2009): 263–74; Michael Taussig, *I Swear I Saw This: Drawings in Fieldwork Notebooks, Namely My Own* (Chicago: University of Chicago Press, 2011).

A critical reading of the (raw) data raises questions about how scientific knowledge acquisition is characterised primarily by visual practices. In this regard, I enquire how 'processes of classification',[13] such as the visual structuring and organisation of data, influence thinking and the acquisition of knowledge. Thus, the previously mentioned gap between the visual components of raw images and their public representation can be observed and analysed. Although the drawings and notes in the field notebooks of the collaborating biologists still appear personal, intuitive, subjective, and observant – that is, close to everyday life – these data are replaced by a scientific semiotics that represents rationality, objectivity, and reproducibility.

In addition, the scientists evolve from being in a situated practice in which they are visible in the raw data as individuals – for instance, in their handwriting – to an objectification of themselves where all traces of them are eliminated. Moreover, the images of the scientists evolve from practitioners in the field to intellectuals in offices, suggesting that the practices during fieldwork and the intellectual processing thereof can be separated. Further study of the different kinds of visual language in the biologists' field notes will provide insights into the involvement of certain practices in the construction of a scientific representation of nature. In short, I follow the material traces of the biologists to reimagine scientific work.

The following chapter provides an overview of the theoretical framework informing this study, allowing readers to combine their understanding of what took place in the field and offices of the evolutionary biologists with how the events and observations were understood.

13
Charles Goodwin, 'The Blackness of Black: Color Categories as Situated Practice', in *Discourse, Tools and Reasoning: Essays on Situated Cognition,* ed. Lauren B. Resnick et al. (New York: Springer, 1997), 111–40.