University of Tartu

Institute of Philosophy and Semiotics

Department of Semiotics

Sugata

Bhattacharya

The use of bird sound imitations and recordings among Estonian birders

Master's Thesis

Supervisor: Riin Magnus

Tartu 2019

I have written the Master's Thesis myself, independently. All of the other authors' texts, main viewpoints and all data from other resources have been referred to.

Author: ....

(*name*) (*signature*)

.....

(*date*)

I permit the thesis for defence.

Supervisor: .....

(*name*)

.....

(*signature*)

.....

(*date*)

Table of Contents

Introduction

The broader aim of the current study is to investigate how humans interact with birds using sound. More specifically, the thesis will study the types of sounds used to attract birds; the means of producing sound (which can be vocal and/or mechanical); the diversity of species which can be attracted using sound; and the behavioral and the ethical considerations of the different situations in which humans use sounds. The thesis studies the practices of bird sound imitation and the use of playbacks among Estonian birders, and is based on a survey, interviews, and participatory observations, all of which were conducted during the spring and the summer of 2018 in Estonia.

The thesis discusses concrete examples of the interaction between birders and birds in nature and the extent to which these exchanges can be influenced by using sound. The geographical area of Estonia was chosen because the use of sound by birders has not been studied in this region. The focus on sound comes in part because it is one channel of information, which is common to both humans and birds, in which signs can be both transmitted and received; thereby allowing both the actors in the interaction—birds and humans alike—to be active participants. An interaction between humans and birds using sound allows communication even when optical information cannot be exchanged between recipients; but in other settings, like daytime, the channels of sight and sound will be simultaneously used to varying degrees in any interaction.

In the contemporary world, humans live in increasingly urban environments, where humans have fewer interactions with other species compared to the past. Among the animals with whom humans still have a daily contact are birds. In urban cityscapes the most commonly encountered avian species are different types of corvids, pigeons and sparrows. In addition to these species, there are nearly 10,000 species of birds in the world—and many of these species have fascinated humans throughout history. Hence, the people who interact with birds are not just scientists from specialized fields of knowledge like ornithology, but fall along the spectrum of casual bird-watchers to serious hobbyists, who spend most of their spare time bird-watching.

According to BirdLife International, a partnership organization made up of conservation organizations from many countries, birds are widely observed by humans all over the world,

and birdwatching has become a prominent pastime over the years: “Watching birds is now one of the world’s most popular pastimes, and its appeal continues to grow” (BirdLife International 2018: 10). Today, birders, from all walks of life, engage in citizen science and help spread the message about birding in their community and on social media (Chu *et al.* 2012). The popularity of birding has been sparked, in part by the greater availability of devices, like binoculars, which allow humans to view a magnified image of birds. In his autobiography, the famous Indian ornithologist Salim Ali (1896-1987) has noted how the paucity of binoculars, in the middle of the 20th century, had hampered the popularity of birding in a poor country like India (Ali 1985). In places like North America, the rise in the popularity in birding was not simply due to the presence of binoculars, but was helped by other factors like the wide availability of birding literature and social clubs for birding:

> After World War II, binoculars became more available to the average American, and interest in the activity continued. Further advancements in books, equipment, and the social aspects of birding over the past 50 years have led to an explosive growth in interest in birding that we revisit in this article. (Cordell and Herbert 2002: 54)

In the past few decades, the advances in digital camera technology, and the availability to display images on numerous social media platforms has furthered the popularity of birding via photography—a revolution akin to the role played by the wide-scale availability of books, following the technological dispersion of the printing press. In the contemporary world, with the advent of smartphones and computers, it possible to listen to the sounds of birds which one has not encountered before. Birders, who want to improve their skills, learn the calls and the songs of birds—just like they learn about the visual features of birds through illustrations in guidebooks. Birders use sounds at home to learn to distinguish the calls of various bird species, and many birders use the recordings of birds, using speakers on their smart-phones, car-speakers and stand-alone speakers connected to sound-sources of digital recordings of birds, while observing birds in the field. However, the unrestrained use of technology can be problematic. The easy availability of technology raises ethical questions about how humans use sound, and if the use of sound has consequences for the well-being of birds. Birders not only watch birds visually using telescopes and binoculars, but use sound to draw the birds closer: “For decades, birdwatchers have been making squeaking noises, imitating owl calls, and using a variety of other methods to entice birds to approach more closely” (Zimmerling 2005: 10). In the past few years, in addition to using the human voice to mimic the sounds of birds, or using techniques like pishing and whistling, humans have increasingly used bird song recordings for both professional bird monitoring and as a part of amateur birding (e.g.,

Johnson and Maness 2018; Hahn and Silverman 2007). Heini Hediger used the term "flight-distance" to designate the smallest distance which an animal allows a human to approach before getting away from a human (Hediger 1934). Using sound allows humans to have auditory contact when visual contact is difficult (like in the dark, or when the bird is not visible to obstructions like vegetation) and can reduce the flight-distance by bringing birds closer to humans. The successful imitation of birds relies not on the ability of humans to imitate bird-specific communication using human-specific communication, but on incorporating in the human umwelt an understanding of the bird's view of the world (which can include factors like an understanding of the habitat of birds, choosing the appropriate bird sounds for imitation, and timing the imitation based on the daily habits and the life-cycle of the bird) (see also Viveiros de Castro 1998; Willerslev 2007).

Scientific surveys which monitor the population of birds, like owls, in an area have protocols which outline the procedures to be followed while using recorded playbacks (e.g., Hausleitner 2006), and scientific manuals contain information on the appropriate practices (including the use of playback) at bird ringing stations (e.g., Busse and Meissner 2015). Several studies have addressed the impact of playbacks on the behavior and reproductive success of birds (Kroodsma and Byers 1991; Catchpole and Slater 1995; Mennill *et al.* 2002). The increased use of playback by birders has resulted in debates on popular online websites about the ethical use of playback (e.g., Sen 2009; Sibley 2011), and the increased use of smartphone applications for playback has resulted in birding organizations like the National Audubon Society (U.S.A) displaying information on their website about the responsible use of playback (National Audubon Society (s.a.)). A study which observed the impact of both pishing and simulated birder playback (using sounds like amateur birders), found that more than 70% of birders, belonging to an email bulletin board (LABIRD-L@listserv.lsu.edu) in Louisiana, USA, use playback, and cautioned that people need to be careful about using sounds around wintering birds: "[…] resource managers should be judicious with the use of pishing and playback activities at sites during the winter, particularly if birds of conservation concern are present" (Johnson and Maness 2018: 136). Thus, while sound is used frequently as a part of both professional ornithological practices and amateur birding, there is a lack of research in the practices of birders using sound, and the perspectives of the birders on the use of sound. To the best of my knowledge, till date, there has been no research in Estonia which has tried to evaluate the extent to which sound is used among Estonian birders and the attitudes of the birders towards the use of sound. In addition to amateur birders, the thesis

will also analyze the use of sounds by professionals for ornithological surveys. The thesis will analyze the means of reproducing the sounds of birds; discuss how birders learn to use sound; and explore the extent to which it is used in hobby-birding, education and scientific work.

There are numerous disciplines which examine the different aspects of the interactions between humans and birds. In biology, ornithologists have focused on intensely studying the behavior of birds and the study of avian behavior is a part of ethology. On the one hand, the knowledge about birding is scattered across numerous academic publications which are mostly read by scientists. On the other hand, the majority of people interested in birds, engage in birding as a hobby, basing their information on widely available guidebooks and tapping into social networks of both primary institutions (friends and family), and secondary institutions (birding organizations, bird-guides)—borrowing the notion of primary and secondary institutions from sociology (Berger and Luckmann 1966). The interaction between organisms, which has been studied via natural sciences like biology and ecology, is often described using the language of physics and chemistry, by focusing on matter and energy, and neglecting the crucial concept of information in biology:

> Unfortunately, many contemporary researchers assess niche only through measures of energy relations, and hence, reduce a whole and dynamic system to a skimpily-looped teleology, albeit one elegantly-clad quantitatively. (Anderson *et al.* 1984: 12)

Charles Morris has defined semiosis to be "a process in which something is a sign to some organism" (Morris (1971 [1946]: 253). The use of a semiotic perspective allows us to supplement quantitative knowledge with a qualitative understanding. The discipline of semiotics, and in particular, the sub-disciplines of zoosemiotics and ecosemiotics offer us a holistic paradigm to merge the knowledge from these diverse disciplines and form an integrated picture of the interactions between birds and humans.

Zoosemiotics, a sub-discipline of semiotics, can be currently defined as follows: "[…] *the study of signification, communication and representation within and across animal species*" (Maran *et al.* 2011: 1, original in italics). In zoosemiotics the focus is not only on communication but also on other forms of semiosis in animals—because the way an animal models its world impacts what is communicated. Additionally, in zoosemiotics a barrier is not built between humans and animals, or between culture and nature; rather, the aim is to study the entirety of the informational web:

> This, however, does not mean inclination towards biological determinism, but rather acknowledging the complex intertwining of culture and biology in human–animal relations, in cultural inheritance among non-human animals and in other similar topics. (Maran *et al.* 2011: 2)

In using another sub-discipline of semiotics, ecosemiotics, there is the advantage of considering the interaction taking place amongst humans and birds, as one in which a network of actors interacts with one another using signs. The ecosemiotics approach also helps to frame an understanding of how a sound produced by a human-being using different means (like the human-voice, whistles and loud-speakers) can result in a response from a bird (or birds). The response from the birds depends on a variety of factors, and the response is neither fixed nor predictable, but can change over time. Hence, this study will be guided by the main principles of ecosemiotics which state the following:

> Ecosemiotics is a view on ecosystems as communicative systems. This means that differently from ecology or any natural science, ecosemiotics is not focusing on material aspects of the object of study but its objects are sign relations in certain space instead. More precisely, ecosemiotics is, in the broadest sense, a branch of semiotics that studies sign processes as responsible for ecological phenomena (relations between species, population patterns, and structures). In particular, it studies the role of environmental perception and conceptual categorization in the design, construction, and transformation of environmental structures. (Maran and Kull 2014: 41)

In the zoosemiotic context, human-animal relations have been studied by various authors. For example, N. Mäekivi and T. Maran have studied the semiotics of the interactions between humans and animals in zoological gardens (Mäekivi and Maran 2016); T. Maran has studied the interactions between humans and the Golden Jackal (*Canis aureus*) in Estonia (Maran 2015); K. Tüür has written about bird sounds in nature writing and human vocalization of bird sounds (Tüür 2009); J. Sueur and A. Farina have studied how animals interpret sounds in their environment (Sueur and Farina 2015); the anthropologist A. J. Whitehouse has studied how humans listen to birds in Britain, Australia and New Zealand (Whitehouse 2017); L. Kiiroja has studied the socialization of Red Foxes (*Vulpes vulpes*) in Norway (Kiiroja 2014); and M. Tønnessen has studied how wolves in Scandinavia interact with other creatures in their environment (Tønnessen 2010). These stances will be combined, in the thesis, with a cultural semiotic analysis by looking at how the change in the technology of recording and playback equipment has changed both professional and amateur birding (Baker 2001). The analysis of digital recordings, a form of new media, will be analysed using the concepts of the media theorist Lev Manovich, who states that the use of new media involves the following principles: "[…] numerical representation, modularity, automation, variability, and cultural transcoding" (Manovich 2001: 18). Overall, the methodology which will be followed will depart from the previous material and will use an ad hoc methodology rather than some

pregiven framework. The thesis will aim to develop a new bibliography in this area by combining the learnings from the various scholars mentioned above with the results obtained from the survey, the interviews and the participatory-observation activities conducted during the study.

The thesis is divided into five main chapters. The first chapter, “Research materials and methodology” presents the primary materials used for the analysis, like survey-data, interviews and supplementary material, and discusses how the material was collected and analyzed. The second chapter, “The use of sound in the umwelt of birds and the diversity of human-bird acoustic interactions” discusses the particular umwelt of birds, and the messages used by birds to communicate with each other using studies from the field of ornithology, while analyzing the findings from a zoosemiotic lens. The third chapter, “Factors influencing the human vocal imitations of bird sounds” discusses how the capabilities of humans, both in the production and the reception of sound, act as pre-condition for the communication between humans and birds. The chapter aims to illustrate how the limitations of the human voice helps guide what methods of sound-production are used in varying contexts to imitate birds. The fourth chapter, “Recordings as media of human-bird interactions” discusses the different contexts in which recordings are used in communicating with birds. The fifth chapter, “Practices and attitudes towards bird-sound imitation” discusses the use of sound in different birding-related activities and explores the ethical issues involved in the interaction between humans and birds using sound.

1. Research materials and methodology

The data for the thesis comes from three main sources: firstly, survey data from Estonian birders; secondly, seven semi-structured interviews with nine people; and finally, supplementary data in participatory-observations with birders. A survey was created to query birders about their use of bird sounds in activities related with birds (the survey can be seen in the Annex 1). The aim of the survey was to collect quantitative as well as qualitative data, which could be analyzed to draw generalizations about the different contexts in which imitation (if carried out at all) was performed by birders; the diversity of birds imitated; the means of imitation as well as attitudes towards the use of sound in birding. The questions in the survey had five sections (see Annex 1). The aim of the first section was to tabulate the list of activities undertaken by birders, ranging from scientific research to various hobbies. The survey used eight categories to span the range of activities performed by birders. The goal was to understand if there was any correlation between the use of sound and the activities engaged in by people. The second section asked birders if they used sound or not: if they used sound, they answered the third section; if they did not use sound, they proceeded to answer the fourth section. This split the participants into two groups: one which used sound and another which did not. The third section asked the birders about the different kinds of birds which could be imitated using sound. The third section allowed people to list up to five examples of imitation. Each of these possible five examples asked information regarding the following: the bird/s which was imitated; the bird/s which responded to the imitation; the type of sound used for imitation; and finally, the physical method used to produce the sound for the imitation. The goal of this section was to get a list of the species which could be imitated and to collect additional data about the birds which responded to the imitation, and the sounds and the methods used for imitation. The fourth section asked the respondent about their opinion about the use of sound in birdwatching. The fourth section was answered both by people who used sound and those who did not use sound, and would thereby clarify if there were major differences in opinion between people who used sound and those who did not use sound. The fifth and final section of the survey asked people to enter basic

demographic information about age, gender and nationality. The fifth section also asked people if they wanted to volunteer to take part in an interview for 30-45 minutes to provide additional information on this topic. Overall, the survey was designed so that people could complete it in 5-10 minutes. The survey, which had the same content in the online and paper format, was distributed at the following places:

1) Online email list-server "Linnuhuvilised"—which consists of birding enthusiasts in Estonia.
2) Online at a Facebook group of birders in Estonia (Eesti Ornitoloogiaühing; Website: https://www.facebook.com/groups/234754490272/)
3) Paper-survey: at the annual meeting (30.06.2018 and 01.07.2018) of the Estonian Ornithological Society at Alam-Pedja, Estonia.
4) Paper-survey: at a choir comprising of university students studying biology.

As mentioned above, the surveys were supplemented by in-depth half-structured interviews, in order to understand the rationale of using sound in birding and the experiences of people, who are imitating birds. The format of a semi-structured interview was chosen, as this offers a "flexibility balanced by structure" (Gillham 2005: 70). However, a semi-structured interview is not without flaws because one needs to prepare in advance with a list of questions; and additionally, interpreting and presenting the interview can take effort (Gillham 2005). Factoring in the ideas, stated by Gillham, we decided to go in for a semi-structured interview for our study in order to gain a richer understanding about the use of sound by birders. The method was to ask interviewee the standard list of questions, but we allowed for flexibility by asking the interviewees for clarifications if anything they had stated was unclear. Finally, near the end of each interview we asked the interviewees to let us know if we had missed any topic; thereby allowing the interviewee to address any issue that might have been skipped during the course of the interview. Thus, the paper survey was supplemented with seven semi-structured interviews with nine people (and each person who was interviewed also filled out the survey—if they had not already filled out the survey). The questions asked during the interviews and the interviews are shown in Annex 2. The initial set of people chosen for the interviews were those people who had said in their survey response that they would be willing to be interviewed. The initial interviewees were people who were involved in birding activities like scientific research, education and in hobby-birding; and they raised some concerns in the interviews that the use of sound is prevalent in activities like bird-ringing and tourism. Based on this information from the interviewees,

research on the internet and local contacts, we contacted people who were engaged in bird-ringing and tourism in order to get their perspective on the use of sound. All the interviews lasted between 30-60 minutes. We obtained consent from the interviewees to record their conversation and notified them that the data would be used both for the thesis and possible academic articles. The names of the interviewees have been changed to interviewee 1 through 9, in order to preserve the anonymity of the sources. All the interviews except one were conducted in English. One of the interviews was conducted in Estonian, and was translated into English by Riin Magnus. However, there were short sections in some of the interviews which were in Estonian—these were translated to English either during the interview or later during the process of transcription. Some of the interviewees interchangeably used the names of birds in Estonian, English and Latin—all these names have been translated into English (with their Latin names in brackets where needed). In cases where the same bird is mentioned multiple times during the same interview, the Latin name has been provided at the first instance the name of the bird was used. Subsequently, the bird is referred to only by its English name. The interviews have also been edited for ease of reading—including minor corrections to grammar; combining some sections into one (by deleting interjections by participants in the interview and so on); and deleting repeated words in the conversation, etc.

Supplementary material for the thesis was gathered by taking notes and photographs during birding trips with some local birders; a visit to a bird-ringing station at Vaibla, Estonia; and by becoming a participant-observer with students who were taught how to observe birds in a Tartu cemetery by ornithologists. In addition to noting if sound was used for imitation at each event, information regarding the species observed was noted down. The voice of a birder imitating a bird was recorded during one birding trip (see Figure 4). The voice of the author was recorded in order to show the spectrogram of the human voice (discussed in Chapter 3). The online data base "Xeno-canto" (Website: https://www.xeno-canto.org/) was accessed in order to obtain recordings of bird voices. The free software tool, Audacity (Website: https://www.audacityteam.org/), running on an Apple computer, was used to process the sound-recordings (discussed above) and create spectrographs for analysis.

Using terms from the U.S. American anthropologist Clifford Geertz, the analysis of each chapter will try to use the notion of "thick description" (Geertz 1973: 9), which Geertz said is the undertaking to report a phenomena with a description that tries to explain the meaning of the observations in context: "Analysis, then, is sorting out the structures of signification" (Geertz 1973: 9). Finding the meaning lies at the heart of semiotics, and the historian and

semiotician, Brooke Williams, has observed that the way to undertake semiotic analysis is to assess and re-assess the signs in the data using abduction, deduction and induction:

> […] wherein the development of a hypothesis or 'new idea' (abduction) contrasts alike with the internal elaboration of consequences of the hypothesis (deduction) and the testing of the hypothesis through its consequences (induction). This testing, in turn (inevitably, if fitfully), leads to new and further abductions. (Williams 1991: 410)

The analysis of the data in the thesis has followed the principles outlined by Williams above. The primary analysis of the data was done by tabulating and plotting the data from the survey to see the trends in the data. Any patterns in the tables and plots from the survey will contain signs of clues about the behavior of birds and people. The clues to the ideas that can explain the tables and the plots can come from the interviews and/or previous scientific research in the area. Thus, each chapter engages in semiotic analysis by a combination of using previous studies; data from the survey; the interviews; and supplementary sources, by seeking to understand a semiotic basis for the phenomena under study.

2. The use of sound in the umwelt of birds

The umwelt of an organism can be considered to be the subjective world of the organism (Uexküll 1982). The way each animal perceives the world is subjective and is in part determined by the physical and information processing capabilities of the organism (which can involve complex feedback-loops across different systems in the organism). In the domain of sound, the organs which are used to produce and perceive sounds vary across species. In order for an interaction to take place between two organisms, there needs to be an overlap in their Umwelten:

> [s]ome signs in one Umwelt are put into a correspondence with some signs in another Umwelt. [...]For it to be possible for translation to occur, there must be a certain connection, or overlapping, between the Umwelten. (Kull and Torop 2003: 318)

A factor which allows this overlap of meanings to take place is the notion of the evolution as "existential poker" (Slobodkin 1968): life is an open-ended system, and thus using the analogy of poker anything which works, as long as it is not terminally deleterious to the organism, can potentially work. The notion of exaptation demonstrates that a part of a biological system may evolve for one purpose (like bird-feathers for thermal regulation); but exaptation may result in the part being used for some other purpose, like in the case of feathers, a thermo-regulatory organ being used for flight; and the role of any organ, like feathers in wings is open-ended—feathers are not just for flight but may be used for other purposes, like an African Egret (*Egretta ardesiaca*) using its wings to create a shadow to help in fishing (Gould and Vrba 1982: 7-8). Thus, organisms which have capabilities to produce and hear sound, may use these capabilities to listen to and produce sounds of other species. Sounds can be interpreted and used by different species, in contexts other than that of the explicit intention of the sender. There is no exactness in the system which implies that the system only responds to a pre-given exact input; if the quality of a sign is good enough (falls within a recognition window), it can be a source of meaning to organisms—even when the

organisms, sending and receiving the signals[1], belong to different species. Thus, while some organisms can produce sounds which are species-specific, there may be other organisms like the Fork-tailed Drongo (*Dicrurus adsimilis*) which is capable of mimicking the sounds of other creatures, and can use this for the evolutionary advantage of stealing food from other animals (Flower 2011).

The overlap of communication between humans and animals can take many forms. In the case of co-domesticated companions like dogs, studies have shown that dogs can follow human gaze (Téglás *et al.* 2012) and pointing gestures (Miklósi *et al.* 2005). In the domain of sound, dogs routinely respond to their name, and highly-trained dogs can even be trained to learn the labels of more than 200 different objects (Kaminski *et al.* 2005). Wild animals in captive situations, like circuses, also follow human vocal commands, though the interaction is supplemented by the interpretation of the body postures of the humans and the animals involved in the interaction (Hediger 1950). Many birds like parrots, can also mimic the human voice and a famous example is the African grey parrot, Alex, who took part in language learning experiments with Irene Pepperberg (Pepperberg 2009). When wild animals respond to a sound produced by a human, the response may depend on prior interactions of the animals with humans. According to a study, American crows (*Corvus brachyrhynchos*), which live in close proximity to humans, can pay attention to the human-gaze, and not facial-expressions, to change their behavior around humans (Clucas *et al.* 2013). Another study showed that American crows have the ability to recognize and remember human faces and pass this knowledge on to other crows who have not encountered the face before (Marzluff *et al.* 2010). Thus, any interaction between humans and birds, even when carried out using solely acoustic means, can be affected by information from other sensory means of perception. The interaction between humans and wild birds is different from an interaction between humans and trained animals. The use of sounds by humans to attract birds can be considered to be a form of mimicry where humans use different sounds to engage in

[1] Although in semiotics, a "signal" is considered to be one kind of sign: "A signal may be defined as a univocal sign, or better as a sign with the lowest degrees of plurivocality" (Petrilli 2001:324), in this thesis the term "signal" will be used synonymously with "sign" because the thesis uses both biological and semiotic sources.

interactions with other creatures. An understanding of the range of sounds used by birds to model their umwelt can help us understand the repertoire of sounds which are available for humans to interact with birds.

2.1. Sound production and reception in birds

In the case of birds and humans, the presence of a common acoustic channel allows both these organisms to exchange signals in the same medium. The organs producing sound in humans and birds are different, and thus the sounds produced vary in physical measurements like amplitude and frequency based on the characteristics of the vocal organs. In the case of birds and humans, the organs for the production and detection of sound have differences in structure—though, broadly speaking, they work by the absorption or emission of sound energy using the common channel of air. The organ for the production of sounds in birds is the syrinx, while humans use the vocal-chord to produce sounds. The detection of sounds in birds is done by the inner-ear, while humans like many mammals have a visible outer-ear and an inner-ear. The following sections will discuss some of the anatomical aspects of these organs in birds. The next chapter, chapter 3, will discuss some psychological and lingua-cultural factors which affect the production and reception of sound in humans.

Birds have to differentiate both amongst individuals of their own species and those of other species and map their environment for food and shelter. The mapping of the world is done using different sensory organs of the birds. The organs of sight and sound are the most common in birds, though many birds like gulls have been shown to have keen olfactory capabilities (Navarro *et al.* 2016).

There is considerable variation in the syrinx organs across different bird species, both phylogenetically and ontogenetically, and consequently a variation in their ability to produce sounds. Some birds, like New World Vultures lacks a syrinx or a voice box (Campbell 2014). In the case of a bird commonly seen in Estonia, the White Stork (*Ciconia ciconia*); the adults have been observed to not produce many sounds. Although white stork adults sometimes produce a barely audible hiss; the sound most commonly heard by humans is loud bill-clattering. The repertoire of sounds produced by young storks is larger and includes different kinds of begging-calls for food (Cramp 1977). Birds use the acoustic channel to monitor their

environment which can include their conspecifics, other organisms in their environment and sources of food. Although to humans the sound of one bird may sound quite similar to that of other birds though a study has shown that birds like parrots not only distinguish the sounds emitted by other individual parrots, but can use their mimicry skills to reproduce the sound of an absent bird (Balsby *et al.* 2012). Jon Young discusses how birds in a given environment keep a close tab on their predators and emit alarm calls to warn other birds about potential predators, and their sense of perception of danger can be keener than humans—Young cites an example of a Pacific Wren emitting an alarm call for a weasel even though Young, who had been living in the area for more than 10 years, had never seen a weasel (Young 2012: 173-174). Nest parasites like cuckoos have been observed to take advantage of the response to these warning calls to fool the host of a nest in order to make it easier for them to lay eggs (York and Davies 2017). The use of mimicry for defense is illustrated by the calls of birds, like Brown Thornbills (*Acanthiza pusilla*), which mimic the sounds of a larger predator (like an *Accipiter* hawk) in order to scare their main nest predators, Pied Currawongs (*Strepera graculina*), away from its nest; and the resulting distraction provides the Brown Thornbill nestlings with a greater chance to escape (Igic *et al.* 2015). In nature, cross-species communication also happens because many species respond to the alarm calls of other species. Birds, like fork-tailed drongos (*Dicrurus adsimilis*), trick other animals to leave food by mimicking calls which are specific to drongos, and also emit false-calls which are the alarm calls of other species. The zoologist T. Flower has performed experiments using the recorded sounds of alarm calls of different species, and stated the following:

> Furthermore, I demonstrate by playback experiments that two of these species, meerkats (*Suricata suricatta*) and pied babblers (*Turdoides bicolor*), are deceived by both drongo-specific and mimicked false alarm calls. (Flower 2011: 1548)

The primatologist, Frans de Waal, has cautioned us about the pitfalls of measuring intelligence in other species (de Waal 2016). Nevertheless, the studies on the use of sound and visual perception by birds show that birds are animals who can act in ways which might be called intelligent by humans: birds do not respond to signals like Newtonian particles—their response is variable and contextual; birds can learn from their life experiences; and be both fooled by and fool other animals using the channel of sound. The current research thus indicates that in many ways birds are equal to humans in the way they perceive and produce sounds. Birds like humans can recognize individual voices in their conspecifics, and can also imitate their voices if needed. In addition, many birds imitate the sounds of other birds and other animals—whether of their own species or that of other species for different purposes.

Thus, when a human is producing a sound in the field, there can be many reasons as to why a human may not get the expected response from a bird—perhaps the bird recognizes that the sound being produced is by a human being, and even a specific human being—and may thus choose to ignore the signal.

2.2. Classification of types of bird sounds

One of the first birds to be studied in detail in terms of the types of sounds was the Chaffinch (*Fringilla coelebs*), and observations made by Peter Marler showed that the chaffinches he studied were capable of twenty-one different signals:

> The 14 basic calls are flight, social, aggressive and injury calls, three alarm calls, subsong and song, three courtship calls and the begging calls of nestlings and fledglings. With their variations they give 21 different signals. (Marler 1956: 231)

Broadly speaking, the categories of sounds produced by birds can be split into two categories: (A) bird-songs, which are usually longer, and are usually used to attract mates; (B) bird-calls, which are shorter. Thus, based on duration, the longer sound sequences of the Chaffinch, studied by Marler (Marler 1956) would be the subsong and the song, and these are used for attracting mates, while the rest of the sounds can be classified as calls. In the case of the Chaffinch, different calls, which are shorter in duration, can have different functions like flight calls which contain information warning about predators, begging calls, used by the offspring to inform their parent birds about the state of hunger, and so on (Marler 1956). While the distinction between songs and calls is not sharp, a classification can be made as follows:

> Thus, songs are considered to be vocal displays usually of a complex set of notes that are repeated and, in north temperate regions, are typical utterances of males defending territories during breeding season. Calls, by contrast, tend to be shorter and of simpler structure than songs and are commonly given by both sexes. (Baker 2001: 8)

Other scientists have also proposed this two-fold classification of the sounds of birds into songs and calls (Tinbergen 1939; Thorpe 1956; Catchpole and Slater 1995). A textbook on ornithology (Gill 1995), has noted that while the classification of sounds into songs and calls is arbitrary, it is a useful distinction even though it is not perfect.

Ornithologists have recently recognized that an unfortunate bias in the knowledge about bird song is the notion that bird song is considered to be a male trait (Odom and Benedict 2018); this bias in part stems from the fact that the initial bird song research was performed in northern temperate climates by scientists who observed the most easily accessible species close to their home bases like Peter Marler studying Chaffinches in Europe (Marler 1956). Thus, ornithologists have called upon researchers to close the gaps in our understanding by documenting the songs of female birds:

> Bird song has traditionally been studied as an elaborate male trait, but female song is also widespread in both temperate and tropical species and likely evolved in the early ancestors of modern songbirds. However, female song is underrepresented in biological collections compared to male song, and we lack documentation of female songs for most songbird species. […] Therefore, we call on all researchers to disseminate their observations of female bird song, and to spread the word among other researchers, students, field technicians, and citizen scientists that many female songbirds sing. (Odom and Benedict 2018: 314)

The complexity of the social organization of birds and the ability of both sexes to sing varies considerably from species to species, and one such example is that of the Alpine Accentor (*Prunella collaris*) in which scientists found that, both males and females sing and female song attracts males—but not females; and may offer evolutionary advantages by increasing the survival of the species (Langmore *et al.* 1996).

The semiotician, C.S. Peirce, has defined a "sign" to be a triadic relation consisting of three objects, a "sign" (or "representamen"), an "object" and an "interpretant" as follows:

> A *Sign*, or *Representamen*, is a First which stands in such a genuine triadic relation to a Second, called its *Object*, as to be capable of determining a Third, called its *Interpretant*, to assume the same triadic relation to its Object in which it stands itself to the same Object. (CP 2.274)

Peter Marler observed twenty-one different vocal signals in the Chaffinch (Marler 1956). Any of the twenty-one signals of a chaffinch can be seen as a sign. For example, we may consider a chaffinch emitting an alarm call for a predator which is heard by another chaffinch. In this case, the triadic relation is formed between the "representamen", "the object", and the "interpretant" as follows: the alarm call is the "representamen", the "object" is the predator, and the association that the other chaffinch establishes between the call and the predator is the "interpretant". Thus, the classification of the signals emitted by a chaffinch can be seen to have a functional role in the life of the organism—each signal has a certain function. A call for flight has the functional equivalent of being interpreted as a call for flight, a begging call by a nestling is a call for food, and so on. The interpreter of the "representamen" is free to decide on the course of action depending on the context—the

chaffinch hearing the begging call for food from a particular nestling might decide to feed the nestling or decide to feed a different nestling in the nest.

The functional nature of the calls described by Marler can be classified into the categories of the functional circles described by Jakob von Uexküll (Uexküll 2010 [1940]). Uexküll has a four-fold classification of the significant functional circles: “The most important functional circles found in most Umwelts are the circles of physical medium, food, enemy and sex” (Uexküll 2010 [1940]: 33). Thus a flight call can be considered to be a part of the functional circle of the “physical medium”, a begging call is a part of the functional circle for “food”, an alarm call is a part of the functional circle for “enemy” and a song is a part of the functional circle for “sex”. All of the calls of the animals do not map into these four principal functional circles: for example, social calls or injury calls do not fall into these main categories. Thus, there can be additional functional circles in the lives of an animal.

According to Uexküll, the subjective world of the animal, termed the Umwelt, determines how an animal reacts to the signs it perceives in its environment (Uexküll 1982). An animal only reacts to objects in its environment if it perceives the object as meaningful. The following experiment (described in Uexküll 1992: 354-355) exemplifies how meanings are conveyed through particular perceptual cues and how the interpretation of cues can help us understand the umwelt of a hen and her chick. The aim of the investigation was to investigate whether a mother hen pays attention to visual or vocal cues in responding to a chick in distress. This was done by examining two separate cases such that only one of the cues, either the vocal or the visual, was received by the mother hen. A chick is capable of emitting cues both visually and vocally. In one case, a chick was kept hidden behind a wall and was kept from moving by attaching its leg to a peg, and the inability to move caused the chick to emit a distress call, with the result that the mother hen would rush to the aid of the chick on hearing the distress call. Thus, when the chick was hidden behind a wall, the mother hen could hear the chick, but not see the chick. In the second case, a glass jar was placed on the same chick, with the result that the hen could not hear the chick (though the chick emitted signs of distress through visual cues which was visible to the mother hen), and the mother hen did not come to the aid of the chick. According to Uexküll, the explanation for the behavior of the mother hen could be understood by considering that in the umwelt of the mother hen danger to the chick is associated with the sign (the distress call of the chick) from the auditory channel; but if the mother hen could not hear the distress call, the mother hen did not consider her chick to be in danger—even though she could see a chick (which appears in

distress to the human observer): “The struggling, but not-peeping chick is not a sensory cue that would release a specific activity” (Uexküll 1992: 354). Thus, when humans observe activities in the world of other animals, humans should be aware that the meaning they attribute to an observation can be different from that given to the same event by other organisms.

The number of calls varies with the species and some species have more alarm calls than others. Peter Marler notes that studies on the domestic chicken (*Gallus gallus domesticus*) have shown that chickens have twice the total number of calls compared to chaffinches (Marler 2004b: 135). In the extreme case, birds, like parrots, can change the call structure based on who the bird is communicating with, and there can be individual variations in calls, and thus using a simple system to classify parrot calls can be problematic: “With such complexities, a simple call typology can hardly capture the potential of these parrot calls for communicative complexities, although it can still serve to highlight issues of interest” (Marler 2004b: 137). Marler observes that the lifestyle of a species can influence the differences in the song and the call systems of birds by noting that birds like the Galliforms (like domestic chickens), corvids (like ravens) and parrots which have complex social lives with hierarchies have a large number of calls; while songbirds in temperate zones (like chaffinches) have a looser-social structure and in general have a smaller call repertoire (Marler 2004b).

Bird vocalizations can vary with geography and the differences have been called dialects. Some scientists can imitate their studied subjects to a remarkable degree of accuracy as shown by this statement about Luis Felipe Baptista: “A great source of amusement and amazement for those who were privileged to hear Luis report on his white-crowned sparrow songs were his precise imitations of their dialects” (Bowman 2004: xii). Baptista also studied chaffinches, and noted the dialectical variations in the rain call of the Chaffinch (*Fringilla coelebs*) (Baptista 1990). The plasticity of bird-calls can be demonstrated by the observation that different sounds can come to stand in for the same function: “In the greater part of Finland, the rain call of the male Chaffinch is hüitt, but in the south of the vast SW archipelago of Finland “hüitt” was found to be replaced by “rriip””(Haartman and Numers 1992: 65).

The majority of recorded bird sounds are emitted by the birds from a distance—thus only long-range calls are over-represented in databases of bird recordings. Heini Hediger coined

the term “flight-distance” to denote the shortest distance that an animal permits a human to approach before fleeing (Hediger 1934). Thus, the experimental conditions have a bearing on what kinds of sounds are measured. Birds, like other animals, have a flight-distance which varies across species, and any sound that humans hear, record or make in the wild is influenced by this “flight-distance”. Recent experiments have tried to overcome the limitations imposed by the flight distance by documenting the range of calls in birds like zebra finches (*Taeniopygia guttata*) by recording the individual vocalizations using “on-bird microphone transmitters” in an indoor setting (Gill *et al.* 2015). Any listing for a set of calls for a given bird will have variations due to the characteristics of the individual, the sex, the distance of recording and the conditions of recording (one may not hear a “rain-call” in good weather), the ontogeny of the bird, the geography and a bird may even learn new calls over the course of its life. Thus, any list of sounds can be considered to be a partial and not a full account of the capabilities of the organism.

2.3. Different aspects of sign use: zoosyntactics, zoosemantics and zoopragmatics

The semiotician, T.A. Sebeok has proposed the concepts of zoosyntactics, zoosemantics and zoopragmatics to differentiate the different aspects of sign use between organisms. Sebeok defined these terms as follows:

> […] zoosyntactics […] deals with combinations of signs abstracted from their specific signification or their ecological setting. Zoosemantics is devoted to the signification of signs, and must take account of the context referred to by the source and apprehensible by the destination; this is the least well understood dimension of animal communication studies.
> Zoopragmatics may be said to deal with the origin of signs in the source, or sender, the propagation of signs through a medium, or channel, and the effect of signs on the destination, or receiver. (Sebeok 2011 [1990]: 83)

The following sections will discuss the zoosyntactic, the zoosemantics, and the zoopragmatic aspects of bird sound imitation by bringing in examples from various contexts involving interactions between humans and birds.

2.3.1. Zoosyntactics

We may first consider the use of a song by a human to attract a bird. In a natural setting, a bird sings the song in order to perform a function—which can vary for the bird. In a hypothetical case, the bird could sing the song for practice or to attract a mate. In the context of the bird, the singing of the song can be combined with other signs like a singing-duet with a partner, a courtship ritual or to bring attention to a nesting-site by flying around the nest. Analyzing this situation using the angle of zoosyntactics, the choice of using the song to attract a bird is made by a human from a number of different types of sounds that are used by the bird—songs, anxiety-calls, invitation-calls and so on. Thus, the zoosyntactics of the combination of signs for a bird can be different from that of a human using only the song as a sign.

One of the interviewees, who studies birds for scientific work, discussed the choice of recordings available for playback when studying birds. In the case of the Ortolan bunting (*Emberiza hortulana*), the use of a recording from Finland (instead of a local recording from Estonia—or other European countries) was found to be more effective, while in the case of the Corn Crake (*Crex crex*), the birds responded better to a certain recording—which to a human appears to be an aggressive variation of the Corn Crake call :

> So what we did in the Ortolan bunting, we are using sound recordings from Finland. We also tried from Sweden, and also from Germany or something. But the best recording, is the Finland recording. For the corn-crake, what we did, when the bird is calling, the calling is also a little bit more aggressive. Corn-crake voice is like “crex” “crex” “crex” “crex”. Something like this. But they also prefer a little bit, this is also what we think, they want a little bit more aggressive voices—higher frequency and higher speed crex-crex. So faster sound. (Interviewee 3, male 35)[2]

Thus, in zoosyntactic terms, the choice of the sign—which can be from a different geographical area, or have other characteristics (which might appear aggressive to a human, but could potentially have other meanings for a bird)—can have a crucial impact on the interaction between birds and humans.

[2] Here, and elsewhere in the thesis, the gender and the age of the interviewees are marked in brackets.

2.3.2. Zoosemantics

From a zoosemantic perspective, the response of a bird to a sign can vary widely depending on the context. Animals do not respond to the same signal in the same manner all the time—they have the freedom to change their behavior depending on the circumstances. In general, it is not possible to find out why a certain behavior takes places without knowing the context; only careful observations can help us unearth patterns in behavior as seen from the variable response of the Carolina wren (*Thryothorus ludovicianus*) to the same song:

> An experimenter playing back recorded songs to birds at different distances cannot judge whether a subject fails to hear a song or chooses to ignore it. Carolina Wrens, however, provide an opportunity for differentiating these two possibilities. In natural circumstances, Carolina Wrens respond to songs broad-cast within their own territory by silent approach and agonistic calls rather than song. In contrast, a song from an adjacent territory stimulates a wren to sing. (Wiley and Richards 1983: 164)

One interviewee commented on how the change in the behavior of birds during the life-cycle of the bird affects the response of the bird to the same signal:

> I think, the time when they are more territorial; like the mating season, because if they already have nestlings then they are too busy; they may be too tired to respond. And if it is cold winter time, they are just more anxious to survive and not so anxious to fight for every bit of territory; and to answer to every intruder, which could easily just be another bird passing by, and they themselves do not bother to find out if it is a serious competitor or not. (Interviewee 9, male 35)

Thus, a human cannot be fully aware of the context of each individual bird, but they can guess some of the contextual information based on the species. This information can include prior learnings from the behavior of the species, and can include information about the season of the year and the corresponding life-cycle of the bird. Awareness of these factors can help a human understand why certain contexts increase the probability of a response from the bird (say during the mating season), while other contexts can reduce the chances of hearing a response from the bird (say when the bird already has nestlings).

In the case of sound, a part of the semantic content stems from being able to accurately locate the source of a sound—but not all sounds are equally easy to locate. In terms of energy, the energy content in a sound with a pure-tone and a sound with a lot of varying frequencies will be the same; however, from an informational or semiotic perspective, these sounds are radically different. The differences in the rate of arrival of different frequencies play a role in the location of sound by an organism—when these cues are removed, like in a case of a sound with a single frequency, the ability of an organism to locate the source of the sound in

the environment diminishes. Peter Marler notes that there is an advantage to having a call which consists of pure tone: “Students of audition have long known that broadband sounds, containing a wide range of frequencies are easier to locate than narrowband pure tones” (Marler 2004b: 140). In the case of humans, this means that a sound containing a single frequency is almost impossible to locate: “But it is impossible, while blindfolded, to judge accurately whether a neutral buzzer, at a constant distance, is directly before or behind one and, similarly, whether directly overhead or underfoot” (Carpenter and McLuhan 1960: 68). This feature of a pure-tone sound is a part of some avian signalling systems. Alarm calls for aerial predators, like hawks, are high-pitched narrow-bandwidth sounds, and a number of species have similar calls including European birds like the Blackbird (*Turdus merula*), the Chaffinch (*Fringilla coelebs*) and the Blue-tit (*Cyanistes caeruleus*), and thus if these calls are used sparingly they make the perfect alarm-call—hard to locate, short, and carrying important information (Marler 2004b). The call of the Hazel Grouse (*Tetrastes bonasia*), shown in Figure 6 also fulfills these criteria. A study performed on a pair of animals in a prey-predator relationship with the Great Tit (*Parus major*) as the prey and the European Sparrowhawk (*Accipiter nisus*) as its predator found that the high frequency alarm calls used by the prey (the Great Tit) have the additional advantage that the sound may not be heard by the predator (the European Sparrowhawk): “In contrast, the “seeet” call, an alarm call given mainly in response to distant flying sparrowhawks, can only be heard well by the tit” (Klump *et al.* 1986: 317).

2.3.3. Zoopragmatics

Among the zoopragmatic aspects to consider are the properties of the medium through which the signal travels. For example, consider the mention of the word “wind” in three interviews:

> There are also other factors like wind, so if the wind is a great distraction, then you cannot hear the owls, and the owls cannot hear you. The wind is the same factor with all the species you try to have contact with. (Interviewee 9, male 35)

> Usually, but if we do night tours, during night time, then it is hard to use your visible senses. Sound works. Like during sunset the wind is really weak, and the sound will reach more far, then it has more ethics. (Interviewee 2, male 21)

> All the factors were right. The timing was when the previous observation was made. The place was the same, and it was nice. There was no wind and no clouds. Yeah! The bird was not interested or in the right mood. I do not know. (Interviewee 5, male 47)

All three cases illustrate that the condition of the channel has an important bearing on the outcome of the interaction. In the case of birding at night, the channel of sight cannot be used—because humans cannot see well at night; but the use of the channel of sound can only be done if there is not a degradation in the transmission of the signal due to wind. The decision to go birding might be cancelled if there is wind or one might choose a certain time of the day, like during a sunset, to increase the chances of low interference due to wind. Finally, even if all the conditions are met, there is no guarantee of a response from a bird.

In addition to the channel conditions, the reaction of the receiver to the signal can have an impact on the outcome. The reaction to sound varies with species—some birds like wrens—which can be hard to find visually—respond to playback; while others, like certain kinds of hummingbirds, might be driven away from the source of the sound:

> Luis Baptista always used playback when teaching in his Sierra Nevada summer bird course. In the neotropics he found playback to be a very effective way to positively identify wrens, which are highly vocal but extremely elusive in dense underbrush. However, this technique was almost useless with certain hummingbird species such as green violet-ears that tend to flee from playback […]. (Gaunt and McCallum 2004: 349)

In conclusion, Sebeok's three-way splitting of the study of the interaction between humans and birds into the holistic components of zoosyntactics, zoosemantics, and zoopragmatics, helps frame the interaction as comprised of signs perceived in an environment between organisms and the failure to account for any of these aspects of the interaction can reduce the understanding of the meaningful content of the interaction.

2.4. Comparing human language and animal communication systems

There are a number of contrasts and similarities between human language and the communication systems used by animals (including birds). A primary reason for this distinction is the difference between the signs used to communicate (which can be sounds in the acoustic domain; sign-languages and writing in the visual domain), and the deep-structure of human language. The mimicry of human speech, like a bird like a raven or parrot

mimicking a human voice, does not imply that the imitator knows the language. While it is common knowledge that birds like parrots can mimic human speech, humans are surprised when parrots can learn to do tasks, like Rocco, an African Grey Parrot, ordering online using an internet-based voice-recognition machine (NAWT 2018). Rocco's ability to figure out how to do a task is similar to what was done by another African Grey Parrot, Alex, who spent more than thirty years in a laboratory learning to perform tasks using the model-rival technique (Pepperberg 2009). While some linguists have claimed that human children have a hypothetical module in the brain called the Language Acquisition Device, which accounts for the innate ability of humans to acquire language (Chomsky 1965: 25), other scientists have observed that the way humans acquire language is a multi-step process which can involve different strategies of learning:

> In the new usage-based approach (which includes ideas from functional linguistics, cognitive linguistics and construction grammar), children are not born with a universal, dedicated tool for learning grammar. Instead they inherit the mental equivalent of a Swiss Army knife: a set of general-purpose tools—such as categorization, the reading of communicative intentions, and analogy making, with which children build grammatical categories and rules from the language they hear around them. (Ibbotson and Tomasello 2016: 74)

While Chomsky's theory would rule out the abilities of other species to learn a human language, using a "Swiss Army knife" approach implies that it is possible to teach some aspects of human language, like say categorization, which was demonstrated in an African Grey Parrot by Irene Pepperberg (Pepperberg 2009), to other species. Additionally, Gregory Bateson, using the term "preverbal mammals" to designate mammals not using human language, contends that the communication mechanisms in animals do not follow the behavior of humans in similar situations: "[…] their discourse is primarily about the rules and the contingencies of relationship" (Bateson 1999 [1972] : 366-367). Bateson contends that this can be seen in the behavior of animals like a domestic cat, which requests food from humans by replicating the action of a kitten towards a mother cat, with the result that the human has to deduce that the cat is in a dependent relation and needs food. Thus, Bateson opines that we should not think of the actions of a cat begging for food, as a direct cry for food, but an exaptation of the behavior of a kitten (Bateson 1999 [1972]).

T.A. Sebeok has cautioned against using the term "language" for non-human animals, because Sebeok has maintained that only humans possess "syntax":

> Language itself is, properly speaking, a secondary modelling system, by virtue of the all-but-singular fact that it incorporates a syntactic component (for there is, as far as we know, no other such component in zoosemiotic systems, although this feature does abound in endosemiotic systems, such as

> the genetic code, the immune code, the metabolic code, and the neural code). Syntax makes it possible for hominids not only to represent immediate 'reality' (in the sense discussed above), but also, uniquely among animals, to frame an indefinite number of possible worlds. (Sebeok 2001 [1994]: 149)

Sebeok does not deny that animal communication can be analysed from a "zoosyntactic" angle—but maintains that animals do not have "syntax". The cognitive ethologist, Donald Griffin, has investigated the mental activity of animals (Griffin 1994). The differences of opinion between cognitive ethologists, like Griffin, and linguists, like Sebeok, who reserve the term "language" for only humans are discussed by semioticians (e.g., Maran 2010). Peter Marler has proposed the concept of "phonological syntax" to describe the order in which sets of units are arranged in a particular sequence (Marler 1977). Nathan Pieplow has recorded how many birds repeat patterns in their song, and the repetition can be classified into different varieties as follows:

> Birds can sing with *no variety*, when consecutive phrases are always the same; *alternating variety*, in which two song types alternate back and forth; *eventual variety*, in which the bird sings one song type repeatedly, then switches to another which it repeats for a while; *immediate variety*, in which consecutive song types are always different; and *variable variety*, which is like immediate variety, except that consecutive song phrases are repeated now and then […]. (Pieplow 2007: 54)

The different sequences used in bird-songs can be analysed using Markov sequences (Dobson and Lemon 1979). Others who have also studied the syntactic components of birdsongs using similar methods, have noted that while birdsong may have phonological syntax, birdsongs do not have nested dependencies like human syntax, and changes in the sequence of elements in a birdsong alters the strength of the message without changing the type of the message: "[…] because of the lack of semantics in birdsong, […] song sequence changes typically alter message strength but not message type" (Berwick *et al.* 2011:120).

In addition to songs, the study of syntax in the sounds of birds has been conducted in the use of calls. A playback study conducted on the Japanese Great Tit (*Parus minor*), a bird with more than ten different vocal notes either singularly or in combination, changed the order of notes to find that the order of notes can change the behavior of the birds:

> Experiments reveal that receivers extract different meanings from 'ABC' (scan for danger) and 'D' notes (approach the caller), and a compound meaning from 'ABC–D' combinations. However, receivers rarely scan and approach when note ordering is artificially reversed ('D–ABC'). Thus, compositional syntax is not unique to human language but may have evolved independently in animals as one of the basic mechanisms of information transmission. (Suzuki *et al.* 2016: 2)

However, other scientists have questioned the conclusions which can be drawn from these experiments, by noting that the criteria of systematicity has to be met before drawing conclusions:

> We surmise that the question remains open as to whether the version of compositionality that is evident in the bird calls study does indeed support systematicity […]we derive testable criteria for systematicity in the context of bird calls. These criteria must be met before claims of human-like compositional syntax in non-humans could be justified. (Phillips and Wilson 2016: 1)

Over the years a list of criteria have been proposed, initially thirteen (Hockett 1966), and subsequently expanded to sixteen (Vocal-auditory channel; Broadcast transmission; Directional reception; Rapid fading/Transitoriness; Interchangeability; Complete feedback; Specialization; Semanticity; Arbitrariness; Discreteness; Displacement; Productivity / Openness; Traditional transmission ; Duality of patterning; Prevarication; Reflexiveness; and Learnability) to denote what are termed as the "design-features of a language" (Hockett and Altmann 1968). These criteria have in turn been rebutted by ethologists who contend that: "Most of the 16 design features are, in fact, present in many animal-communication systems" (Griffin 1981: 82). When comparing birds, with other animals, it can be seen that the system of calls in birds is similar to what has been observed in other animals like primates. The classic study was performed on Vervet Monkeys (*Chlorocebus aethiops*), where the animals were found to produce distinct alarm calls associated with a different type of predator like a leopard, an eagle or a snake (Struhsaker 1967). The response of the animals to the alarm calls was re-confirmed by a later study relying on playback where the animals responded to the alarm calls in the specific manner even in the absence of a real predator with the ability of the animals to respond improving with experience and age: "Recordings of the alarms played back when predators were absent caused the monkeys to run into trees for leopard alarms, look up for eagle alarms, and look down for snake alarms" (Seyfarth *et al.* 1980: 801). In a paper highlighting the importance of meaning in animal communication systems, scientists have concluded that the production of vocalization in animals is not a fixed reflexive process, but is produced contextually, and emphasized that the pragmatic aspect of communication is central to understanding both the communication in animals, and the possible roots for the evolution of language in humans:

> The ubiquity of pragmatics in animal communication, combined with the relative scarcity of semantics and syntax, is important for those interested in the evolution of language because it suggests that, as language evolved from prelinguistic systems of communication, semantics and syntax were built upon a foundation of rich pragmatic inference. (Seyfarth and Cheney 2017: 342)

Thus, while the debates about the aspects in which animal communication using the vocal-auditory channel differ from human language are far from settled (with recent experiments challenging old theories), it can be seen that animals, whether it be primates or birds, respond to sounds (whether they come from another creature or a playback) in a meaningful manner by taking into account all the semiotic aspects (zoosyntactic, zoosemantic and zoopragmatic) of the interaction.

2.5. Types of sounds used by humans to interact with birds

Humans can use a number of different types of sounds to attract birds. The survey of the current thesis classified the use of sounds into the following categories: Song, anxiety call, invitation call, territory call and other (to account for any kinds of sounds which might have been missed by the previous categories). Thus, for the purposes of the survey, the sounds produced by the birds were categorized into the five groups discussed above in order to keep the list manageable for the people filling the survey because birds like a chaffinch can have more than twenty calls (Marler 1956). Table 1 shows the list of sounds used to attract the top five bird orders according to the survey. Firstly, it can be seen that the only entry in the "Other" column, belongs to the case of the White-backed Woodpecker (*Dendrocopos leucotos*), Order *Piciformes*, which was attracted using the recording of a drumming sound. Thus, the five-fold classification of the categories of sound covers the types of sounds used by birders in the study. Grouping the list of birds by bird orders helps us analyze if there are any major differences in the ways in which sound is used for different bird orders. In the survey, birders listed individual birds but also noted orders in their replies—using terms like "kakud" (Owls in Estonian, Bird-Order: *Strigiformes*). Thus, grouping by bird order allows us to aggregate the data by including the data from the two cases: firstly, when the individual bird-name is mentioned, and secondly, when the bird-order is mentioned. The bird order, *Passeriformes*, derives its name from the Latin term *passer*, which refers to sparrows and similar birds, and contains around 60% of all the approximately 10,400 avian species and the order is informally known as "songbirds" (Jarvis *et al.* 2014). As indicated by Table 1, almost all the birds of the order *Passeriformes*, who were mentioned in the survey, can be imitated using songs (36 out of 39) as shown in Table 1.

Table 1. The types of sounds used to attract the top-five bird orders [3]

No.	Order	Instances of Sound usage	Song	Anxiety call	Invitation call	Territory call	Other
1	Strigiformes	53	24 (45%)	2 (4%)	8 (15%)	27 (51%)	0 (0%)
2	Passeriformes	39	36 (92%)	5 (13%)	4 (10%)	2 (5%)	0 (0%)
3	Piciformes	25	14 (56%)	3 (12%)	3 (12%)	9 (36%)	1 (4%)
4	Cuculiformes	12	7 (58%)	0 (0%)	1 (8%)	5 (42%)	0 (0%)
5	Galliformes	10	9 (90%)	2 (20%)	0 (0%)	1 (10%)	0 (0%)

Birders have observed that the use of the call of a bird can result in a response from other birds of the same order, like in the case of the Grey-headed Woodpecker (*Picus canus*), one interviewee noted: "When you use the calls of the grey-headed woodpecker, other woodpeckers respond to this call" (Interviewee 1, female 37). Other interviewees confirmed such observations, by noting that the Black Woodpecker (*Dryocopus martius*) and White-backed Woodpecker (*Dendrocopos leucotos*) can be attracted by the sounds of the Grey-headed Woodpecker:

> For example, I can imitate some owls and woodpeckers, and also some sounds can be used to attract different birds like the grey-headed woodpecker, whose sound is good to attract the black woodpecker, or white-backed woodpecker because they just go crazy when other woodpeckers start making noise. (Interviewee 8, male 45)

Another birder described how birds like Pygmy Owls (*Glaucidium passerinum*) and Grey-headed Woodpeckers (*Picus canus*), can be engaged in to-and-fro call-back sessions:

> Then, they usually come closer to find the source of the sound. They are usually not sure, like where is the other bird—maybe they only see me, or the people with me. So, they fly around close by, to see from different angles; they usually fly by, over me. And I know that owls can even get aggressive; even

[3] Note: Some birds can be attracted using multiple types of sounds: hence, the total of percentages can be greater than 100%. For example, one respondent mentioned that for the Great Tit (*Parus major*), they used both the song and the anxiety-call to attract the bird.

> the small pygmy owl can give you a slap—if you are really good at the imitation, and you want the bird to become excited. But usually, you do not want. Maybe if you have done it once, you know that it is enough; like you know how irritated the bird can be. So, it's no point to irritate the bird so much. (Interviewee 9, male 35)

Table 1 shows that as per the survey, the least commonly used sounds are anxiety-calls and invitation-calls. This might be partly related to the idea that the use of anxiety calls can be stressful for the birds—and hence the use of other types of sounds like songs can be better:

> I have heard that if you want to catch or get the bird, then songs are mostly used. And we have mostly used songs and not calls […]
> Almost only songs; and I think, the songs are not as disturbing for the birds compared to if you attract them with some calls, alarm calls, then it can be quite stressful for the birds. (Interviewee 7, male 18)

However, the contrast of stressing the bird, can be counteracted by a desire to see birds—which is why there is not a total absence in the use of anxiety-calls. In addition, the ease of the imitation of the song can factor into whether the song or some call (like an invitation-call) is used: "But sometimes the song is very complicated, and the invitation call is the easiest to learn" (Interviewee 1, female 37). "Pishing" is an easy technique to learn, and thus birders might use "pishing" instead of mimicking the exact call of a bird (Zimmerling 2005). "Pishing" will be discussed in more detail in the next chapter (chapter 3). Birders sometimes imitate the sound of the predator of a bird, in order to get a response from a bird which is a prey. In the example below, the use of the sound of a Pygmy Owl (*Glaucidium passerinum*) is a strategy used to make passerines, like tits, visible:

> For tits, for example, if you use this same pygmy owl sound in the day-time, it makes all the small birds anxious; it makes them loud, and to come out and reveal themselves from their hidden-lifestyle and become excited; because they are nervous about the possibility of the presence of a dangerous predator; so they come out. Sometimes, it is a way to see them. (Interviewee 9, male 35)

Thus, birders follow a number of different strategies to elicit response from a bird. From a purely zoosemantic perspective, it might be assumed that only a direct invitation for a bird, like the invitation-call, can be used to bring a distant bird close to a human being. From a zoopragmatic perspective, birders use the different strategies because they work: if the birds do not respond to calls—which are not strictly invitation-calls—then the birders would not be using them. When the interaction is cross-species, like in the case of a bird-human interaction, any sound which gets a bird to respond might be classified as an invitation call—because the call is successful in inviting a bird to respond. For example, to a bird, the song or a territory call of another bird, might appear to be an invasion of its territory, and the bird might be interested in driving the intruder out of its territory. Hence, the use of other kinds of sounds (which are not strictly invitation-calls) can also elicit a response from a bird.

2.6. The diversity of imitated bird species

Estonia is a country which is located in northern Europe and is both a hub and a throughway for the migration of birds. The number of birds in Estonia changes between seasons, with seasonal fluctuations of a low of slightly over a hundred species of birds in winter, to around double that number in times of both breeding and migration. The avian census, from 2013, lists the number of birds observed in Estonia: "Breeding has been confirmed in 229 species (209 regular). 159 species have been observed in winterer (113 regularly) and 216 species on migration (204 regularly)" (Elts *et al.* 2013: 112).

The survey used for this report allowed people to enter either the name of an individual bird, or that of a bird-order. Hence in order to account for the total varieties of birds which have been imitated two tables, Table 2 and Table 3, are provided in this section. Table 2 shows the list of the individual bird species while Table 3 contains the list of the bird orders mentioned in the survey. The survey results in Table 2 show that 55 species of birds were either imitated, attracted with playbacks or responded to the use of sound. Hence, Table 2 and Table 3 show that it is possible to get a response to a sound from many different species of birds.

Table 2. List of imitated birds and birds attracted with playbacks

Number	English name	Scientific name	Sound Used	Responses
1	Common Cuckoo	*Cuculus canorus*	12	12
2	Pygmy Owl	*Glaucidium passerinum*	11	15
3	Tawny Owl	*Strix aluco*	11	13
4	Ural Owl	*Strix uralensis*	9	13
5	Grey-headed Woodpecker	*Picus canus*	9	10
6	Hazel Grouse	*Bonasa bonasia*	8	8
7	Golden Oriole	*Oriolus oriolus*	6	6
8	Northern Goshawk	*Accipiter gentilis*	5	5

Number	English name	Scientific name	Sound Used	Responses
9	Tengmalm's Owl	*Aegolius funereus*	3	5
10	Thrush Nightingale	*Luscinia luscinia*	3	3
11	Greenfinch	*Luscinia svecicus*	2	3
12	Bluethroat	*Phylloscopus collybita*	2	2
13	Chiffchaff	*Coturnix coturnix*	2	2
14	Common Quail	*Crex crex*	2	2
15	Corncrake	*Emberiza hortulana*	2	2
16	Ortolan Bunting	*Porzana porzana*	2	2
17	Spotted Crake	*Panurus biarmicus*	2	2
18	Bearded Tit	*Carduelis flammea*	2	1
19	Common Redpoll	*Regulus regulus*	1	2
20	Goldcrest	*Parus major*	1	2
21	Great Tit	*Carduelis chloris*	1	2
22	Siskin	*Carduelis spinus*	1	2
23	White-backed Woodpecker	*Dendrocopos leucotos*	1	2
24	Wood Nuthatch	*Sitta europaea*	1	2
25	Barn Swallow	*Hirundo rustica*	1	1
26	Bean Goose	*Anser fabalis*	1	1
27	Blackcap	*Sylvia atricapilla*	1	1
28	Booted Warbler	*Hippolais caligata*	1	1
29	Common Raven	*Corvus corax*	1	1
30	Firecrest	*Regulus ignicapillus*	1	1
31	Greenish Warbler	*Phylloscopus trochiloides*	1	1
32	Hooded Crow	*Corvus corone*	1	1

Number	English name	Scientific name	Sound Used	Responses
33	Icterine Warbler	*Hippolais icterina*	1	1
34	Little Grebe	*Tachybaptus ruficollis*	1	1
35	Long-eared Owl	*Asio otus*	1	1
36	Long-tailed Tit	*Aegithalos caudatus*	1	1
37	Marsh Warbler	*Acrocephalus palustris*	1	1
38	Middle Spotted Woodpecker	*Dendrocopos medius*	1	1
39	Pied Flyctacher	*Ficedula hypoleuca*	1	1
40	Red-breasted Flycatcher	*Ficedula parva*	1	1
41	Robin Redbreast	*Erithacus rubecola*	1	1
42	Sedge Warbler	*Acrocephalus schoenobaenus*	1	1
43	Tundra Swan	*Cygnus columbianus*	1	1
44	Willow Tit	*Parus montanus*	1	1
45	Yellow-Browed Warbler	*Phylloscopus inornatus*	1	1
46	Great Spotted Woodpecker	*Dendrocopos major*	0	2
47	Green Woodpecker	*Picus viridis*	0	2
48	Bearded Reedling	*Panurus biarmicus*	0	1
49	Black Woodpecker	*Dryocopus martius*	0	1
50	Blue Tit	*Parus caeruleus*	0	1
51	Common Golden Eye	*Bucephala clangula*	0	1
52	Crested Tit	*Parus cristatus*	0	1
53	Eurasian Collared Dove	*Streptopelia decaocto*	0	1
54	Mallard	*Anas platyrhynchos*	0	1
55	Wood Pigeon	*Columba palumbus*	0	1

Ornithological information, from 2018, states that there are 41 bird-orders in the world (Clements *et al.* 2018); of these, around 19 bird orders are found in Estonia (Elts *et al.* 2013). Table 3 shows that birds from eleven bird-orders, out of a possible 19, were imitated in Estonia.

Table 3. List of bird-orders which were imitated or whose playbacks were used

Number	Bird Order	Sound Used	Responses
1	*Strigiformes*	53	53
2	*Piciformes*	25	25
3	*Cuculiformes*	12	12
4	*Acciptriformes*	5	5
5	*Gruiformes*	4	4
6	*Passeriformes*	39	40
7	*Podicipediformes*	1	1
8	*Galliformes*	10	10
9	*Anseriformes*	5	5
10	*Charadriiformes*	1	1
11	*Columbiformes*	2	2

Almost any kind of birding involves keeping a mental list—whether it is scanning the window momentarily (or pausing and listening) outside the house to look for birds,or planning a trip to go birding to a close-by nature reserve or a far-away destination. Every occasion for birding has a list associated with it:

> Lists are central to bird-watching, and practitioners commonly keep several: "life lists" which record a cumulation of species identified by a particular person; occasional lists which record species identified by a person or group at a particular place and time; preprinted checklists distributed to visitors of nature preserves; and lists collectively compiled during "Christmas counts" and other organized surveys sponsored by ornithological societies. Superficially, such lists *represent* a collection of observations, but they do much more than that. The compilation of a list is an important *constituent* of individual and collective observations. (Lynch and Law 1999: 321)

One of the reasons to use sound while birding is that it allows humans to include more birds in a list compared to what would be possible without the use of sound. Table 2 and Table 3

show that a wide variety of birds can be attracted using sound. A birder is always keen to look for birds which can be termed as "exotic" (in the sense of a rare-sighting, and not in the sense of being a non-native species), and this can be seen in a comment made by an interviewee, who also works as a birding-guide, about "exotic" species while answering a question about how birds are chosen for imitation:

> First these birds should have vocal territorial activity. Some birds are singing melodiously, and one cannot just imitate them. like snipes they are diving through the air, and their sides start vibrating, and you cannot imitate them easily. And many common birds, you are just not interested. So, you are checking more exotic birds like species of woodpeckers and owls and grouses, and there are bird species which your clients want to see or there are protected species which you are monitoring them at the same time. So, you pick the more interesting species, but you also pick the ones which have more promising territorial vocalization or drumming to detect more easily. (Interviewee 5, male 47)

In this quote, the interviewee notes that many clients want to see new and rare species which they have not seen before and are birding in the company of a bird-guide in order to improve their odds. On the one hand, Table 2 shows that the use of sound can lead to interactions with rare birds as seen by the entries at the top of the list, but the use of sound can also result in responses from common birds like a Mallard (*Anas platyrhynchos*) or a Blue Tit (*Parus caeruleus*). The perceived rarity of a bird may depend on the home area of a birder. An excerpt from an interview highlights this aspect, where a client to a bird-guide mentions that woodpeckers were rare in the United Kingdom, and so a client who visits Estonia has the expectation of seeing woodpeckers on a guided birding-trip: "[…]in the UK you only have a few woodpecker species; they are happy to see them more […]" (Interviewee 5, male 47).

There are numerous websites where ordinary birders can upload their lists to online databases like eElurikkus[4], based in Estonia, or eBird[5] managed by the Cornell Lab of Ornithology, Ithaca, New York, USA. Both these databases allow birders to report and keep track of bird lists, photos, and sounds of their own records and also monitor the activities of other birders. The practice of recording information was noted by an interviewee: "Every bird, which I observe, I will write it down and put them onto the databases" (Interviewee 4, female 33). In the case of data from bird-ringing stations, an interviewee, who rings birds as a professional ornithologist, stated that not all the information is uploaded on public databases: "All

[4] Retrieved from: https://elurikkus.ee/en, 25.04.2019.

[5] Retrieved from: https://ebird.org/home, 25.04.2019.

information about ringing birds in our ringing station, when I usually work, but it is not for public" (Interviewee 3, male 35). The availability of recordings on websites allows birders to easily compare the songs of the bird heard in the field with those from the internet databases:

> And sometimes if I hear it out of the country, especially if I hear bird songs or calls which are not familiar to me, then I use the internet as well, and I check from dedicated bird webpages, how different bird songs or species can look like or sound, so I can almost do a live comparison which is sometimes really handy. (Interviewee 5, male 47)

The ability of a database, like eBird, which can be considered to be a list of lists, allows the collection and aggregation of data, and the inference of patterns on a global scale, which can help birders immensely and further our understanding of the planet in a scientific manner:

> Through its development as a tool that addresses the needs of the birding community, eBird sustains and grows participation. Birders, scientists, and conservationists are using eBird data worldwide to better understand avian biological patterns and the environmental and anthropogenic factors that influence them. (Sullivan *et al*. 2009: 2282)

Thus, it can be seen that a list of birds (along with associated information like geographic distribution or the recordings of the vocalizations of birds) plays a key role in the life of birder—whether it be list of birds they have seen in the past, the list of birds they might observe during a trip or the list of birds they plan to observe in the future.

3. Factors influencing the human vocal imitations of bird sounds

The present chapter will discuss how sound acts as a channel of communication, and how the human limitations in the production of sound shapes the uses of different methods of producing sound. The chapter will demonstrate the how the frequency-range, complexity and duration of the sound influence whether humans use the human-voice, mechanical-whistles or recordings to imitate the sounds of birds. The chapter will compare how learning the skills of mimicking the sounds of birds are more prevalent in some cultures compared to others, and discuss how this skill is acquired by Estonian birders.

3.1. Linguistic and cultural factors influencing human perception and production of sound

A human being is different from a mechanical device which will record or produce sound in a fixed manner. Unlike machines, human beings can engage in learning and change their behavior. The role of convergent evolution is seen with humans and songbirds, who have independently evolved areas of the forebrain, in which both the motor and the auditory centers coordinate with each other—using complex feedback mechanisms—to control the vocal motor areas, and results in the ability of the organisms to engage in vocal learning at critical periods in ontogeny, with an ability to learn more at early stages in life (Doupe and Kuhl 1999). Using fMRI (functional Magnetic Resonance Imaging), scientists have found that the means used to engage in vocal imitation in humans is similar to the pathways activated in songbirds for imitation: "The corticostriate system thus appears to be the central pathway for vocal imitation in humans, as predicted from an analogy with songbirds" (Belyk *et al.* 2015: 621). The processing of the sounds of speech begins with the detection of sounds by the ear and subsequently processed as follows:

> Speech sounds are initially analysed in terms of their basic acoustic properties in the auditory brainstem and core areas of the auditory cortex. They are then passed for higher-level analyses in surrounding cortical areas, including the superior temporal gyrus and the inferior frontal gyrus, which form parts of the 'language network' of the brain. (Pickles 2012: 267)

At birth, human newborn babies have the ability to perceive sounds from all languages equally, but by the time they turn 12 months, the perception of sound gets adapted to match the categories of sound used by their native language (Pickles 2012). Human children have the ability to innately acquire the sounds of any language, but adults find it difficult to perceive the sounds in non-native languages. Different languages have different sounds, and thus speakers of one language may have trouble differentiating the sounds in another language. For example, Japanese speakers have trouble distinguishing the differences between the sounds /r/ and /l/, and scientists have studied the ways in which speakers of Japanese can be taught to both listen and produce these sounds when they are learning English (Bradlow *et al.* 1997; Logan *et al.* 1991). Human listeners also have the ability to listen to a sound differently—changing the details of the sound—depending on whether the sound is processed as speech or non-speech (Pickles 2012; Moore 2013). People tend to pay more attention to acoustical differences which change meanings in words while neglecting to pay attention to sounds that do not change the meaning of words and use coarticulation (coarticulation is the term used to designate the change in the sounds of words based on the sounds preceding and following the sound being uttered) when speaking (Moore 2013). Humans can distinguish identical sounding sounds based on the context: “For example, most such machines would have great difficulty in distinguishing the utterances "recognize speech" and "wreck a nice beach" if they were spoken in a normal conversational manner” (Moore 2013: 323). Humans can fill in words in sentences when the sound is interrupted by a cough (Warren 1970), or a part of a word is partially or completely missing (Bagley 1900). Thus, the languages to which a human is exposed changes both the perception and the production of sound in humans.

The perception of sounds is also integrated with other systems of the body, like the processing of visual stimuli, resulting in an integrated audiovisual perception of sound. While the human auditory system has the ability to distinguish the position of a stationary sound source even when the head is moving, clever experiments, involving the use of moving screens, have demonstrated that the position of the perceived sound can change when the visual stimuli (by the movement of a screen with vertical stripes) changes the location of the perceived sound (Wallach 1940). The influence of vision on the perception of speech can be seen in experiments in which the voice of a person speaking on film was dubbed with a different sound, with the result that the person viewing the film (and thus subject to both visual and auditory stimuli) heard a different sound compared to the sound heard by the same

person when they only heard the soundtrack (only auditory stimuli) and could not see the lip-movements (McGurk and MacDonald 1976). The experimenters also noted that: "By merely closing the eyes, a previously heard [da] become [ba] only to revert to [da] when the eyes are open again" (McGurk and MacDonald 1976: 747). Thus, a human hearing sounds can be subject to auditory illusions just like the more commonly known optical illusions associated with visual stimuli.

Bird-guides are a common way for people to get acquainted with the songs of birds and the manner in which the songs are transcribed in bird-guides is influenced by the linguistic constraints of the language. Nadja Weisshaupt, in a study looking at the translation of a Swedish bird-guide into English and German, has observed that the decisions to follow a certain transcription strategy is influenced not only by the phonetic limitations of each language (the number of monophthongs in Swedish, German and English are 18,16 and 12 respectively; while the number of diphthongs in Swedish, German and English are 0,3 and 9 respectively (Weisshaupt 2015: 234)), but also by human choice, which may ignore ornithological categories:

> Overall, it can be stated that the shifts observed in the transcriptions/transliterations and phonetics as well as other aspects such as omissions and additions can generally be attributed to 'human decisions' and are not based on ornithological factors such as bird dialects or varying species distribution across the three language regions. (Weisshaupt 2015: 247)

Kadri Tüür discusses how the naming and the vocalization of the same bird can vary based on linguistic influences (Tüür 2009). Tüür discusses the case of the Common Chiffchaff (*Phylloscopus collybita*), where different European languages use the synecdoche of the linguistic transcription of the predominant bird-vocalization to name the bird: "[…] Finnish *tiltaltti*, Estonian *silksolk*, German *Zilpzalp*, Dutch *tjiftjaf* […]" (Tüür 2009: 604). The name of the bird in English—chiffchaff—also belongs to this category. Tüür shows how the vocalization of the bird is depicted differently in English and in Estonian in two bird-guide books:

> English (Collins 1999: 306): "Song a *slow and measured* series of well-spaced clear, forceful, *monosyllabic* (exceptionally disyllabic) notes on *two or three pitches*, 'silt sült sült sult silt silt sult sült sült silt...' Birds newly arrived at breeding site add a muffled 'perre perre' between verses."
> Estonian (Jonsson 2000: 450): "Song monotonously tinkling [like a wooden sheep bell — K.T.] 'tsilt, tsalp, tsilt, tsalt', among which there is now and then a quiet 'tsr tsr'." (Tüür 2009: 604-605)

Due to cognitive associations between the hearing and the production of sounds in humans, the phonetic constraints used in a guide-book will influence the human hearing and the human mimicry of the vocalization of the bird in nature. The vocalization will be influenced

by the lingua-culture of the human mimicking the bird, and there can be considerable geographical variation of any language, including Estonian (e.g., Pajusalu 2003; Lindström and Pajusalu 2003).

One way to learn about the possibilities of the mimicking bird sounds come from ethno-biological studies. The ethno-biologist, Hannah Sarvasy, has proposed a three- fold classification of the human attempts to mimic a bird: firstly, "non-verbal vocal mimicry"—which can be termed as the attempt at a verisimilitude of bird sounds unfettered by linguistic constraints; secondly, onomatopoeia—using the phonetic constraints of a language to mimic birds sounds; and thirdly, "warblish"—a novel term coined by Sarvasy to denote the use of words in a language to approximate sounds emitted by birds (Sarvasy 2016:765-766). The categories of both "onomatopoeia" and "warblish" are constrained by language: on the one hand, this constraint works as a convenient mnemonic tool to distinguish the sound of a particular bird, while on the other hand, the constraint implies that the sounds produced using "onomatopoeia" and "warblish" will not have a high fidelity to the sound produced by the bird (Sarvasy 2016). The sound which is the closest copy of a bird-sound is that which is produced using "non-verbal vocal mimicry" (Sarvasy 2016).

The warblish for the Common Chaffinch (*Fringilla coelebs*) is as follows in Estonian: "[…] Siit-siit sa ei saa mitte üks pirrutikk!" (Jüssi 2007: 27). The example of warblish shown here differs from the linguistic transcription in the guide-book shown above (Tüür 2009: 604-605). The naturalist, Fred Jüssi, mentions both the warblish and the transcription on the same page as seen in the case of the Ural Owl (*Strix uralensis*), where the warblish reads as: "*uhu, kas tüdrukud kodu*" (Jüssi 2007: 63), while the transcription of the call reads as "[…] *vuhu* ja umbes nelja sekundi pärast *vuhu-huhuhu*" (translated into English as "*vuhu* followed four seconds later by *vuhu-huhuhu*", with "*vuhu*" and "*vuhu-huhuhu*" describing the vocalization of the bird in Estonian) (Jüssi 2007: 63). On a birding trip at night to hear owls, in Tartu county in April 2019, the author (who is not a native-Estonian speaker) heard the call of the owl which matched the transcription shown above, while some of the Estonians on the trip remembered the warblish. The warblish, remembered by the Estonians, was not just a source of humor, but a mnemonic device to distinguish the call of the Ural Owl from that of other owls heard during the trip. The influence of Fred Jüssi as a naturalist was discussed by Kadri Tüür (Tüür 2009), and he played a prominent role in the lives of many Estonians in learning bird songs, as seen from the following passage from an interviewee:

> In Estonia, we have the master, Fred Jüssi, who has been influential for many naturalists and birders of my age. He had this famous radio broadcast called Textbook of Nature (*Looduse aabits* in Estonian), and mainly he introduced bird songs and other natural sounds, but on the other hand we did not have that much nature related information. The broadcast was useful, and was done in a very good way. The recordings, considering the technical limitations of the time, were done extremely well. (Interviewee 5, male 47)

Thus, the way humans experience a lingua-culture influences the way they hear and mimic the sounds of birds. In addition to the linguistic constraints of the native-tongue (and other languages), which play a critical role in early childhood, the exposure of people to programs on nature and guide-books continues to have an influence throughout their lives.

3.2. The characteristics of human voice and hearing

Human voice as a means of sound production varies across humans—every human has a unique voice which is influenced by lingua-cultural factors as discussed above. However, one can get an understanding of the range of the average human voice by looking at measurements which have quantified the range of the human voice. A common graphical method used to quantify the human voice is the Voice Range Profile (shortened as VRP; also called a phonetogram). This is a two-dimensional plot showing the loudness of the voice at a given frequency on the y-axis in decibels versus the frequency of the voice in Hertz on the x-axis. The loudness of the voice can vary with distance and usually the distance at which the sound is measured is specified in the data. According to the experiments conducted by Ingo Titze, the typical fundamental frequency of the VRP of human males starts from a low frequency of slightly below 100 Hz to a high frequency range of about 500-600 Hz when producing the sounds of the vowels /o/ and /l/. In the case of human females, the lower range of the typical fundamental frequency of the VRP starts slightly above 100 Hz and can extend to 800 Hz. The loudness of the voice in a chart of the VRP varies with frequency—with a loudness of 50-80 decibels at the lower range of the spectrum (near 100 Hz), and increases with frequency (with dips in places) to about 100 decibels at the higher end of the spectrum. While the female voice is quieter than the male voice at the low end of the spectrum (near 100 Hz)—the voice is equally loud at higher frequencies. While these results show the fundamental frequency of the human voice, higher frequencies which are multiples of the fundamental frequency (but with less energy) are also produced by the human voice (Titze

1992). Other scientists have also replicated similar results for normal human voices and have shown that this range can change in case of abnormalities (Sulter *et al.* 1992).

The ornithologist Hans Slabbekoorn states that three types of graph are usually used to represent sound visually. Firstly, intensity fluctuations plotted over time result in a graph depicting the amplitude of sound. Secondly, sonograms (equivalent names are spectrograms or spectrographs) plot the frequency on the y-axis (with frequency increasing from lower to higher frequency as we move away from baseline) versus time. Thirdly, power spectrograms plot the amplitude versus frequency for a given duration of time. Out of these three, Slabbekoorn notes that the sonogram is the most frequently used graph because it shows the frequency response versus time and is more accurate compared to other methods of transcription: "The sonogram is the most widely used, often to measure temporal and spectral characteristics of songs. It is also used more and more in bird guides to describe songs, instead of onomatopoeic renditions or musical script" (Slabbekoorn 2004: 5). In addition, the analysis of bandwidths can be undertaken using different methods (with each method of analysis resulting in different representations of the same sound); but this information is usually omitted in spectrographs because most people use equivalent bandwidth settings for their graphs: "[…] but generally people use similar, wide-band settings for birdsong, making sonograms more or less comparable […]" (Slabbekoorn 2004: 5). The spectrograms used in this report also follow the standard practices, outlined by Slabbekoorn as shown above, by presenting the amplitude data on a black-and-white scale and by omitting the description of the band-width setting. Thus, when looking at the spectrographs (which plot frequency on the y-axis; time on the x-axis) in this thesis the information on the loudness of the signal is missing, but it allows for a comparison of sounds on the basis of the frequency content of the sound.

Figure 1 shows a spectrograph of the author speaking the following: "I speak English. A B C D E F"—this demonstrates that the normal range of vocal frequencies occupy the spectrum between 100-800 Hz (though there are higher harmonics present) as discussed by Ingo Titze (Titze 1992). A human whistle can vary in frequency but can extend the production of sound to higher frequencies compared to the range of the normal human voice: The typical frequency range for human whistle has been found to be 500-5000 Hz (Nilsson *et al.* 2008). There are languages in the world which have a complementary system of communication, relying on the use of modulated whistles, which are classified as "whistled languages", and the sounds used typically range around a central frequency of 2 KHz: "The whistles are

represented by modulations of frequency, centered around 2000 ± 1000 Hz" (Meyer 2004: 406). Thus, while not all cultures use "whistled languages", nevertheless it is possible for humans to become adept at using whistles for communication with humans and other species like birds.

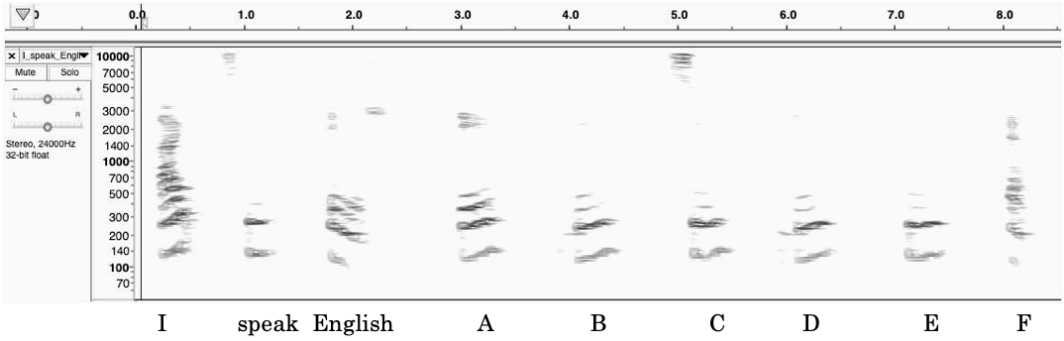

Figure 1. Spectrograph depicting a human voice speaking English.

The variations in the mammalian ear can be manifold and in addition to hearing can be exaptated for thermoregulation of the body (Webster 1966), but in the case of humans the main considerations are the limits of hearing. Contrasting the sense of vision with that of audition, Edmund Carpenter and Marshall McLuhan write that unlike the human eye which focuses on limited objects in the surroundings—which in humans can be done to various degrees by the combination of the movement of either the eye in the eye-socket, or a part of the body like the head, or the entire body; the reception to sound is only guided by the lower and upper limits of hearing:

> Auditory space has no point of favored focus. It's a sphere without fixed boundaries, space made by the thing itself, not space containing the thing. It is not pictorial space, boxed in, but dynamic, always in flux, creating its own dimensions moment by moment. It has no fixed boundaries; it is indifferent to background. (Carpenter and McLuhan 1960: 67)

The range of human hearing exceeds the range of the human voice at both the lower and the higher end of the frequency spectrum—allowing humans to hear a wider range of sounds than what can be produced by their vocal organs. The range of hearing is not constant but can change with age:

> Humans can detect sounds in a frequency range from about 20 Hz to 20 kHz. Human infants can actually hear frequencies slightly higher than 20 kHz, but lose some high-frequency sensitivity as they mature; the upper limit in average adults is closer to 15–17 kHz. (Purves *et al.* 2004: 282)

In addition, the human hearing is not uniform across the spectrums because the shape of the human ear amplifies the sounds of certain frequencies: "One consequence of the configuration of the human auditory meatus is that it selectively boosts the sound pressure

30- to 100- fold for frequencies around 3 kHz via passive resonance effects" (Purves *et al.* 2004: 287). Thus, the same sound heard by a human will sound different to another creature which does not selectively amplify certain frequencies in a similar manner. Thus, the human ear is not a neutral organ that picks up all the sound from the environment in an objective manner. The human ear can only hear a limited range of frequency which can change with age. Thus, humans with hearing loss might not be able to hear certain sounds, and this can have practical consequences in which a person may not be able to hear a bird. An example of such a situation was described by an interviewee:

> Once I remember, I had a client from the UK, his working career has been passed as hearing safety or hearing health inspector or expert in UK, and he came here to see and hear about hazel grouse, which is a bird species which has a really really high pitch, quick and sudden whistle whistling, which you have not heard before, and which you are not prepared, its very hard to get. He also had a problem of a high pitch hearing loss. Unfortunately, it was a bit ironic that everybody else in the group heard the bird, which was calling quite intensively in the woods. And he missed it. (Interviewee 5, male 47)

Thus, when understanding the interactions between humans and birds, we need to take into account that the human ear is not a neutral organ which can hear all the sounds as an ideal instrument. The limitations in the human hearing can impact the nature of the interaction because of the physical limitations of the ear. Studies have documented that some birds, like oilbirds and swiftlets, engage in echolocation (Brinklov *et al.* 2013). Birds like the Tengmalm's Owl (*Aegolius funereus*) have asymmetry in their skull and ear structure, which gives them the ability to locate objects with precision in the vertical plane (Norberg 1978). Thus, the hearing range of humans differs considerably from that of birds—both in the magnitudes and the abilities of perceiving sound.

3.3. The means of bird-sound imitation and the imitated species

Humans using sound as a channel of interacting with birds have the option of producing different kinds of sounds using firstly, their own voice; secondly, mechanical-devices like whistles; and finally, electronic means like using speakers to produce the sound. Table 4 shows the number of instances in which various means of producing sounds were used according to the survey. In the survey, people could report multiple means of imitating the same bird, and each person could report multiple birds (up to 5). Thus, in some cases Table 4

shows that the number of reported uses, like in the case of voice-imitation or recordings, is larger than the number of people in the survey.

Table 4. Number of reported uses of sound use.

Means used to produce sound	Number of reported uses
Voice-imitation	89
Recordings	73
Whistles	8
Others	3

Out of the 71 people who answered the survey, 51 said that they used sound in some form or the other to interact with birds. As shown in the Table 4, the use of recordings (73) and imitation with voice (89) were the most common methods of reproducing the sounds of birds. Even with the advent of smartphones and electronic devices like portable loud-speakers, it can be seen that people still continue to use their own voice to imitate birds. One unusual instrument used to imitate the sound of birds was the mouth-piece recorder which can be used to contact owls according to the survey. The user (male, 58) of the mouth-piece recorder pointed out that he used the instrument only to make contact with the bird and not for attraction. Further, in the comments section of the survey, he clarified that the use of sound was suitable only for scientific work to monitor the presence of birds and should not be used for personal curiosity or for bird-tourism.

A way to understand the preference of the sound source is to look at the top-ten birds which were imitated and deduce if there is any preference for the source of sound chosen for each bird. The reason to look at the top-ten birds is that the data—coming from a larger number of birders—permits us to see a pattern from multiple occurrences of the same choice. The survey allowed people to use other categories for birds, instead of only entering species, and thus this table does not reflect the real array of species, but only those which were mentioned by using the species name. Table 5 shows the list of the top-ten imitated bird species.

Table 5. List of top-ten imitated species

Number	Bird	Sound used for imitation	Whistle	Recording	Voice-Imitation
1	Common Cuckoo (*Cuculus canorus*)	12	0	0	12
2	Pygmy Owl (*Glaucidium passerinum*)	11	1	2	9
3	Tawny Owl (*Strix aluco*)	11	0	3	9
4	Ural Owl (*Strix uralensis*)	9	0	4	6
5	Grey-headed Woodpecker (*Picus canus*)	9	1	0	8
6	Hazel Grouse (*Tetrastes bonasia*)	8	5	6	4
7	Golden Oriole (*Oriolus oriolus*)	6	0	0	6
8	Northern Goshawk (*Accipiter gentilis*)	5	1	5	2
9	Tengmalm's Owl (*Aegolius funereus*)	3	0	0	3
10	Thrush Nightingale (*Luscinia luscinia*)	3	0	3	0

Table 5 shows that for certain birds, humans have a preferred way of imitating the sound of the bird. The most commonly imitated bird is the Common cuckoo *(Cuculus canorus)*—and remarkably, Table 5 shows that all the imitations were done by the human voice. Thus, one can look at the spectrogram of the call of the Common cuckoo and try to find the similarities with the human voice. There are other birds like Golden Oriole *(Oriolus oriolus)* and the Tengmalm's Owl *(Aegolius funereus)* which are imitated only by voice. In addition, Table 5 shows that many owls and woodpeckers can be imitated by the human voice—but people also use other means to reproduce their sound. The Hazel Grouse (*Tetrastes bonasia*) is the bird which is imitated the most using whistling (in addition to being imitated by other means). Thus, one can look at the acoustic characteristics of the call of a Hazel Grouse and try to see what makes it amenable to imitation by whistling. A look at the characteristics of

the human voice will help us deduce how the properties of the human voices make it easier for a human to mimic some sounds and not others. Hence, the following subchapters will discuss the frequency spectrum of the human voice to understand the range of the human voice and how it matches with the acoustic characteristics of the bird sounds.

3.4. A classification of bird sounds based on the ease of production by the human voice

Studies have shown that humans, speaking rapidly, can enunciate as many as 30 phonemes per second (Liberman *et al.* 1967), and can hear up to a hundred separate items in a second: "[…] identify sequences of non-speech sounds when the individual items are as short as 10 ms […]" (Moore 2013: 324). There are common aspects to the sounds used by birds and the sounds used by humans which make it amenable for humans to reproduce the sound of birds:

> Thus, language and song share a dependence on timing on several timescales: a shorter timescale (on the order of tens of milliseconds), as in phonemes and syllables, and a longer one, up to many hundreds of milliseconds (as in syllable, phrase, and word ordering). (Doupe and Kuhl 1999: 569)

Table 6 shows a novel scheme which has been used to classify the ways in which humans can mimic the sounds of birds. The first criteria for the classification is based on the frequency-range of sounds which can be produced by the human voice: the lower range comprises of sounds which can be comfortably produced by the normal human voice (approximately 100-800 Hz). This range can be extended by two ways: one by changing the method of the production of sound by switching from the normal voice to whistling—allowing us an additional range of upto 5 KHz; and, secondly, by the use of a mechanical whistle—which can extend the range beyond the 5 KHz barrier. In addition to these techniques, there is an additional method used by birders to attract birds which is called "pishing"—a technique which is an approximation of the alarm-calls of certain small birds (and these alarm calls are complex sounds and cannot be directly imitated):

> Pishing involves saying the words "pish pish pish pish" in rapid succession, followed by "chattering," where the observer quickly says "chit chit chit chit chit chit chit." When birders make these pishing noises, they often find themselves quickly surrounded by a flock of little birds. […]Pishing is believed to resemble the alarm call of a group of small birds mobbing a predator. (Zimmerling 2005: 10)

Finally, in cases where the sound of the bird is too complex or too long in duration, humans use recordings of birds which are reproduced using speakers—this is shown in the final

column of Table 6. Coincidentally, the difficulty faced by algorithms to detect a fundament pitch are similar to the ones faced by humans who try to imitate the sound of a bird. Scientists working on the automatic processing of bird sounds—which would allow for the extraction of the pitch of a bird song in order to compare species in large volumes of data—have noted that certain characteristics of bird songs make it hard to apply pitch detection algorithms to bird-songs: firstly, the presence of harmonics or nasals; secondly, "two-voice" sounds; and thirdly, complex changes in sound used by birds like nightingales, sedge warblers, and sky larks:

> Each syllable in isolation may not be complicated but the speed at which they vocalize and how rapidly the syllable type changes from whistles to trills or two-voiced leads to their overall complexity. (O'Reilly and Harte 2017: 25)

One reason for the complexity of some bird songs is the presence of two sound production organs in birds—one in each bronchus—which can act singularly or in a combined manner. Thus, each bird potentially has the ability to produce sound from two sources and the term 'two-voice' was coined by C.H. Greenwalt (Greenwalt 1968) to name this phenomenon. One of the first measurements of the contribution of each individual side of the syrinx was done by R. A. Suthers, who reported the following:

> I have now directly measured the acoustic output and motor dynamics of the left and right sides of the syrinx during song in catbirds and thrashers. In these birds, sound may be produced by either side of the syrinx alone, by both sides acting together, or by switching from side to side. When both sides of the syrinx contribute simultaneously to a note or syllable, both may generate the same sound or each side may produce a different sound. A given syllable type is generated by a similar motor pattern each time it is produced. (Suthers 1990: 473)

Table 6. Classification of sounds by complexity and frequency.

Frequency-range	Simple in frequency (pure-tone) and short time-span	Complex in frequency and short time-span	Complex in frequency and/or long time-span
100-800 Hz	Voice (pure-tone)	Pishing (pssh-spssh)	Recording
100-5 kHz	Voice (with whistling)		
> 5 kHz	Mechanical Whisle		

A common bird like the European Starling (*Sturnus vulgaris*), in addition to showing sexual dimorphism in its vocal organs, has the ability to use each side of the syrinx to produce different sounds, with males usually using the left syrinx to produce lower frequencies, and

using the right syrinx to produce higher frequencies (Prince *et al.* 2011). Thus, humans—who have only one vocal-chord—cannot imitate the sound emanating from two separate sound sources. Thus, when birds use each side of the syrinx independently, the only option to imitate the sound, is to use a recording.

The following sections will discuss each category shown in Table 6, and show how the category matches the call of a particular bird.

3.4.1. Sounds which are easy for the human voice to imitate (short-duration and 100-800 Hz)

Figure 2 with the spectrograph of the Common Cuckoo (*Cuculus canorus*) shows an inverted ”U” (”Cuc” in English) shaped pattern at regular intervals, followed by an inverted ”C” (”koo” in English). Two complete utterances of the call are visible: one between 0-1 second, and another between 2-3 seconds.

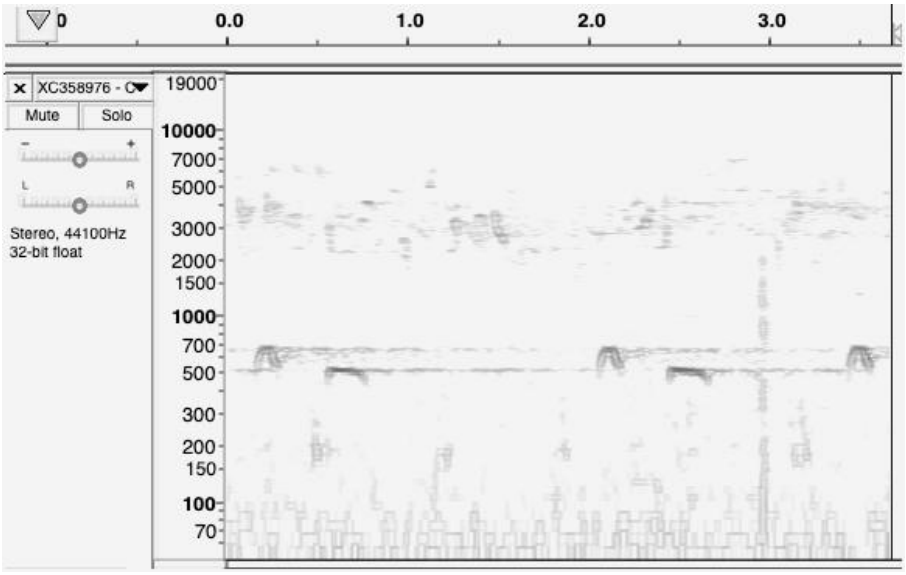

Figure 2. The spectrograph of a Common Cuckoo (*Cuculus canorus*)[6]

The onomatopoetic naming of the bird in English (and also as “kägu” in Estonian) is apparent from the spectrograph. These simple sounds—which falls in the range of 400-700 Hz—make

[6] Lidster, James XC358976. Retrieved from www.xeno-canto.org/358976, 25.03.2019.

it easy for a human being to reproduce. According to one interviewee, the Common Cuckoo was one of the first birds she imitated when she began birdwatching: “Yes, in the beginning, I started with the cuckoo—that was the first one. That was the first success story and the rest came later” (Interviewee 1, female 37). The Common Cuckoo is a common bird in Estonia which can breed in different habitats like forests, bogs and urban places like parks and gardens (Rootsmäe 1994). The presence of the bird as a commonly found species in a wide variety of geographical habitats (including urban spaces) and the ease of imitating its call are the two factors which probably make this bird the top imitated bird in our survey.

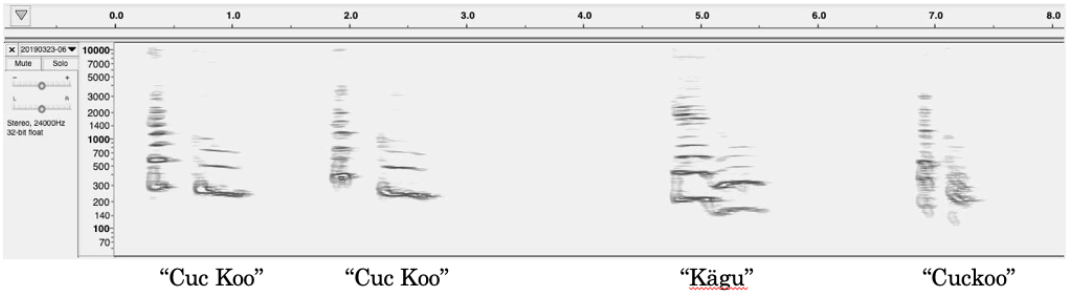

Figure 3. Spectrograph of a human mimicking the Common Cuckoo (*Cuculus canorus*).

Figure 3 shows the spectrograph of the author’s voice voicing the following:” Cuc koo Cuc koo Kägu Cuckoo” (done without practice); followed by speaking the word “kägu” (Estonian for Cuckoo); and, the English word “Cuckoo”. Comparison of the spectrographs of amateur recordings (Figure 3) with the sound of the bird (Figure 2) show that while the sound emitted does not match the sound of a Common Cuckoo call precisely, the sounds are a close approximation, and provides additional evidence about the ease of imitating the Common Cuckoo.

3.4.2. Sounds imitated by voice and whistling (short-duration and 100-5000 Hz)

Figure 4 is a comparison of the spectrograph of a Pygmy Owl (*Glaucidium passerinum*) and a human voice. The human voice belongs to an interviewee (male 34), who was recorded mimicking a Pygmy Owl in Tartu county in the year 2018. The spectrograph shows that the human voice produces a sound which matches the sound of the Pygmy Owl (*Glaucidium passerinum*) in both the approximate duration of the call and the frequency.

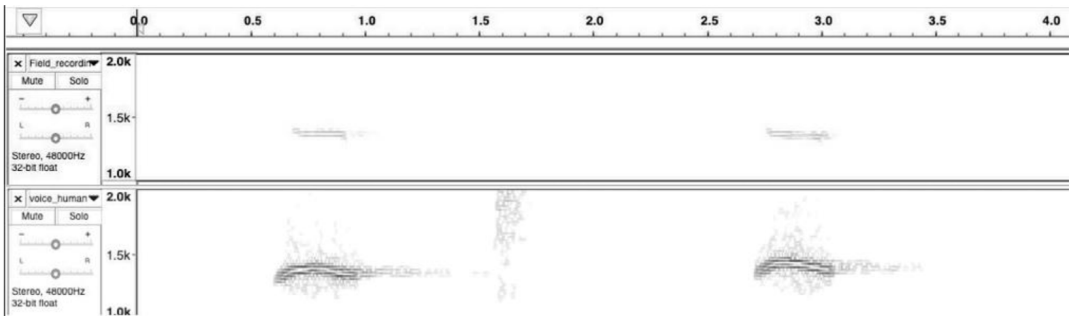

Figure 4. Spectrograph of a Pygmy Owl (*Glaucidium passerinum*) and a human voice.[7]

During a field trip in Southern Estonia in Spring 2018, made with the birder whose sound is reproduced here, we observed a case where a Pygmy Owl responded back to the call of the human voice. While the human voice may learn to imitate the sound of a particular recording, the natural voice of a bird has a lot of variations coming from the age, the sex, the geographical location, and the individuality of the bird (no two birds are exactly the same) and the sound produced by an individual bird also has variation. In a natural setting, there are a lot of elements which contribute to the noise—the wind, the presence of trees, and reflections from sources like the ground. Hence, it is not necessary to match the source of the sound exactly in order to get a response from a bird.

[7] Paal, Uku XC306740. Retrieved from www.xeno-canto.org/306740, 25.03.2019.

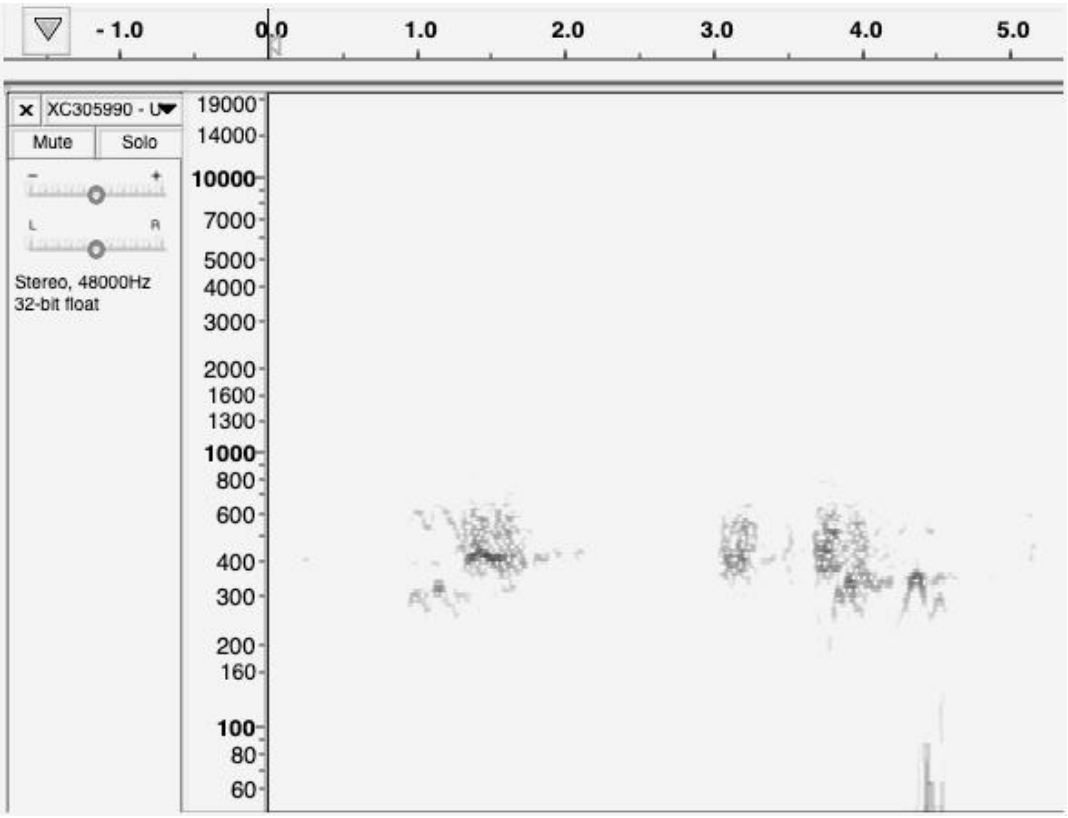

Figure 5. Spectrograph of a Ural Owl (*Strix uralensis*).[8]

Figure 5 shows the spectrograph of the calls of the Ural Owl (*Strix uralensis*). The calls are in the range of 200-800 Hz, making it a suitable range for the human voice to imitate. The Ural Owl is larger than the Pygmy Owl and hence the frequency of the Ural Owl's call is lower than the Pygmy Owl' call. The first group of inverted "V" marks on the spectrograph can be seen around the 300 Hz range at the one second mark, but the recording shows that this particular specimen is capable of modulating this frequency to a higher range as seen in the second group of inverted "V" marks on the spectrograph at around four seconds.

[8] Paal, Uku XC305990. Retrieved from www.xeno-canto.org/305990, 25.03.2019.

3.4.3. Sounds which can be imitated by a mechanical whistle (short-duration and > 5 kHz)

The call of the Hazel Grouse (*Tetrastes bonasia*), as seen in the spectrograph in Figure 6, is much higher than the normal range of voice production by the human voice (both the normal voice and regular whistling) and lies in the range between 7 kHz and 10 kHz. However, it is a simple sound—with a relatively constant frequency. Hence, it is possible to imitate this call using a mechanical whistle.

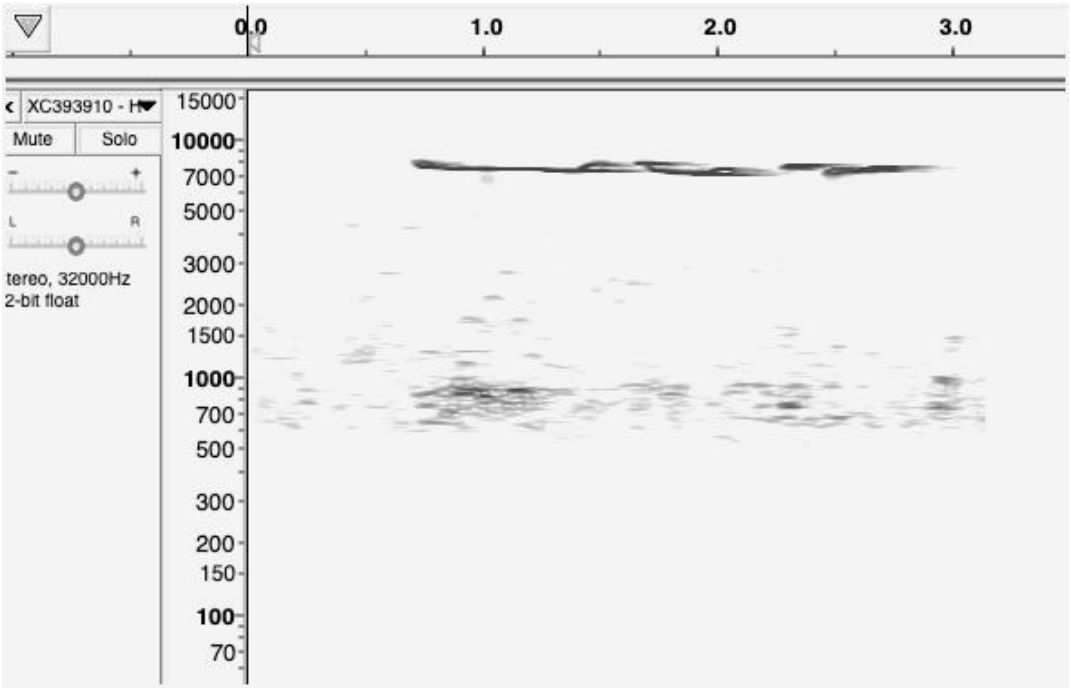

Figure 6. Spectrograph of a Hazel Grouse (*Tetrastes bonasia*).[9]

The Hazel Grouse is one of the most commonly hunted birds in Northern Europe, and among the methods used to hunt the bird (in addition using dummies and the use of certain breeds of dogs to assist in hunting) is the use of special grouse whistles which allow the production of sounds beyond the range of the human voice (Storch 2007). The Hazel Grouse is a bird which

[9] Livon XC393910. Retrieved from www.xeno-canto.org/393910, 25.03.2019.

is not pursued only by hunters—birders are also interested in finding the bird; more discussion of this bird will be undertaken in chapter 5.

3.4.4. Pishing: a technique to imitate the production of complex sounds

Figure 7 shows the spectrograph of the alarm call of a Marsh Warbler (*Acrocephalus palustris*). The alarm call shown is a complex sound and cannot be imitated by the human voice. However, humans can use "pishing" to attract a wide variety of birds, particularly warblers, because the sound produced by pishing approximates the alarm-calls of many birds (Zimmerling 2005). The use of pishing by Estonian birders will be discussed in chapter 5.

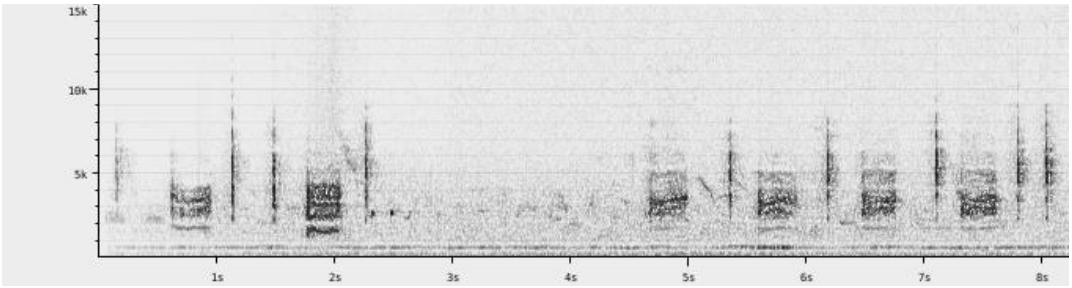

Figure 7. Spectrograph of a Marsh Warbler (*Acrocephalus palustris*).[10]

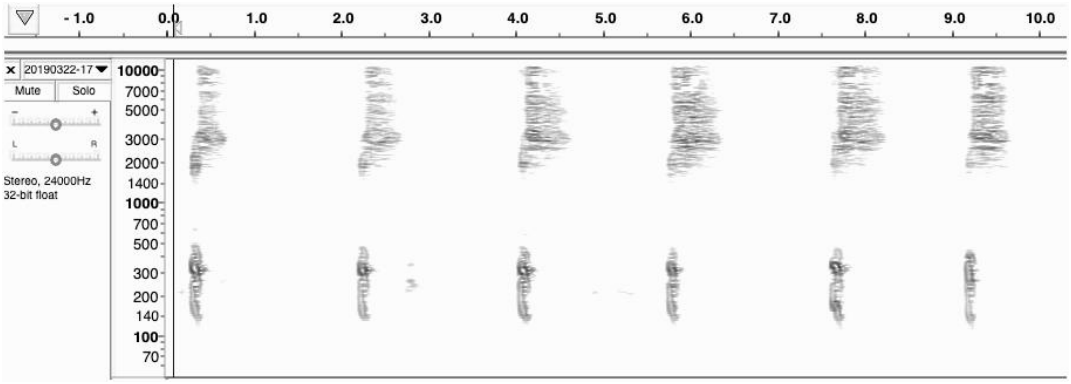

Figure 8. Spectrograph of a human voice making "pishing" sounds.

[10] Linjama, Tero XC347283. Retrieved from www.xeno-canto.org/347283, 25.03.2019.

Figure 8 shows a sample spectrogram of the voicing of "pish" done by the author to capture the spectrogram of the pishing sound. The sound "pish" was repeated six times over the course of 10 seconds. The spectrogram shows that the sound has two components—one centered at around 300 Hz and another centered at 3000 Hz (extending in range, due to harmonics, from around 1500 Hz to 10 kHz). Thus the "pish" sound can be seen to approximate one section of the alarm call of the Marsh Warbler—the rectangular shaded boxes in the spectrogram shown in Figure 7. The voicing of "pish" does not capture the broad-range high frequency "l" marks on the spectrogram.

3.4.5. Sounds that cannot be imitated by human voice: an example of a complex "two-voiced" song

Figure 9 shows the two distinct range of frequencies can be seen in the recording of a Common Starling (*Sturnus vulgaris*). The "two-voiced" song cannot be imitated by a human voice which has a single sound source. Imitation of "two-voiced" sounds can only be done using a recording which is played back on a speaker.

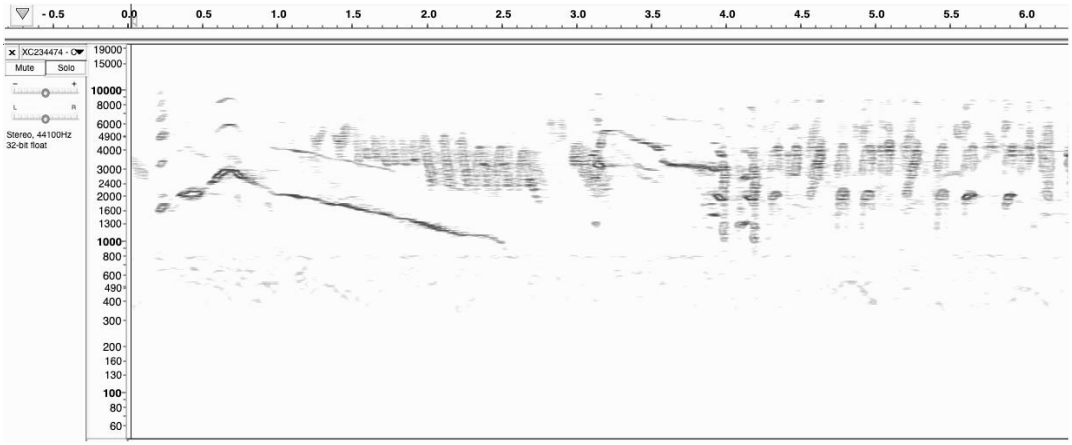

Figure 9. Spectrograph of a Common Starling (*Sturnus vulgaris*).[11]

[11] Hallikainen, Lauri XC234474. Accessible at www.xeno-canto.org/234474, 25.03.2019.

3.5. Learning and skills of imitation

The ability to imitate does not depend only on the properties of the human voice, but also on the skills of imitation as well as the choice of the right place and time for imitation. The ability of humans to imitate sounds plays a crucial factor in learning different socio-cultural skills like learning a language (Kuhl and Meltzoff 1996), using different kinds of tools (Abravanel *et al.* 1976) and social interactions with other human beings (Chartrand and Bargh 1999). Children in different cultures imitate the sounds of nature around them—including birds—in order to interact with them:

> Humans sometimes address birds with human language to elicit non-vocal responses. Nungon-speaking children call to Raggiana birds-of-paradise (*Paradisaea raggiana*): *mak! nok eppot!* ‘‘Mother! I’m coming!’’, to draw the birds into view and Tashelhit-speaking children (Morocco) taunt domesticated turkeys with *tmut 3aisha Bibi*!, ‘‘Aisha Turkey has died!’’, to elicit gobbling and eventually charging. (Sarvasy 2016: 779-780)

The ability of humans to observe nature, and record their observations can be seen from the case of the song of the Eurasian golden oriole (*Oriolus oriolus*), known as *peoleo* in Estonian, which was transcribed into Estonian as follows:

> Peo-leo, kas Tiit on teol?
> Teol, teol!
> Mia tal kaasas?
> Päts piima, lass leiba,
> kausiga kilet ka,
> piim läks ümber – vurr! (Ziegel 1929)

Children and adults engage with nature while influenced by the socio-cultural environment. The following cases show that human action can depend on reading the signs from nature, like people in agricultural societies associating rainy weather with the arrival of birds, and using the migration of birds to time the planting of crops. The association between the sounds of birds and the seasons has been observed in cultures like the Nage of eastern Indonesia, who plant their maze crops after they hear the calls of the Channel-billed Cuckoos (*Scythrops novaehollandiae*) and the Common Koels (*Eudynamys scolopaceus*), by correlating the calls of the birds with the arrival of the rainy season (Forth 2004: 180). Data compiled from eBird observations, on the Pied-crested Cuckoo (*Clamator jacobinus*) (known commonly by the Sanskrit derived name *Chataka*), have confirmed that similar observations of nature, about associating the Pied-crested Cuckoo with rain can be confirmed from multiple observations on a continental-scale:

> As the animation shows, between 1 April and 31 July, the progress of monsoon and the sightings for pied cuckoo go hand in hand. Before the monsoon, pied cuckoo sightings are restricted to South India until mid-May. Once the monsoon breaks and spreads across the subcontinent, the pied cuckoos also spread. At the peak of monsoon, the entire subcontinent is covered by both the cuckoos and rainfall. The Chataka is, indeed, a harbinger of the monsoon. (Yousaf 2019)

The anthropologist Steven Feld, while doing field-work amongst the Kaluli of New Guinea, observed that imitating birds was an everyday skill that was common among most members of Kaluli society and noted that Kaluli hunters were "expert in mimicking calls to attract the birds" (Feld 1982: 61). Feld observed that the avian taxonomy of the Kaluli was based on sound, and the Kaluli associated the beginning of the season of *tɛn* with the sound of a rainbow bee-eater (Feld 1982). The Greater Racket-tailed Drongo (*Dicrurus paradiseus*) is a bird whose ability to mimic other birds has been observed by scientists to play a central factor in attracting other birds to mixed-species flocks in Sri Lanka (Goodale and Kotagama 2006), and the mimicry and the behavior of the bird in policing mixed-flocks has been observed in the naming the bird by the Solega of southern India:

> The significance of such conspicuous gatherings of birds, and of the possible role of the drongo in maintaining them, is not lost on the Solega; the drongo is also called ***ko:luka:rã*** ('rod bearer'), the title given to a traditional Solega elder charged with maintaining peace and order, and meting out punishment to wrongdoers: ''We call it the sheriff. It's like a counselor to all the birds. [doḍḍa karali]'' (Agnihotri and Si 2012: 206)

Writing about the lives of people in contemporary Northern America, Richard Louv contends that while many people assume that they have lost the capabilities to be able to sense nature because their capabilities of sensory perception have atrophied, they can improve their skills of observing nature by changing their mindset: "Such senses are not vestigial but latent, blanketed by noise and assumptions" (Louv 2011: 12). Louv discusses many possibilities for people to improve their skills, and among them is birding, where he analyses how someone can become a "superbirder" by attending courses on birding and paying close attention to the sounds made by birds: "[…] birding starts with one sense, which leads to an opening up of other senses. A superbirder learns to see birds first, then hear them, and then to "see" them by hearing them" (Louv 2011: 14).

Being part of a culture does not automatically imply that everyone in the culture acquires equal skills through the same process. Just like the "Swiss Army knife" model of learning for language (Ibbotson and Tomasello 2016), the anthropologist Tim Ingold has argued that people from the same culture do not achieve the same proficiency in performing a task, and

use different methods to learn, and thus distinguishes the process of learning a skill—enskilment—from that of enculturation:

> […] to observe is actively to attend to the movements of others; to imitate is to align that attention to the movement of one's own practical orientation towards the environment. The fine-tuning of perception and action that is going on here is better understood as a process of enskilment than as one of enculturation. […] For what is involved […] is not a transmission of representations, as the enculturation model implies, but an education of attention. (Ingold 2000: 37)

People, learning skills, do not simply memorize and follow instructions, but engage in the process of learning by being exposed to environments where learning can take place and improve their skills over time in explicit and implicit ways. For example, people do not learn to drive a car or ride a bicycle by reading a set of instructions, but learn by doing the activity (which may or may not be supplemented with formal instructions). Ingold observes that people in cultures, when passing on a skill from one generation to the next, do not simply transmit a set of instructions, but provide people with opportunities where humans can be in an environment, where they may learn by being part of a general framework of learning:

> […] And in this process, each generation contributes to the next not by handing on a corpus of representations, or information in the strict sense, but rather by introducing novices into contexts which afford selected opportunities for perception and action, and by providing the scaffolding that enables them to make use of these affordances. (Ingold 2000: 353-354)

During one of the interviews, when queried about his skills, the interviewee replied: "[…] I need to whistle, and I am really bad in this […]" (Interviewee 4, male 35). Another interviewee noted how, while he was not adept at imitating a wide variety of sounds, he was aware of people who had superior skills:

> I am not that skillful myself, but with that smallest owl, quite a lot of ornithologists whistle his sounds, which is kind of the same in my opinion, and it works yeah. And some people can make lots of sounds themselves, and it's difficult for me. […] I think, I only know about owls, that you can whisper them. Well, I have watched some videos where people can imitate perfectly about 20-30 bird species sounds. I think it could be kind of cool, to test how the birds react, like if you compare the recording and the imitation. (Interviewee 2, male 21)

The ways to learn to imitate a bird can be many—one can try learning from the electronic recording of a bird, or one can try to learn the imitation by directly hearing the sound of the bird. One interviewee noted, that while she had learnt many songs from electronic recordings, in the case of the Pygmy Owl (*Glaucidium passerinum*), she learnt the sound of the bird by simply hearing the bird—an endeavor which can involve long stints at bird-watching:

> Some birds I've learned from CDs. Pygmy Owl is one of the bird who I studied independently. One can hear it in a recording; but it is also easy to hear the bird directly; and it is easy to do the imitation in

> either case. But, in general this information comes from a lot of bird-watching. (Interviewee 1, female 37)

Other interviewees noted the importance of learning from both personal experiences and learning from other birders:

> Well imitating them myself comes with experience; or from other bird watchers. For example, making owl songs comes when I went together with some people who were researching owls and we were out searching for them, and we used those techniques, and so I learnt that; so it is from others' experiences and teachings. (Interviewee 8, male 45)

Another interviewee mentioned an additional aspect about learning to imitate birds—teaching the skill of imitation can be a useful educational technique to teach a novice birder about new species of birds:

> If I want to become better at imitating birds, or I want to teach someone else about a bird's responses or sounds, or even allows itself to be looked at; I think it is a good way to introduce other people to species. I have been an assistant to a bird-survey. Someone does it for their work, and I just go with them [for] bird-monitoring. (Interviewee 5, male 47)

Thus, in summary, humans who want to learn the craft of imitating birds, need to learn the skills, and they can learn from recordings, from other birders and also directly from nature. Learning this skill can require patience and it is easier for some people to learn than others. The enskilment of learning to mimic birds is an implicit part of some cultures, like Kakuli culture (Feld 1980), while in other places people take concrete steps to learn to mimic birds because they may be part of a milieu where the majority of the society is not in direct contact with nature. Humans are not machines with a fixed set of functions but can engage in learning to mimic birds at any stage of their lives.

4. Recordings as media of human-bird interactions

This chapter will discuss how the process of transcribing bird songs has changed over the years, with early practices involving transcribing sounds by hand to the contemporary world where the recording of sounds and their analysis is performed using electronic equipment. The change in the nature of recordings from old media forms, like written transcriptions, to new media forms, like digital recordings, has changed birding practices in the areas of scientific work, education and hobby-birding. The changes in the use of recordings have come about in part due to the changes in technology, and in part because the change in technology has made it easier for people to have access to recordings—both due to the reduction in the physical-size and the reduction in the prices of devices used for recording and audio playback. According to sociologists, humans live in a world where humans make information available to others even when the other person has not witnessed the event, and this activity can be defined as objectivation:

> Human expressivity is capable of objectivation, that is, it manifests itself in products of human activity that are available both to their producers and to other men as elements of a common world. (Berger and Luckmann 1972 [1966]: 49)

The use of recordings can be seen as an example of objectivation, because a recording allows humans to reproduce the sound of another organism, even though that organism is absent. The media scholar, Marshall McLuhan, contends that to conceptualize about the impact of a certain object in a culture we need to look at societies without that object (which can different in time or space from the society in which the object exists) :

> Today when we want to get our bearings in our own culture, and have need to stand aside from the bias and pressure exerted by any technical form of human expression, we have only to visit a society where that particular form has not been felt, or a historical period in which it was unknown. (McLuhan 1964: 7)

In the case of birding, we have to go back in time to the lives of some of the survey respondents to note how the use of sound has changed their birding activity. Without the use of recordings, a person taking a birding trip would hear many sounds—but would not have a good mental map to classify all the sounds; such a person would be able to only classify sounds which they have heard in nature (or perhaps sounds imitated by other humans). When we consider the impact of the technology, our analysis should not be confined only to recordings, because according to McLuhan, media includes not just TV, newspaper, and

radio—but also means of transportation like cars, aeroplanes, trains, which allow humans to travel larger distances than they would be capable of travelling with only muscle power:

> The modern metropolis is now sprawling helplessly after the impact of the motorcar. As a response to the challenge of railway speeds the suburb and the garden city arrived too late, or just in time to become a motorcar disaster. (McLuhan 1964: 14)

The use of technology can be seen to make humans into a creature with a magnified sensory system:

> In this understanding, technology is an "extension" of biology: the expansion of the electronic media as the "metaphor" or "environment" of twentieth-century experience implies that, for the first time, the central nervous system itself has been exteriorized. It is our plight to be processed through the technological simulacrum; to participate intensively and integrally in a "technostructure" which is nothing but a vast simulation and "amplification" of the bodily senses. (Kroker 1984: 57)

Thus, the impact of recordings is not felt only at home, where birders can learn about bird songs in an undisturbed acoustic environment, or in a university, where computers can be used to analyze bird songs, but the impact of the use of recording is felt in places in nature which one would not normally visit without the use of means of transportation fueled by fossil-fuels. The use of a car by humans expands the size of cities, destroys bird-habitat on a grand-scale and distances humans from nature, while simultaneously allowing them to travel hundreds of miles to view the nature excised from their urban settings. Although the use of technological tools, like means of transportation, is important this chapter will focus on the use of recordings and its effect on human interaction with birds. Gunther Kress and Theo van Leeuwen have classified technologies into three categories: firstly, technologies that extend the reach of a human hand like a chisel or a brush; secondly, technologies, which all allow for a reproduction of the original object: " […]that is, technologies of the eye (and ear), technologies which allow more or less automated analogical representation of what they represent, for instance, audiotape, photography and film […]" (Kress and van Leeuwen 2006: 216); and thirdly technologies which can resynthesize digital data (Kress and van Leeuwen 2006). Thus, the use of recordings can be seen as extensions of the human-self, in the sense of both McLuhan and the first category as defined by Kress and van Leeuwen; but the use of playback encompasses both the second and third categories discussed by Kress and van Leeuwen. The use of any technology always raises questions about how the technology is used and what are the attitudes of the people using the technology; and this will be discussed in chapter 5.

4.1 History of recording media to store bird sounds

Humans have been fascinated with the sound of birds from time immemorial. One of the earliest recorded attempts at transcribing the songs of birds was done by P.A. Kircher who used musical notation as a method of transcribing bird song (Kircher 1650). Figure10 depicts the musical transcription of the sound of the Common Cuckoo (*Cuculus canorus*) which is named as "Cuculi" in the book.

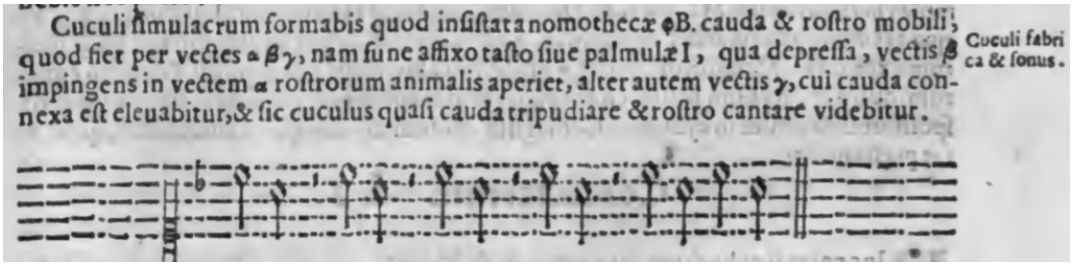

Figure 10. Musical transcription of the Common Cuckoo (*Cuculus canorus*).

The difficulty of the process of transcription was noted by W. Flagg in the 19th century, who said that the sounds of the majority of birds could not be transcribed on account of their complexity, while also noting the deficiencies of humans in the process of transcription of bird songs because the changes in songs were too rapid for a human to perceive:

> There are not many birds whose notes could be accurately described upon the gamut. The nearest approach we can make to accuracy is to give some general idea of their time and modulation. Their musical intervals can be distinguished but with difficulty, on account of the rapidity of their utterance. (Flagg 1858: 288)

Throughout the 19th century, the inability of humans to observe fast occurring natural phenomena was seen in other fields, like astronomy, which tried to record the precise occurrence of natural phenomena. The accuracy in the observation of the same natural event—like the precise time of an eclipse— by two humans observers was found to be around a tenth of a second (Canales 2010). Thus, the lower limit of human perception can be seen to be about 1/20 of a second or so; an error of 1/20 by each human, adds up to twice the time interval—namely, one-tenth of a second.

According to the biologist Jakob von Uexküll different creatures have differing rates at which they perceive the world and he has used the term "moment sign" to designate this interval. Uexküll states that in the case of humans, it is 1/18 of a second; in the case of certain fish it can be faster—1/50 second; while the pace of a snail's life moves at around 1/3 to 1/4 of a

second. Uexküll notes that humans can speed up or slow down the rate of occurrence of natural phenomena so that they are perceivable at a “human tempo”: like speeding up a slow event like the “blossoming of a flower” or by using fast-shutter speeds in “slow-motion photography” to capture still and apparently stationary, photographs of fast moving objects (Uexküll 1992).

In addition to the domain of time, humans are limited in their ability to finely distinguish amplitudes. According to a study carried out by I. Pollack, in which humans attempted to distinguish sounds which varied from 100 Hz to 8 kHz in equal logarithmic steps, it was found that humans could only process 2.3 bits of information for each stimulus presented: “This is equivalent to perfect identification among only 5 tones” (Pollack 1952: 745). Pollack’s experiment showed that humans can only assign the frequency of sounds to five different categories accurately; if there were more categories, like six and above, the rate of the error in classification increases. In the 1950s, the psychologist, George A. Miller, summarized the research from different experiments, which measured the human ability to distinguish stimuli, like the frequency or the loudness of sound; metrics of taste like saltiness; or the position of dots on a square, by concluding that the limit of humans to process information present in one-dimensional stimuli has an-upper bound—the magic number seven plus minus two (Miller 1956). Thus, while humans can distinguish minute differences between two stimuli—like frequency or intensity differences between two sounds—there is an upper limit to the human ability to classify independent stimuli into categories—and this upper-limit of classifying one-dimensional stimuli varies between five and nine categories. The limitation applies to quantities that vary on an analog scale—and do not apply to discrete quantities like a list of objects.

The limitation of the human Umwelt, firstly, in the domain of time, and secondly, in classifying analog metrics, meant that research in the sounds of birds had to wait till changes in technology made it possible to accurately record and reproduce sounds. In addition to the direct recording of sounds using tape-recorders, another device which played a crucial role in the history of audio research was the sound-spectrograph. The sound-spectrograph can transform the sound energy received by a recording device into other units of measurement like frequency (measured in S.I. units of Hertz; symbol: Hz) and loudness (measured in S.I. units of decibels; symbol: dB). The sound-spectrograph transforms the analog signal of sound into a visual representation—removing differences that are inevitable when a human being is comparing sounds. A machine can be engineered to overcome the human limitations: there

can still be errors in machines (no two machines can be identical)—but the signal to noise ratio can be calibrated to be within acceptable error margins. This change in technology had a massive impact on the fields of research studying audio signals—including areas studying avian sounds:

> A dramatic change in the pace of advance in song research, characterized by a steep rise in the time course of growing knowledge, began to emerge through the 1950s. This was precipitated in large part by the tape recorder, which had become increasingly available somewhat earlier, and the sound spectrograph, a device developed for military applications during the war years and capable of transforming tape-recorded vocalizations into detailed visible portraits of sound. The new horizons in bird song studies opened by these technological innovations must be similar to the new world of organisms revealed by the first microscope. (Baker 2001: 3)

One of the first scientists to study bird songs after the invention of the spectrograph was William Thorpe, and his student Peter Marler is considered to be one of the pioneers in this field (Brenowitz *et al.* 1997). Peter Marler discusses the impact of the sound spectrograph on research by describing the method used to chronicle scientific observations during the early days of his research, when he hiked around places in Western Europe to study chaffinches: "Altogether I transcribed by ear more than five hundred chaffinch songs, learning much about their behavior and ecology in the process" (Marler 2004a: 3-4); but many people, including his boss, W.H. Thorpe, did not believe in his results. However, things changed when Thorpe's lab acquired a sound spectrograph in 1950 (this was the second device in Great Britain at that time—the first being used for military purposes) allowing them to process a lot of data, including past data: "records of bird sounds donated from the archives of the British Broadcasting Corporation (BBC)" (Marler 2004a: 4-7). Echoing the observations of Baker above, Marler notes how the sound spectrograph changed research:

> As the sound spectrograph became more widely available, its use in bioacoustics spread like wildfire. Studies of geographic variation in birdsong began to appear, first as a trickle, then as a flood, in both Canada and the USA. (Marler 2004a: 10)

The impact of technology continues to have a strong bearing on research today. The use of algorithms to process large amounts of data using computers is used to process large-scale databases of bird sounds (Stowell and Plumbley 2014), and ecoacoustics, a novel field in ecology which studies the interpretation of sounds in the environment by organisms, integrates research in this area (Sueur and Farina 2015).

The cultural critic Walter Benjamin has argued that art objects have an aura associated with them, which are absent in their copies (Benjamin 1992 [1935]). Art objects, which can be copies of objects in the natural world, are now frequently replaced with objects like

photographs and recordings, which create a copy of the original object by automatically reproducing it using electro-mechanical means of reproduction. Gunther Kress and Theo van Leeuwen distinguish between realism in art and realism in science. Kress and van Leeuwen define realism in art, or naturalism, as follows: “From the point of view of naturalism reality is defined on the basis of how much correspondence there is between the visual representation of an object and what we normally see of that object with the naked eye [..]” (Kress and van Leeuwen 2006: 158); and contrast this with scientific realism, which does not stop at details at the surface level but tries to examine reality by making comparisons, as follows: “[…] defines reality on the basis of what things are like generically or regularly” (Kress and van Leeuwen 2006: 158). Recordings of birds in natural settings, which are copies of the original object, belong to the category of scientific realism, because they are predominantly used for scientific purposes (though in rare cases some people may use them for artistic purposes). According to the media scholar Lev Manovich,old forms of media, like vinyl records and film stocks, now exist in the form of new media based on the following five principles:

> The translation of all existing media into numerical data accessible through computers. The result is new media—graphics, moving images, sounds, shapes, spaces, and texts that have become computable; that is, they comprise simply another set of computer data. […] Rather than focusing on familiar categories such as interactivity or hypermedia, I suggest a different list. This list reduces all principles of new media to five—numerical representation, modularity, automation, variability, and cultural transcoding. (Manovich 2001: 18)

This can be seen in the case of recordings which are used to reproduce the sounds of birds. The early recordings of sound used analog media like Edison’s cylinders, vinyl records or cassette tapes. These forms of old media are now replaced by different formats which store the sound digitally. The five principles of new media by Manovich (outlined above) are discussed below in the case of digital recordings (which are one form of new media). Firstly, all digital storage formats are numerical representations of the data. This implies that the different formats are stored in digital ones and zeroes in a numerical format, and do not match the original analog signal of sound. Numerical computation is needed to both convert the analog signal to the digital form and to convert the digital signal to the analog form for playback. The property of modularity means that combination and re-combination of the object can take place with ease: “The objects themselves can be combined into even larger objects—again, without losing their independence” (Manovich 2001: 30). In the case of digital recordings, this implies that recordings can be accessed as part of a large data-base or by an application on a phone. In the case of previous formats, like vinyl or cassette-tapes, one

would have to change the physical object in order to hear a different recording; while in the case of a digital recording, one can access a particular recording with ease because the entire recording—stored in a digital format—can be accessed in a piece-wise manner. Automation implies that many of the physical difficulties of playing a recording and repetitive activities can be combined into a single step which reduces the time and effort needed to play a recording. For example, in the case of bird-banding stations, the same recording needs to be played over and over again, and this procedure can be undertaken by the software (which reduces human intervention in the task). This can be contrasted with the case of a magnetic-tape where the tape has to be physically rewound before playing the same segment. Variability implies that the recording is not an exact copy of the original object. In the case of digital recordings, the variability comes in part from the algorithms (which convert the original analog signal to different digital formats) and also from the different kinds of equipment replaying the recording. There are variations in the final physical object replaying the recording which can be due to the diverse physical specifications of different speakers, and variations can also arise from the differences in the hardware (like the semiconductor circuitry) involved in the digital-to-analog conversion. In the case of recordings cultural transcoding changes with new media because the physical interface between humans and machines changes. For example, if humans want to change the volume of output of a recording, using the interface of a touchscreen on a smart-phone screen replaces the analog knobs of older electronic equipment. Additionally, software interfaces replace older methods of data retrieval (which rely on physically moving objects). All these technological changes have increase the convenience of using digital recordings:

> Where once one had to physically lift the tone arm of a phonograph and move it through space to reach a desired song (literally looking at the grooves in the recording to identify where songs began and ended), today the artifact of recorded sound increasingly has no observable, physical quality. Listening to a desired song merely requires the push of a button, a keystroke, a mouse-click. […] The containment of the phonograph within a cabinet, the physical design of radio receivers, the innovation of single-control radio tuning, and the introduction of automatic record changers (all during the 1910s and the 1920s) are steps in a larger process through which technological principles and processes become increasingly opaque. Progress, convenience, efficiency—at least as they have come to be commonly defined—all hinge on this dissimulation of labor, this elision of technology, the sealing of technology's black box. (Wurtzler 2007: 282-283]

The use of a physically bulky playback equipment, like a phonograph, is impractical compared to the convenience of smartphones. In addition, the cultural transcoding changes because a human with access to digital media can virtually play any song (by accessing an online database using a cell-phone connection), and is no longer limited to physical objects

which one can physically transport or afford to buy. The cheaper cost of the equipment, and the availability of access to free recordings of bird sounds lowers the economic-threshold for the use of recordings. One of the biggest factors in the spread of recordings has been the miniaturization of electronics throughout the twentieth century:

> Devices that once depended on bulky vacuum tubes to control the firing of electrical pulses could now run on a relatively minute and powerful assemblage of silicon, electrons, and bits. In the early 1970s, as the integrated circuit became even more sophisticated, it developed into the "computer on a chip," or microprocessor, which allowed for electrical control within a vast array of devices, from pocket calculators to micro- wave ovens to toys and automobiles. (Gabrys 2013: 29)

Since the 1970s, in addition to the reduction in size, the number of transistors of transistors have been doubling on a computer chip approximately every 18-24 months—a trend which has been characterized as Moore's Law (Moore 1965). This has implied that the processing speed of electronics has been increasing exponentially, and in the contemporary world, a cheap smartphone can perform the same computations which were possible on an expensive computer from the 1980s. Smartphones, which first made their appearance in the 1990s, are ubiquitous today, and can perform a wide variety of sophisticated operations, and are in essence a miniature computer (Curley 2011: 103). The reduction in the cost of smartphones has resulted in people being able to afford smartphones. In addition to the cost of the hardware, change in technology has meant that the amount of space needed to store recordings in formats like the MP3 format has reduced while still maintaining acceptable audio quality (Hardy 2012: 89); and this reduction in file sizes is in part possible because computer algorithms which compress data and decompress the files before playing, rely on processing power, and processing power has become cheaper and more affordable over the years due to Moore's Law (Moore 1965). The availability of electronics has changed over the years with people today having access to portable consumer electronics compared to the past, and is reflected in the ability of birders to access electronics, which can play recordings of new forms of digital media is reflected in the comments made by the interviewees. One interviewee recalled how during a project in the past, which involved the study of woodpeckers, they had used a magnetic-tape player—even compact-disc players (CDs short) were still a rarity: "Yeah it was a cassette player. CDs were quite rare" (Interviewee 3, male 35). The changes in the technology of playback equipment and their use by birders will be discussed in the following sections, which discuss the use of recordings in three broad areas: scientific work and surveys (including bird-banding stations); education; and in birding as a hobby.

4.2.1. Use in scientific work and surveys

The use of tape lures to attract birds can change the outcome of the kinds of birds caught in mist net at bird banding stations compared to other methods like using a decoy. The studies have to be interpreted with caution because each bird is unique in behavior, and factors like the extent of sexual dimorphism can play a huge role in gauging the effectiveness of the control like a decoy. An example of this bias can be seen from a study conducted on migrating Curlew Sandpipers (*Calidris ferruginea*), where the study showed that "Mist-net with tape lures were on average twice as effective as nets without tape lures" (Figuerola and Gustamante 1995: 498), and noted that birds, especially females, with a lower body mass were more likely to be attracted to tape-lured mist nets because "Tape lured birds might have lower masses because they are newly arrived and in lower body condition" (Figuerola and Gustamante 1995:499). A study conducted on the Eurasian Reed-Warbler (*Acrocephalus scirpaceus*) noted that the chance of capturing this bird increases, from nearly zero, without the use of sound, to a significantly higher probability with the use of sound: "The probability that a bird was a new arrival at the stopover site varied between 50% and 85% on days with tape luring and was almost zero on control days without luring" (Schaub *et al.* 1999: 1047). In the case of Estonian birders, the use of sound to lure birds for scientific work can be seen from the comments of interviewee, who uses sounds to attract birds for scientific work, describing the use of playback:

> So, for the Corn Crake (*Crex crex*) what we did, we went to the site in the Karula National Park, and we were waiting there about a few minutes, we heard the bird, the Corn Crake, if it is there or not, and when it was quiet, then we start recording, this playback recording, and if sometimes, if they are there, they answer for the call, so you can recognize that this species is here, or the other case, when it was quiet, we do not know, if they are there or not, and we assume that they are not there. But, of course, some birds do not answer for the recordings. This was the corn-crakes, and for the Ortolan Bunting (*Emberiza hortulana*), what we did was, it was very hard to catch the bird. So, what we did was that we put mist-nets, close to the bird-territory when the male is singing, with the net there, we had the recording there, and we had one dummy. (Model bird, something like this there). We put this one there, and we start recording, and the bird come and attracted to the dummy, and we can catch them, and we put these devices, geolocators, so we study migration. So, this is what we did, this is the main thing I have done. (Interviewee 3, male 35)

The practices of using playback to attract birds for conducting census, and of attaching geolocators, follows the standard practices of ornithologists across Europe and around the

world. In the case of the Corn Crake (*Crex crex*) the use of playback was used to determine the presence of the bird: if the bird replied to the playback it was recorded as being present in the territory. Birds, like the Corn Crake, are studied because the population of these birds has been reducing throughout Europe, and locating the birds plays a crucial role in trying to find solutions to reverse the reduction in populations:

> Studies of the decline of European farmland birds such as the Corncrake (*Crex crex*), for instance, have identified specific agricultural practices as the cause, and have thus been able to recommend sustainable solutions. (Unwin 2011: 122)

Interviewee 3 stated (as shown in the excerpt above) that in the case of the Ortolan Bunting (*Emberiza hortulana*), playbacks were first used to attract the birds in order to trap them using mist-nets. The trapped birds had geolocators placed on them, thereby allowing the birds to be tracked across space and time. The decline in the numbers of the Ortolan Bunting stem from the decrease in the area available for breeding (which reduces the number of offspring raised) and due to hunting practices in places, like France, along the migration route from Europe to Africa (Sondell *et al.* 2011). Scientists from Sweden have observed that in the case of the Ortolan Bunting it is difficult to re-capture the same birds using playback, because while it is easy to locate the bird using a geo-locator, the birds might recognize the playback sounds, and thereby avoid the locations of the mist-nets:

> Re-trapping next year was very difficult. Many of the birds equipped with loggers could not be caught despite time-consuming trials. The most probable reasons were that males had learned from last year's trapping and it was now easier for them to avoid the nets in the open terrain. It is also possible they could separate playback sound from the song of real competitors. (Selstam *et al.* 2015: 4)

The cases of the Corn Crake and the Ortolan Bunting show that scientists can use playbacks to study a particular species. In the case of bird-banding stations, playbacks are also used to attract birds. A bird-banding station is a place where birds are trapped in mist-nets, and a small band or ring, with identification markings, is attached to the leg of the bird. The use of bands and rings is the reason why these places are called banding-stations or alternately, as ringing-stations. The book, *Bird Ringing Station Manual* (Busse and Meissner 2015), a scientific manual on the practices at bird ringing stations, states that sound can be one of a number of different methods which can be used to lure birds; other methods might involve the use of food or decoys:

> Attracting migrants using so called "tape-luring" […]. This traditional name is derived from using in the past analogue voice registering and playing devices, tape recorders, for attracting the birds to nets or traps. Nowadays, there are digital recorders and mp3 players, running CD or memory sticks, in use.

> This is a very controversial method of attracting migratory birds to a certain place or a catching area by broadcasting bird voices using loudspeakers. There are three different, but frequently combined, procedures using this method: (1) while migrants are still on air (before a dawn), (2) during a day for attracting birds being within the area to a certain nets and (3) in the evening attracting birds roosting nearby to places where nets are set." (Busse and Meissner 2015: 76)

The change in technology in the case of bird-banding stations can be seen from an excerpt of an interview, which discusses the chronology of the adoption of the use of playback using smaller portable devices at a bird-banding station in Estonia[12]:

> SB: For example, with the bird-banding station in the past, people did not use loudspeakers; but you have started to use them. How did you learn about this technique?
> Interviewee 8: Well, we started, I think, because of the availability of technology. I remember, years ago we even planned, when there were no small MP3 players, we used a big radio with a CD player, but it needed lots of batteries, and so we tried to put some long wires for the loudspeakers; but technologically it was not in widespread use. So, as technology became available, we started using it.
> RM: When did you start using recordings at the ringing stations?
> Interviewee 8: Now, for the past four years, we have use this intensively. When we ringed before in the years 2000-2008, we used the old radio. And before that we started about 15 years ago, but in the last 4-5 years we have used intensively.
> RM: Which are the birds for which recordings are used?
> Interviewee 8: First birds, for which we used the recordings were swallows, like the Barn Swallow (*Hirundo rustica*), just on some evenings when they gather on the reeds, we try to attract them. But for the last four-five years we use various reed warblers and others like the Garden Warbler (*Sylvia borin*) or the Blackcap (*Sylvia atricapilla*). Plus, in the autumn: the Siskin (*Sylvia atricapilla*) and the Long-tailed Tit (*Aegithalos caudatus*). (Interviewee 8, male 45)

The interview conducted in 2018, shows that at this banding station in Estonia, playback was done using compact-disc players—which required physical compact discs—during the period from 2000-2008. Subsequently, the availability of smaller speakers, which can use sounds stored in the MP3 format, made it easier to use playback to attract a wide variety of birds. The ability to store the recordings on electronic hardware, in formats like MP3, imply that the recordings can be changed with ease (unlike the case of older methods like CDs and cassettes which require changing of the physical recording).The use of new media, like MP3, to store sounds has the advantage of portability because the physical storage space for the recordings is small, and allows the use of small-portable devices which can be recharged. The use of smaller speakers with rechargeable batteries makes the use of playback convenient, without

[12] SB – Sugata Bhattacharya; RM – Riin Magnus

having to string a long wire to the mist-nets from the electricity supply of the building of the banding station, as seen in the comments below:

> In Vaibla, at midnight we switch on reed-warbler songs; because reed-warblers are night migrants, and they fly over, and if they hear the sound, they come down to the reeds. From midnight to about the noon of the next day, to about a bit later, then we charge the batteries for some hours, and in the evening—from six p.m. to midnight—we use swallows, hoping to attract them to come to overnight to the reeds. (Interviewee 7, male 18)

The location of the bird banding station plays a crucial role too—if the location is not part of the migration route of birds (or has other problems like urban or traffic noise sources which might make it hard for the birds to hear sounds), the likelihood of attracting birds decreases.

Banding a bird using a mist-net is a skillful task involving many components. In the case of Estonia, the northern latitudes imply that the banding activity, which takes places in late summer or early fall to coincide with the southern migration of the birds for winter, takes place with short nights: thus a person working on the project has to collect birds from the mist-nets late in the evening and early in the morning. It takes skill to free a bird from the net—some people are more adept at learning this compared to others—and this skill is learnt by participant observation with more experienced bird-ringers. The information about the banded birds are placed in a database—this activity inherently immense skill to classify birds. For example, during my visit to a bird-banding station, some of the ringed birds were the Garden Warbler (*Sylvia borin*) and the Common Whitethroat (*Sylvia communis*)—which were entered into the logbook as SYLBOR and SYLCOM respectively. As an amateur birder, I could hardly tell these two birds apart—even at a close distance. The experienced banders also consulted some books from time to time to identify the birds accurately—which was aided by careful observations of the feathers and coloration of the bird. In this example, the use of recordings attracts closely related species of birds, which are attracted by the same sound, and humans need visual cues to distinguish them.

4.2.2. Use of recordings in education

R.M. Pyle has defined “the extinction of experience” as a syndrome in which a human being starts losing their connection to the natural world:

> Essentially, the extinction of experience syndrome works as follows: when common species of plants and animals (as well as cultural, architectural, or any other features of diversity) become extirpated in

> one's everyday environs – within, that is, one's radius of reach – one grows increasingly inured to their absence. (The radius of reach is smaller for the poor, the very old, the very young, and the disabled.) That is, as the richness of the neighbourhood diminishes, the power of the neighbourhood to fascinate, arouse, excite, and stimulate also passes into dullness, ennui, and apathy. (Pyle 2003: 209)

J.R. Miller has argued that the extinction of experience is not a unidirectional process, but can be reversed by improving the design of places of so that people can have more meaningful interactions with the natural world, which will increase public support for conserving biodiversity (Miller 2005). Scientists studying the impact of a program, called "Bird Buddies", a UK-based educational project aimed at school children aged 7-10, with a focus on bird identification, bird feeding and ecology, found that the attitude of children changed as result of the program, with the greatest impact on children who had minimal prior knowledge about nature (White *et al.* 2018). The use of playback for educational purposes can be seen in an excerpt from an interview with two interviewees, Interviewee 5, male 47 and Interviewee 6, female 46, who conduct educational camps for children:

> SB: And with children you talked about warblers?
> Interviewee 5: Yes, it is reed-warblers, and it is a new method. When I was working in ringing stations, they did not use it. But nowadays, they use this playback of songs, and it is quite impressive considering that these long-distance migrants travel in the nighttime, that this happens between 500-700m altitude, and if you play a song that they are dropping into your reed beds. They have to drop down somewhere anyway during the morning, because they migrate during the night, but if they specifically choose your area then your ringing catch will be higher.
> SB: So, you use that with the children? You were teaching the children about nature and birds.
> Interviewee 6: For the last seven years, we have in Saaremaa, a children's bird camp, we study the bird voices, and we watch the birds with binoculars and scopes, and do trips. Not only birds, but trees and plants.
> SB: So, it is in the forest away from the city?
> Interviewee 6: And then we do some bird ringing too.
> SB: So, did you use a mist net?
> Interviewee 5: Mist nets. Yeah.

The use of binoculars and spotting-scopes helped the children observe the birds from a distance, but the use of playback played a crucial role in attracting birds to the mist-nets—which allowed children to observe birds at a much closer distance. The use of playback, can also be seen in the following excerpt from another interviewee:

> SB: […] And so, when you started birdwatching, did you start using just binoculars or did you also start using sounds/recordings?
> Interviewee 2: Ya—the teacher said that we should interrupt the birds as few as we can, but yeah, some bird species we use sounds to invite them, hear them. Yeah, we did it quite rare, every time we did it, ten or fifteen people, and only the teacher would play the sounds. (Interviewee 2, male 21)

In this case, the interviewee noted that the teacher conducting the education activity pointed out that people should try to disturb birds as little as possible, and ensured that the only

person playing the recordings was the teacher. In the same interview, the interviewee (Interviewee 2, male 21) said that sometimes the teachers would take groups of students to locations where owls were known to nest, and playback was used to record the presence of owls. Thus, the two examples of educational camps in Estonia are examples where children were given an opportunity to observe real objects in nature—using all their senses to observe the natural world. This experience is richer than the typical classroom scenario, where children have a distant relationship with natural objects through images and texts. The use of recordings in these settings enhanced the experience of the children: instead of simply being told that birds exist in this place, children were able to come in close contact with the birds, as in the case of bird ringing, or hear the birds, as in the case of owls. The use of playback in educational settings helps children learn about nature in a manner which inoculates them against "the extinction of experience" as described by R.M. Pyle.

4.2.3. Use of recordings for hobby birders

The use of recordings by hobby birders is facilitated by the miniaturization of electronic components like the ubiquitous use of smart-phones in daily life today. This is because the use of recordings by a hobby-birder depends on what can be carried personally on a human being—it is impractical to haul around large speakers while observing birds. Steven Johnson has noted that human innovation can arise from a multiplicity of factors, and one of the ways is parallel to exaptation in biology (Gould and Vrba 1982); where humans adapt an existing technology for a different purpose (Johnson 2010). Cars have included cassette-players from the 1970s, and with changes in technology have incorporated the ability to play compact discs and files in different digital formats including MP3 files (Williams 2011). People who go birding, usually travel to the birding destinations using cars, and thus may use the speakers of their cars to play recordings—a clear example of exaptation—as noted by an interviewee:

> I started to use apps and smartphones, I think two years ago, and, but, three or four years ago, when also were also birding with more experiences bird-watchers, we went into the woods or something, and they used for instance, from the car—CDs or MP3s in this car. Open the doors and they are really loud. And also, some birdwatchers had some kind of, I think, some kind of dictaphone or some kind of some small radios. Some kind of speakers. What they can take into hand, and they just hold it and use it. Also a lot of songs, what they can do by themselves. Imitating the birds. (Interviewee 4, female 33)

In the contemporary world, where the availability of smaller handheld speakers is both cheap and accessible, people also play recordings using these devices. The same interviewee

discussed how the use of recordings can be helpful in the field when trying to distinguish the sounds of birds whose sounds sounded similar to a human on hearing them. In this case, the two similar sounding birds were the Garden Warbler (*Sylvia borin*) and the Eurasian Blackcap (*Sylvia atricapilla*). The interviewee first tried to compare the sound of the recording on the smartphone to the sound of the bird which they had just heard. However, they were not able to distinguish the type of bird based on the sounds from the recordings; and subsequently they played the song of the bird through the smartphone-speaker with the understanding that the bird would only respond to the recording of its own species:

> And well, it was in spring, and they were singing, and so one of them was singing, and I was confused which one is it. So, I used the speakers. I let it sound. I have from smartphone, and to see which one is it? […]. First, I used it to just listen quietly (holds hand by ear), and if I don't get it, then I […] play the sound for the bird. (Interviewee 4, female 33)

There are a number of smartphone applications which integrate different aspects of birding such as the application from the National Audubon Society, based in the U.S.A, which allows birders to conveniently access information on birds, and allows users to track their observations: "The Audubon Bird Guide is a free and complete field guide to over 800 species of North American birds, right in your pocket."[13] Another aspect of the use of technology is the social learning of humans in the company of others. If one birder observes another birder engaging in a certain behavior, they are liable to copy a behavior—like the use of recordings—which increases their chances of seeing birds. In all the cases of the use of recordings, as noted in the interviews, the ease of the use of devices has facilitated their adoption. For example, if smartphones were as bulky and heavy as a desktop computer, people would hesitate to use the devices because they would be inconvenient to carry around while birding. Other salient improvements include aspects like the advent of water-proof electronics—which increases the confidence of people to use them in harsh weather conditions like rain. Thus, the exaptation of the use of consumer electronics in the area of birding is a case of innovation by humans which is commonly used by people with smartphones today.

---

[13] Retrieved from: https://www.audubon.org/app, 06.05.2019.

5. Practices and attitudes towards bird-sound imitation

This chapter is divided into two broad areas: behavior and attitudes. The first section on behavior will discuss the prevalence of sound use amongst birders in Estonia by bringing in examples from the survey and the interviews. The second section will discuss the attitudes towards the use of playbacks amongst birders in Estonia based on the survey and the interviews.

The anthropologist Tim Ingold in an exhaustive survey of human behavior has noted that human activity, in the context of interaction with nature using tools, can be classified into two categories, based on whether the tool use is used to control nature or the tool use helps reveal nature to humans: "In short, whereas for farmers and herdsmen, the tool is an instrument of control, for hunters and gatherers it would better be regarded as an instrument of revelation" (Ingold 2000: 320). The use of sound in the context of birding can fall into either of these categories: if used improperly, humans exert control over nature; while a justified use of tools, like the use of playback for scientific surveys, can be considered to be helpful in the long-term by promoting conservation of birds (in spite of having a negative short-term impact by disturbing the bird). Even a small population with powerful technology can have a significant effect on the environment. For example, the impact of the use of speakers playing the recordings of birds at multiple locations is greater than the impact of a single human voice imitating birds. When tackling ecological problems, ecologists have warned against solutions which seek to address a single problem as a crisis by proposing a single solution to tackle a single problem (Odum 1963), and Arne Næss has criticized this approach as shallow ecology (Næss 1973: 95). Arne Næss has proposed that solutions to problems can only be tackled by an approach, which is called deep ecology, by working on solutions that work on longer time-scales, with decentralization and greater local autonomy, with an emphasis on the equality for all life forms in the biosphere (Næss 1973). The philosopher and semiotician, Morten Tønnessen, has extended the concept of "deep ecology" by combining the subjective universe of an organism or Umwelt based on the works of Jakob von Uexküll (Uexküll 1992), with "Ethics" based on the "Deep Ecology" of Arne Næss (Næss 1973), and calling the set of principles derived from this approach as "Umwelt Ethics": "an Uexküllian interpretation or specification of The Deep Ecology Platform […]" (Tønnessen 2003: 282). In the case of humans, Tønnessen notes that humans have a "*conceptionalized Umwelt experience*" (Tønnessen 2003: 290, italics in original), which means the human Umwelt is

not shaped by just our anatomy, but is impacted by socio-cultural influences: “Participation in different common-Umwelten (cultures, subcultures) are of crucial importance to human Umwelt experience” (Tønnessen 2003: 290). Tønnessen states that all living being, irrespective of their size, are in a web of relations with their environment, and when one looks at the impact of an action, one should not only consider the impact of an action on a single organism, but consider how the impact changes the semiotic web of relations of all the organisms it has relations with:

> In capacity of meaning-utilizers, all semiotic agents, be it the simplest creature, are able to distinguish between what they need and what is irrelevant or harmful to them. […] You cannot really value a subject without at the same time valuing the web of contrapuntal relations that it takes part in. (Tønnessen 2003: 292).

The attitude of people towards animals can change based on individual characteristics of the human and socio-cultural factors, but is also influenced by the umwelt of the animal:

> People’s attitudes towards animal species depend on, in addition to psychological dispositions of the people themselves, biosemiotic conditions (umwelt structure, biocommunication) and cultural connotations/symbolic meanings. (Mäekivi and Maran 2016: 227)

Thus, only when the practices and attitudes take into account the umwelt of an animal (and other organisms with whom it interacts with), and take into account the long-term impact of an action (which can be amplified by tool use), can the practices and attitudes be considered to be in accordance with “Umwelt Ethics”. These considerations will be of importance when discussing the use of technological devices to establish a connection with another species.

5.1 Use of bird sound imitation and different activities

The survey distributed for the study, shown in Annex 1, allowed people the option to choose from a list of eight different types of birding activities. In addition, people indicated in the survey if they did or did not use sound to attract birds, but we did not ask if they use sound in particular activities. Hence the results in Table 7 show not how many people used sound in a specific activity, but how many people, who were involved in certain activities also used sound to interact with birds. Thus, Table 7 shows the relative popularity of each kind of birding activity, and the percentage of people who used sound and were engaged in a particular activity.

As Table 7 shows, the most common activity among the survey respondents was bird-watching as a hobby (69 of the 71 people in the survey). While the survey did not target hunters as a group, there was one respondent who engaged in hunting as an activity. If we disregard the single hunter in the survey, the overall picture that emerges from the survey is that that roughly 71% to 83% of the respondents who engage in different birding activities use sound in some manner to attract birds (see Table 7). There have not been a lot of studies which have studied the use of sound by birders, but one study, conducted in the U.S.A., shows that a similar percentage of people reported using playback while birding: "A survey of members of LABIRD, an email bulletin board (LABIRD-L@listserv.lsu.edu) dedicated to disseminating information about birds of Louisiana, revealed that >70% of respondents used playback while birding […]" (Johnson and Maness 2018: 137).

Table 7. Number of people using sound per activity

Activity	Number of people not using sound	Number of people using sound	Total number of responses	Percentage of people using sound
Hunting	0	1	1	100%
Photography	13	32	45	71%
Feed Birds	9	30	39	77%
Hobby-Birdwatching	19	50	69	72%
Scientific-work	3	15	18	83%
Bird-Survey	7	26	33	79%
Conduct Excursions	3	12	15	80%
Education	5	19	24	79%

Thomas R. Dunlap has observed that in the contemporary era, ornithology is a discipline which blurs the distinction between professionals and amateurs because professional ornithologists often work in conjunction with expert recreational birders, and professional ornithologists engage in birding as a hobby in their spare time (Dunlap 2011). Dunlap's observations were seen to be valid by looking at the kinds of activities mentioned by the different interviewees. Interviewees who were professional ornithologists and conducted

surveys took part in birdwatching as a hobby, and people, who were primarily engaged in birding as a hobby, also took part in scientific surveys and bird-ringing. The overlap of activities in birding allows the dissemination of information not only through traditional means of communication like print, mass-media and online means of communication, but through meeting other people at informal birding events. For example, at the annual meeting of the Estonian Ornithological Society, professional ornithologists present their studies on bird populations in Estonia, and a number of other opportunities like book-exhibits, bonfires, nature-walks, and conversations at meal-times allow everybody, professional and amateur alike, to interact with each other. Thus, cultural or subcultural intermixing of amateurs and professionals, in the context of birding, which increases the knowledge of people about diverse aspects of birding, can change the umwelt of people and help people modify their behavior to better match the principles of "Umwelt Ethics".

5.2. The contexts where sound is used by humans

The following section will discuss the responses of people from the interviews to the question asking people about the contexts and purposes for which they use sound. People take part in different kinds of birding activities and use different approaches to attract birds. For example, one of our interviewees, who is a regular birder and uses sound to attract birds, chooses a different strategy in winter: "In the winter, I do not use sound, I just have the feeder outside, and birds come to the feeder and I am not sure if the sound will work in the winter" (Interviewee 7, male 18). Others have noted that while they might use sound in group situations, like say in the context of a birding camp with other students, they might decide not to use sound when they are birding by themselves because they might not have the equipment to play recordings and might not see an advantage to using sound:

> No. When I am doing birdwatching on my own, I only use binoculars, because one reason is that I do not have this technique to play the sounds and I haven't felt that it is giving me so much extra that I have to use it. (Interviewee 2, male 21)

One interviewee said that a context in which they use sound is during birding competitions, when sound is used in order to accurately report the list of observed birds, and carefully enter the list of observations into databases:

> If we have birdwatching rallies, competitions, then I use imitations. I try to minimize using it and with phenological information, I know which kind of bird should be there. I want to check if he is there and so I use it to see if he is active there. Every bird, which I observe, I will write it down and put them onto the databases […]. (Interviewee 4, female 33)

When asked the same question about the contexts in which they used sound, another interviewee noted that sound can play an important role in educating people about birds, by allowing people to associate sounds with the activities of birds:

> Mostly for learning purposes. If I want to become better at imitating birds, or I want to teach someone else about a bird's responses or sounds, or even allows itself to be looked at; I think it is a good way to introduce other people to species. (Interviewee 9, male 35)

The use of sound by one interviewee shows the wide range of contexts in which a person may use sound—for bringing birds in closer for either photography or for clients when one is working as a nature guide; for birding-surveys for scientific-work; and can be a fun activity:

> Most frequently, I want to get the birds nearer to get information about their presence, usually I want to photograph them, or, I want to get them close for my birdwatching clients. To get them closer to a visible distance. Usually, when you are doing some census or monitoring work you need to know whether the birds are in an area or not. For that monitoring scheme, we have certain fixed monitoring spots for woodpeckers and owls, and hazel grouse and we are reaching this point, and we are playing the standard playback tape for about five minutes, and we are recording all the responses for all the specific species and this is a useful method for a census, and you repeat it so that you can get comparable results. But on the other hand if you go to somewhere, which is a new place, and you want to know if there might be some birds which exist there or not, you can imitate the bird using a playback to get an idea of whether there is a specific bird there of interest or not. But sometimes, I whistle or just imitate the birds also for fun. Just to make some contact. (Interviewee 5, male 47)

Many of the interviewees, in their interviews discussed how birding can be a "fun" and rewarding activity. The anthropologist Brian Sutton-Smith has noted that human activities like play can be ambiguous and multi-faceted, and birding, as a hobby, can be distinguished from work, because it has some components of play mentioned below, and has the added benefits of personal and social interactions which can lead to overall well-being:

> So, when play is opposed to work and is said to be optional, fun, non-serious, and nonproductive, this can be from the point of view of factory work and other forms of economic discipline. Play is obviously very serious to its participants; they strive very earnestly and with great effort at their play and sports, and their efforts produce important personal and social outcomes that cannot be gotten easily in any other way. (Sutton-Smith 2001 [1997]: 202)

The intrinsically rewarding nature of the interaction between humans and birds can be seen from the interview of Interviewee 3, male 35, an ornithologist by profession, who described the circumstances in which they used whistling for imitation: "For the Grey-headed Woodpecker (*Picus canus*), the sound is "Too too too too", so the sound is. But this is for leisure, for fun, for something like that" (Interviewee 3, male 35). Thus, people, even

professional ornithologists, can engage in birding as an activity, because it is a pleasurable activity compared to other activities like work. Another interviewee mentioned in his interview that the use of imitation can sometimes be done for fun to contact birds: “But sometimes, I whistle or just imitate the birds also for fun. Just to make some contact” (Interviewee 5, male 47). The component of fun was also mentioned by another interviewee, who noted: “Sometimes a dialogue with birds is just for fun too—not only for attracting” (Interviewee 8, male 45), and as an example cited the case of his wife, who has imitated cranes around their house, with the result that the cranes circled their house to find the source of imitation. In addition, birding as an activity can be seen to be an activity which people engage in for self-actualization, similar to the activities of people who are compelled to make music, paint or write:

> Even if all these needs are satisfied, we may still often (if not always) expect that a new discontent and restlessness will soon develop, unless the individual is doing what he is fitted for. A musician must make music, an artist must paint, a poet must write, if he is to be ultimately happy. What a man *can* be, he *must* be. This need we may call self-actualization. (Maslow 1943: 382)

Birding as a hobby has the component of self-actualization, and can be a fun activity for oneself, and can play a role in education (both for oneself and for others like one’s children) and this aspect can be seen in the comments of an interviewee, who replied to a question about the contexts in which she used imitation:

> Right now, I do it mostly for fun; because, I haven't been to bird-watching for many years in this context, I don't mark and note down any phenological observations, nesting or something like that. But I also try to teach my child and then it's good to bring the bird closer. So, currently, the imitation is done mostly educational purposes in this context. (Interviewee 1, female 35)

Thus, sound can be used for a number of different contexts and purposes while birding, ranging from casual bird-watching; to photography; for education; as a useful tool for nature guides and for scientific-work. The results of the survey and the interviews show that the same person can be engaged in multiple activities, and the way a person uses sound can vary depending on the purpose. People usually follow strict guidelines and standard procedures, while using sound for scientific work. People might use sound to improve their tally and accurately record the birds observed in a birding competition. People can imitate birds for fun and use sound as an important education aid to teach other people about birds. The list of all the activities in this sub-section do not meet the criteria of being strictly ethical according to the norms of “Umwelt Ethics” because many people consider that the activity can be a fun activity from the viewpoint of humans, but do not necessarily consider the impact of the activity on the bird. However, there are cases where humans consider the impact of their

activity on birds, like the example of the interviewee who uses the functional circle of food by using a feeder (instead of using the functional circle of enemy by using a territory call) to attract a bird in winter, and thereby preventing the needless expenditure of energy by a bird to respond to a false sign in winter when food may be scare. Other interviewees have noted that the use of sound can be used for educating people about birds, and thus this long-term goal is considered to be of more value than the short-term disturbance to the bird. Activities where the long-term goal is paramount is the scientific survey of birds, where the information about the birds is used for conservation purposes. The impact of activities like birding competitions are harder to assess, because they cause short-term disturbance to the birds, which are counterbalanced by the availability of accurate information (with a possible increase in accuracy coming from the use of sound) on the distribution of birds, which is entered into databases by competitors, and this information can subsequently be useful for conservation.

5.3. Behavior of humans and birds while using sound

The use of sound can entail subsequent modifications of behavior of both humans and birds. The usual practice, while using sound, which was mentioned by some interviewees, was the avoidance of making sudden movements or sounds which might scare birds away, and prevent humans from hearing or seeing them. Experiments on the reaction of the mother hen to the distress of her chick showed that the mother hen only responds to auditory cues and not visual cues (Uexküll 1992: 354). Thus, if the umwelt of other birds is similar to the umwelt of the mother hen (described above), a bird is going to respond to an auditory cue even in the absence of a visual cue. Hence, the analysis of the effectiveness of human behavior like hiding (which hides the visual cue) or standing still (reducing visual disturbance) can help us understand the similarity in the umwelt of birds.

When asked to describe their behavior when they were imitating birds, one interviewee replied by noting that the absence of movement was more important than the practice of hiding: “Maybe just to be still. Not to move around. Not to be too easily noticeable, but I do not think that there is any point to hide myself” (Interviewee 9, male 35). An interviewee said that birds can be wary of human presence; may cease to perform their regular activity in the presence of humans and birds restart their normal activity after a lot of time; and hence their

standard procedure is to wait for as long as fifteen minutes to half an hour before using sound to attract birds:

> First, I am waiting. […] Well, I have made notes or noted that if you are waiting sometime, I think fifteen minutes or half an hour, the birds are becoming active, and they are making more sounds. (Interviewee 4, female 33)

Another interviewee, when asked if they hid before engaging in imitation, said that while hiding may be important for photography or hunting in the case of a bird like the Hazel Grouse (*Tetrastes bonasia*), humans need not hide from a bird, if the only purpose to use sound was to merely record the presence of a bird:

> Not always. For example, if you want to just record the presence of the bird, then one shouts and notes down its response in the territory; and hiding is not important. But for a photographer who wants to take a picture, or if a hunter wants to hunt a hazel grouse, then surely. (Interviewee 1, female 37)

When asked if humans needed to hide while conducting scientific surveys, an interviewee described the practices followed in the case of birds like the Ortolan Bunting (*Emberiza hortulana*) and the Corn Crake (*Crex Crex*):

> No. Usually no. Of course, when we did the catching of the Ortolan Bunting (*Emberiza hortulana*), we put the mist net there, there was the dummy and this recording device, and we went away. This was for the catching. For the corn-crake we did not do it. And when you do it for fun, you do not hide yourself or something. No. Never. Hunters: they do it; which I have heard. (Interviewee, ale 35)

The use of sound can attract birds as can been in the case of an experience with an interviewee, where they were able to hear the Eurasian Pygmy Owl (*Glaucidium passerinum*) come closer to humans, after humans imitated the sounds of the owl:

> I remember once when it was summer and close to Räpina and we had a camp there, and we tried to invite one owl (*Glaucidium passerinum* in Latin), and we just sat there for quite a long timed we were in a thick forest and we know that they nest there. It was the nesting time in March. It was actually before the nesting time. Yeah. We were like on the edge of the thick forest, and we sat there for a while. It was the first time I was in a group when we tried to use sounds and yeah, it worked. The bird came closer, but we did not see it, but we heard it. Yeah. I think, it was the most memorable imitations of bird sounds that I have. (Interviewee 2, male 21).

The use of imitations can attract birds like the Common Raven (*Corvus corax*), who might get curious about the source of imitation:

> An ordinary bird — a raven and during the autumn, probably the young birds together with their parent-ravens, around seven birds, and at that moment I really hid myself in the bush and imitated the raven. Then, they all started to fly around this shrub, lower and lower, they wanted to see who was inside. (Interviewee 1, female 37)

According to the survey results (see Table 5), various species of owls and woodpeckers are amongst the top-ten imitated birds. Studies conducted on owls, like the Spotted Owls (*Strix*

occidentalis), have found that owls are not as vocal and harder to locate outside the breeding season (Forsman 1983). There are standard protocols to follow while using playback to record the presence of owls for scientific surveys and usually involve repetition of the survey in order to confirm the presence of the owls (e.g., Hausleitner 2006). One of the interviewees, Interviewee 9, male 35, has described the behavior of birds which come closer and closer to humans when their sound is imitated, as seen in the excerpt below:

> RM: Do you also do imitations during excursions or for fun, and do you sometimes establish a duet with the bird, or when they respond, do you also respond; so that there are some mutual responses. For which species for example? Can you describe some occasions?
> Interviewee 9: yah. Most easier ones are these smaller owls: The Pygmy Owl (*Glaucidium passerinum*). And this Grey-headed Woodpecker (*Picus canus*). I think, these are the two with whom I can have a long duet.
> RM: So, they have come very close, and they know that it is actually not another bird; and so, they continue?
> Interviewee 9: They are a bit curious. Who is this strange looking bird which makes my kind of sound?
> SB: So, can you explain what happens: you first try to imitate them—and they imitate back?
> Interviewee 9: Then, they usually come closer to find the source of the sound. They are usually not sure, like where is the other bird—maybe they only see me, or the people with me. So, they fly around close by, to see from different angles; they usually fly by, over me. And I know that owls can even get aggressive; even the small pygmy owl can give you a slap—if you are really good at the imitation and you want the bird to become excited. But usually, you do not want that. Maybe if you have done it once, you know that it is enough; like you know how irritated the bird can be. So, there's no point to irritate the bird so much.

Thus, it can be seen that hiding oneself is not a common practice among birders in Estonia using sound, though people engaging in other activities, like hunting, can use hides for disguising their presence from wildlife (Bélanger and Bédard 1995). However, in some cases, like in the case of the Common Raven discussed above, people may still hide themselves while imitating birds. Thus, like the mother hen described by Uexküll (Uexküll 1992), it can be seen in some case that birds pay attention to auditory cues (and may neglect visual cues in cases where the humans do not explicitly hide themselves while performing the imitation). In the case of banding stations or scientific surveys, people use playback, using speakers to reproduce the sound of birds and capture birds in mist-nets, and are not present in the vicinity when birds get captured in the mist-nets (though they come back later in order to ring and release the birds). The examples in this section show that the activity of a human can have a significant impact on the lives of birds. Birders, like Interviewee 4, are aware that the mere presence of humans disturbs birds, and thus she is patient, and waits for a long period of time for the birds to be restart their activities before beginning birding. The examples of the interactions with birds described by Interviewee 2, show that birds such as owls respond to

imitations of their sound and come closer to investigate the source of the sound. Interviewee 9, described how owls can respond to imitation, and can even get irritated to such an extent as to physically contact humans. From the perspective of "Umwelt Ethics" it can be seen that in these cases, humans may perceive that they are disturbing the bird, and take steps to reduce harm to the bird (like not engaging in imitation when the resultant activity results in display of aggressive behavior or vocalization of the birds). The use of alarm calls of predators to attract prey birds like songbirds, by direct imitation of the predator or using techniques like pishing (Zimmerling 2005), was also reported by some interviewees. Examples of scientific studies, which study the impact of sound on birds will be discussed in the next sub-chapter (though many of these studies have limitations because they study the influence of sound on particular species, and do not account for the influence of sound on a wide variety of species which are present in the wild).

In spite of the shortcoming of human knowledge, humans can take certain steps, which meet the criteria of "Umwelt Ethics", like some practices which were observed during a visit to a bird-ringing station, which used playback to attract birds. The people in charge of ringing the birds took some basic precautions, like ensuring that songbirds and reed-warblers were not kept in the same basket as their predators, like shrikes, when transporting birds from the mist-nets to the ringing-station. The bird-ringers increased their frequency of visit to the mist-nets in case of a light-drizzle, and removed the mist-nets and stopped the playback of recordings in case of heavy-rain to ensure that the birds did not get wet when trapped in a mist-net. Another practice, which is followed in the case of a social bird like the Long-tailed Tit (*Aegithalos caudatus*) is that bird-ringers, who are aware of the strong group dynamics of the bird, take care to keep the flock together when releasing the birds after ringing the birds: "And also, when Long-tailed Tits are ringed, we release them together—not separately—so that the flock stays together" (Interviewee 7, male 18). Thus, while a practice need not meet all the criteria of "Umwelt Ethics", humans can improve their practices in order to reduce the disturbance to birds by taking into account the umwelt of the bird.

5.4. Attitudes towards the use of sound by birders

A recent book on birding, titled "Birding Estonia", whose primary focus is on the introduction of birding areas in Estonia, has a section where the authors dissuade people from using sound (using the term "playback"):

> Many skulking woodland birds are often attracted by the use of tape lures (playback). The playback of bird calls is a problem encountered in well-visited birding areas worldwide. Increasing wildlife tourism means that pressure is growing in Estonia too, so we discourage any unnecessary disturbance to birds, especially in protected areas. Most Estonian species can be seen without the use of playback, even if some of them need a little more patience and field craft! Many species which breed in the old-growth forest are protected by law, and disturbing them is illegal. (Paal and Ots 2018: 27)

The use of playback is a common practice by birders, and its use has prompted a number of debates about the ethics of using playbacks to attract birds by popular online websites for birding information (e.g., Sen 2009; Sibley 2011). Information on the ethics of playback is available on the websites of birding organizations around the world like BirdLife, Australia (BirdLife Australia 2012) and the National Audubon Society, U.S.A. (National Audubon Society (s.a.).).

Bird song can have many functions in the lives of birds, like the territorial function to keep away other male rivals, to attract females and to increase the reproductive activity in females (Kroodsma and Byers 1991; Catchpole and Slater 1995); and thus the use of playback can have an impact on any of these aspects of zoosemiotic communication. Ornithologists have conducted a variety of playback experiments to observe the impact the use of playback has on the behavior of birds, and the response of the birds to playback can help guide human action in the area of responsible playback behavior. J. B. C. Harris and D. G. Haskell conducted playback experiments on two species of birds in Ecuador, the Plain-tailed Wren (*Thryothorus euophrys*) and the Rufous Antpittas (*Grallaria rufula*), in order to monitor the changes in the vocal behavior of the birds. Harris and Haskell conclude that while playback can initially result in negative impact like stressing the birds or making the birds waste energy by responding to the playback, habituation to the playback can have minimal impact on the long term behavior of the birds, and cite the case of one group of birds building a nest, a mere 10 meters away from a speaker, after being exposed to the song for nearly two weeks (Harris and Haskell 2013). A playback study on the Black-capped Chickadees (*Poecile atricapilla*) found that male birds engage in counter-singing contests with playback vocalization (which is seen as an intruder by the male birds), and female birds who listen to these contests

reassess the status of the high-ranking and low-ranking male birds in the area near the playback experiments, and the change in the hierarchy of the male birds changes the subsequent mating behavior of the group of birds (Mennill *et al.* 2002). Studies on the temporal patterns of testosterone levels in blood of birds, who were responding to playback, found that male birds of monogamous species have the highest changes in their testosterone levels compared to polygynous species where the male birds do not take part in parental care of their offspring (Wingfield *et al.* 1990). In the case of bird called the Serin (*Serinus serinus*), experiments showed that female birds exposed to male serin playback, spent more time building nests compared to females who were not exposed to songs (Mota and Depraz 2004). Playback experiments on mockingbirds (*Mimus polyglottos*) found that playback stimulated male birds to build nests sooner than other male birds who heard no songs or heard the song of a different bird (Logan *et al.* 1990). A study conducted by D.M. Watson, E. Znidersic and M.D. Craig on the practices of birding-guides in Columbia has noted that the use of playback is not necessarily harmful for birds in all cases, and have suggested that the use of playback can even be beneficial because the use of playback increases the number of species that can be observed in a given location, which can improve the ecotourism potential of a location; allows birding guides to take their clients to a smaller number of known areas (reducing the environmental impact of tourism); and birding-guides have learnt over time to tailor their interactions with birds so that negative practices are avoided (Watson *et al.* 2019). Thus, it can be seen that the effect of playback on the behavior of birds is a complex phenomenon which varies from species to species: in some cases there are clearly negative effects of playback on birds; while in other cases the effect of playback diminishes over time due to habituation; and there can even be beneficial effects of playback because playback may increase nest-building activity in birds, or may promote birding related tourism, which can improve the situations for birds in the long term (because tourists are more likely to visit areas where bird habitat is conserved, and can thus encourage people to engage in conservation for the economic benefit of tourism).

In Estonia, there are some published regulations to inform people about the responsible use of sound. For example, the following (translated into English from Estonian) contains an excerpt from a list of regulations, titled "Linnuhuvilise Meelespea", for observing birds which ought to be followed by birders (on a voluntary basis), and was distributed online:

> [..] 2.1. Keep in mind that bird watching can interfere with bird welfare—it is important to keep their disturbance to a minimum.[..]

> […] 2.10. Disturbing birds with sound recordings is prohibited during breeding, as it affects bird behavior and may interfere with breeding success. [1, 17, 18] […]
> [...] 2.17. Direct disturbance of birds is justified only by official monitoring and research work with the permission of the Environmental Board (eg decoy with sound recordings, visiting nesting colonies to evaluate breeding success, etc.). […] (Tali 2017: 1; translated by the author)

Thus, on the one hand, books and online regulations in the birding community inform people about ethical behavior in the use of sound. On the other hand, some of the interviewees raised concerns about the problematic use of sound they have observed in Estonia, especially in the case of tourists:

> If I hear the bird, I don't have to see the bird. And we have in Estonia, we have a lot of tourists, who watch or want to see the birds. And the guides have to do lots of these imitations or chase the bird. They have to show the bird, but tourists they are not pleased, if they do not see the bird; they can hear the bird is singing, but they have to see it. Well, I think it's a problem, because, I don't have the need to see the bird. If I already have heard him, so then I don't have to imitate it, or to call it closer and so on. (Interviewee 4, female 33)

However, the opinion of this interviewee (Interviewee 4, female 33), can be contrasted with the opinion expressed by one of our interviewees, who works as a nature-guide:

> In my home woods we had a pygmy owl territory two years ago, near a main road, and it was a cooperative bird. It was always game to see what was happening—if you did playback a few times there. And I have been able to show this bird over the course of five years, I think, with fifty, sixty, may be one hundred birdwatchers throughout the world with my groups, and nothing happened every next year. The bird was in exactly the same place and behaved in exactly the same way. I can expect that this does not harm his habitat and his well-being. It was perhaps a short time annoyance perhaps in his behavior, but in the long run it did not cost anything, he was calm. But what happened after the fifth year, is that a harvester came and took down this woodland, and the woodland was gone. So you should always consider the magnitude of the effect, but usually it is in reasonable limits. But, I criticize back to these people, if it is a problem why they do not criticize the massive clear-cut harvesting; this is happening in an increasing scale in this country. I think this is a major problem. We cannot compare our bird watching and bird-watcher's community with some countries like England or some others like the States, where for one wooded area, or a rare bird species, there are tens or hundreds of people gathering. That might be a problem, if everybody wants to get there. But we still have so many birds, and so few birdwatchers and bird watching groups that I do not think it would be a big issue, at least for now. (Interviewee 5, male 47)

In his interview, the interviewee mentioned that while clients want to see rare birds, the activity can be done responsibly as shown above. In the case mentioned above, the interviewee was able to reliably contact the owl, using sound, for a number of years. However, the interviewee could no longer contact the owl once the habitat of the owl was destroyed due to logging. Further, he observed that compared to places like the United Kingdom or the U.S.A, which have a larger population of birders, the disturbance caused to birds in Estonia is on a much smaller scale.

We live on a planet that is constantly changing at different scales in space and time. A recent report on wildlife in Europe, *The State of Nature in the EU* states that since the start of the twentieth century, Europe has seen an alarming decline in wildlife resulting from a host of factors including a loss of habitat: "Valuable habitats have been lost as a result of rapidly changing land use, pollution, infrastructure development and continuing urban sprawl" (Vella 2015: 5). In the case of Central and Eastern Europe, there was a temporary increase in the population of farmland birds in the 1990s due to a decreased intensity of agriculture, but the populations have declined since the 2000s due to increase agricultural activity (Gregory *et al.*, 2005). The trends seen in Estonia are parallel to that seen in Eastern and Central Europe, with the status of farmland bird index and woodland bird index showing a similarity in trends as follows:

> Among the multispecies indices, the woodland bird index shows a steady increase until 2000, followed by a moderate negative trend in 2001-2006, and a sharp decline in 2007-2010. The farmland bird index largely follows the woodland bird index, but shows two distinctive declines in 1994-1996 and in 2007-2010 […]. (Kuresoo *et al.* 2011: 94-95)

According to the Quarterly Bulletin of Statistics Estonia (2/2018), the coverage of forest land in Estonia was 51.4% of Estonia's land territory (Statistics Estonia 2018: 42), but the coverage of old-growth forests, which have more bio-diversity compared to commercial forests, is much lower (Lõhmus 2002) and the diversity of birds is larger in old-growth forests (Tjernberg 1983; Rosenvald *et al.* 2011). Thus, when considering the impact of logging in Estonia, as noted by Interviewee 5, male 47, it can be seen that while a large amount of land is under forest cover in Estonia, the area under old-growth forest—which can be more suitable for many birds—is not that high, and people should be concerned if the area under old-growth forest reduces. In addition, people in the interviews knew about the problems of declining bird populations, and a lot of their activities, like conducting population surveys of birds, bird-ringing, and uploading bird distribution on databases, helps document and spread information about the status of birds.

The data shown in Table 8 aims to compare the number of birders in three countries mentioned in the interview. Table 8 shows that Finland has more birders belonging to birding organizations per million people compared to Estonia and U.K. On the other hand, U.K. has more birdwatchers belong to birding organizations per per unit area of land compared to Estonia and Finland. The numbers in Table 8, which show that Estonia has lower birdwatchers belonging to birding organizations compared to Finland and U.K. support the conclusions of Interviewee 5, who felt that the impact of birders in Estonia was not severe

because of their low numbers relative to other places. The opinion of the interviewees is shaped by their perception of the popularity of birding in Estonia. Thus, while some birders think the use of sound is low, according to others, the use of sound can be problematic in situations where they think it is over-used—like in the context of guided nature tours. Even in the case of guided nature tours the impact may not be large if a guide is considerate in their behavior and does not disturb a bird inconsiderately.

Table 8. Membership in birding organizations

Country	Birdwatchers belong to birding organizations	Population (in million)[14]	Birdwatchers belong to birding organizations per million people	Surface area (in thousands of square km)[15]	Birdwatchers belong to birding organizations per area (in thousands of square km)
Estonia	550[16]	1.3156	418.1	45.2	12.2
Finland	13000[17]	5.503	2362.3	338.4	38.4
United Kingdom	115600[18]	65.808	1756.6	248.5	465.2

[14] Retrieved from: https://ec.europa.eu/eurostat/documents/2995521/9063738/3-10072018-BP-EN.pdf/ccdfc838-d909-4fd8-b3f9-db0d65ea457f, 18.04.2019.

[15] Retrieved from: https://europa.eu/european-union/about-eu/figures/living_en#tab-0-1 , 18.04.2019.

[16] Retrieved from: https://www.birdlife.org/europe-and-central-asia/partners/estonia-%E2%80%93-estonian-ornithological-society-eos , 18.04.2019.

[17] Retrieved from: https://www.birdlife.org/europe-and-central-asia/partners/finland-%E2%80%93-birdlife-finland , 18.04.2019.

[18] Retrieved from: https://www.birdlife.org/europe-and-central-asia/partners/uk-royal-society-protection-birds-rspb , 18.04.2019.

Using the principles of “Umwelt Ethics” can help birders examine the consequences of using sound to attract birds. People should question if their short-term desire to see or hear a bird, during a birding trip is absolutely necessary and instead of their short-term goal, they can take alternate long-term actions in concordance with the principle of “Umwelt Ethics” which might be better for the well-being of birds in the long run. When humans are considering using sound to attract birds, they should try to understand the full impact of the situation by considering that the use of sound may be harmful to the bird, and that there can be other ways of viewing a bird.

Thomas R. Dunlap has shown that there is overlap of activities between professional and hobby birders (Dunlap 2011), and in our survey this was also the case. Thus, people can take advantage of this by engaging in learning about methods of observing birds like learning the skills to do scientific birding surveys and becoming members and becoming familiar with the work of organizations like the Estonian Ornithological Society. Many bird-ringing stations in Estonia also encourage participation of visitors and volunteers and people can get a first-hand experience of bird-ringing, and observe a bird at a close distance. Following the practices of the interviewees, people can question how the popularity of a certain activity can change the nature of the interaction, and try to reduce travel to see a rare-bird in a wild-setting because it can be disturbing for the bird. The knowledge of the umwelt and the life-cycle of a bird can help guide the actions of people. For example, people can avoid disturbing a bird by not using sound at a critical stage in its life-cycle like during nesting, courtship activities or at times when food may be scarce (like during winter). People can try to use alternate methods to view birds, like using a bird feeder in winter, instead of using sound. The construction of lists by birders is an ubiquitous activity (Lynch and Law 1999), but in many cases people have access to only the information about the number of birds seen by a particular individual, but do not have first-hand information on the practices followed by the birder to observe the birds on their list. Thus, when studying the ethical attitudes of humans towards birds when using sounds, we need to take into account that the influence on birds is amplified by human tool use, and the way that humans conceptualize about the impact of sound is influenced by socio-cultural factors. Humans might copy the harmful behavior of birders around them, or avoid harmful action because those practices are prohibited by law or by ethical guidelines outlined in guide-books and websites. A certain human practice might be legal and follow all the ethical guidelines, yet we may observe that the practice is having a negative impact on birds or we may find that human laws or guidelines have deficiencies which need to be

improved. John Dewey has stated that in tackling many public issues, it is not possible to know all the solutions at the outset, but the pragmatic approach would be to constantly monitor practices and modify practices as we learn about their impact (Dewey 1927). Following John Dewey's advice, we cannot know the impact of every human action in advance, and thus any practice, law or guideline should always be under review for improvement, and be changed when necessary.

Conclusions

The current study has analysed the role of voice imitation and playbacks in the birding practices of Estonian birders, explored the means of imitation, the diversity of species imitated as well as the attitudes of birders towards the use of recordings while birding. Relying on a survey, interviews and field observations, the study established that birders use the human voice, mechanical aids like whistles, and recordings to imitate the sounds of a wide variety of birds. The survey found that birds from 55 bird species and 11 bird orders were attracted using sound. The most imitated bird species was the Common Cuckoo (*Cuculus canorus*) which is a common Estonian bird and relatively easy to imitate with the human voice. The top bird order imitated with voice and attracted with playbacks consisted of owls (*Strigiformes*) and the reason for their popularity is that owls are nocturnal animals which are difficult to see during the day, and can be contacted by humans in the dark using sound.

Birds have different types of calls and songs associated with different functions in their life cycle. Some of these calls can be mapped into four key functional circles of "physical medium, food, enemy and sex" (Uexküll 2010 [1940]: 33). Birders need to use the appropriate call to interact with a bird because a bird may not respond to the call at the incorrect moment in its life cycle, and so a sound associated with enemy or sex may work only at certain times of the year. For example, the study found that birders were more likely to use sound to interact birds when the chances of the bird responding were high, like during the breeding season (late February or early March) in the case of owls. Additionally, the study found that birders know that the use of sound can be harmful to birds at certain times of the year like during the nesting season or winter (when a bird can waste valuable energy in responding to sounds), and may choose the alternate technique of feeding birds in order to see them. The types of sounds used to attract the top-five bird orders showed that a wide-variety of calls could be used to interact with birds. The current study established, that although alarm and invitation calls of birds are often the easiest to imitate, birders do not limit themselves to only the invitation-call to get a bird to approach them, but also use songs to attract birds. The study found that while birds of the same species respond to the imitated sound, birders also use the calls of one species to attract birds of different species. Many birds which belong to the same order have similar calls. For example, the use of the calls of

the Grey-headed Woodpecker (*Picus canus*) can attract the Black Woodpecker (*Dryocopus martius*) and the White-backed Woodpecker (*Dendrocopos leucotos*). The study found that another technique to attract birds is that the sounds of the predator species like the Pygmy Owl (*Glaucidium passerinum*) may be used to get the attention of prey species, like some passerine birds.

Among the top-ten imitated birds, there were 9 birds which were imitated with voice and 6 with playbacks. This shows that although a wide variety of birds can be attracted with human voice, humans are not capable of imitating the sound of every bird or they are capable of imitating only certain sounds of a particular bird species. The frequency range of the human voice sets the fundamental anatomical limitation on what sounds can be imitated. For example, the call of the Common Cuckoo (*Cuculus canorus*), which falls within the pure tone range of the human voice, 100-800 Hz (Titze 1992), is an easy bird to imitate and birders used only voice imitation to imitate this bird. The sounds of some birds, like the Pygmy Owl (*Glaucidium passerinum*), exceeds the pure tone range of the human voice. However, humans are capable of imitating this call precisely by using various whistling techniques. The call of birds like Hazel Grouse (*Tetrastes bonasia*), exceeds the range of unaided human whistling, but is a pure and simple tone, and can be imitated using mechanical whistles (like copper whistles). The birders used the technique of pishing (producing a "pssh pssh" like sound) to approximately imitate the alarm calls of Passerines. There are anatomical differences between humans and birds in the voice production organs, with humans having only one vocal-chord and thus only one source of sound, and thus humans cannot imitate the sounds of birds like the Common Starling (*Sturnus vulgaris*), which can produce sounds from two independent sources (left-side and right-side) from each syrinx. The study found that some scientific surveys conducted at bird-ringing stations need to produce bird sounds at multiple locations for long periods of time, and speakers were used for playing the recordings of birds in these cases. The study showed that the use of one or the other means of imitation also depends on various other factors—like the purpose of imitation, the skills of the imitator, and the ethical stance towards the use of different means of imitation.

Given the easy access to playback devices, like smartphones and portable speakers, and the ability to access a wide variety of bird recordings from websites and smartphone applications, one might assume that people prefer using recordings compared to imitating birds with their own voice in contemporary practices of birding. However, on the contrary our study results found that there only 73 reported uses of recording compared to 89 uses of imitation using

the human voice. The use of recordings by birders in Estonia in the professional domain appears to be similar to the practices around the globe where the use of playback is used extensively to monitor the population of a wide variety of threatened birds, like the Corn Crake (*Crex crex*) (Unwin 2011), conduct surveys on nocturnal birds like owls which are hard to see at night (Hausleitner 2006), and the use of playback at bird-ringing stations (Busse and Meissner 2015). The study found that the use of recorded sounds of birds can be part of the toolkit for education and the use of recordings can help amateur birders to attract birds towards themselves.

The same person may use sounds in different contexts (from survey to hobby-birding) and have different kinds of interactions with birds. While the use of playback in scientific monitoring is necessary to monitor the population of birds, the indiscriminate use of sounds can be problematic and has been discussed in birding circles. The guidelines of the Estonian Ornithological Society and Estonian guide-books (e.g., Paal and Ots 2018) discourage the use of electronic playback while birding. While all the survey respondents and the interviewees mentioned that while the use of playback for scientific monitoring is permissible, there was a divided opinion on whether the use of sounds in other contexts like amateur birdwatching is harmful. Some interviewees felt that playback is overused by bird-guides in Estonia, while others felt if playback is used responsibly, by keeping contact to a minimum, one can maintain contact with birds in a given location over a number of years.

It is suggested that the replication of studies like this in other parts of the world could help determine the extent to which these findings are valid in other situations. The survey could be repeated in the future to determine how the use of voice imitation changes compared to playback. There is a paucity of research which studies the long-term impact of sound use on a wide variety of species, and thus further research in this area can provide valuable information to help frame guidelines and laws which can promote human practices which cause the least harm to birds. All these research questions can benefit from a perspective which uses both a cultural semiotic and a biosemiotics framework to understand how the interaction between animals and humans is shaped by socio-cultural transformations, and how in turn animal-human relations influence socio-cultural activities.

References

Abravanel, E.; Levan-Goldschmidt, E.; Stevenson, M.B.; 1976. Action imitation: the early phase of infancy. *Child Development* 47(4): 1032-44.

Agnihotri, S.; Si, A. 2012. Solega Ethno-Ornithology. *Journal of Ethnobiology* 32(2):185-211.

Ali, S. 1985. *The Fall of a Sparrow.* Delhi: Oxford University Press.

Anderson, M.; Deely, J.; Krampen, M.; Ransdell, J.; Sebeok, T. A.; Uexküll, T. von 1984. A semiotic perspective on the sciences: Steps toward a new paradigm. *Semiotica* 52(1/2): 7–47.

Bagley, W. C. 1900. The apperception of the spoken sentence: A study in the psychology of language. *The American Journal of Psychology* 12(1): 80-130.

Baker M. C. 2001. Bird Song Research: The Past 100 years. *Bird Behaviour* 14: 3-50.

Balsby T. J. S.; Momberg J. V.; Dabelsteen T. 2012. Vocal Imitation in Parrots Allows Addressing of Specific Individuals in a Dynamic Communication Network. *PloS ONE* 7(11): e49747.

Baptista, L. 1990. Dialectal variations in the raincall of the Chaffinch (*Fringilla coelebs*). *Vogelwarte* 35: 249- 256.

Bateson, G. 1999 [1972]. Problems in Cetacean and Other Mammalian Communication. In: Bateson, G. *Steps to an Ecology of Mind*. Chicago, London: University of Chicago Press, 64-378.

Bélanger, L.; Bédard, J. 1995. Hunting and Waterfowl. In: Knight, R. L.; Gutzwiller, K. J. (eds.) *Wildlife and Recreationists: Coexistence Through Management and Research.* Washington, DC, USA: Island Press, 243-256.

Belyk, M.; Pfordresher, P. Q.; Liotti, M.; Brown, S. 2015. The neural basis of vocal pitch imitation in humans. *Journal of Cognitive Neuroscie*nce 28(4): 621-635.

Benjamin, W. 1992 [1935]. The Work of Art in the Age of Mechanical Reproduction. In: Mast, Gerald; Cohen, Marshall; Braudy, Leo (eds.), *Film Theory and Criticism*. Oxford: Oxford University Press, 302-312.

Berger, P. L.; Luckmann, T. 1972 [1966]. *The Social Construction of Reality: A Treatise in the Sociology of Knowledge.* Harmondsworth: Penguin Books.

Berwick, R. C.; Okanoya, K.; Beckers, G. J.; Bolhuis, J. J. 2011. Songs to syntax: the linguistics of birdsong. *Trends in Cognitive Sciences* 15 (3): 113–121.

BirdLife Australia 2012. Ethical Birding Guidelines. Retrieved from: https://birdlife.org.au/documents/POL-Ethical-Birding-Guidelines.pdf , 10.05.2019.

BirdLife International 2018. *State of the world's birds: taking the pulse of the planet.* Cambridge, UK: BirdLife International.

Bowman, R. I. 2004. A tribute to the late Luis Felipe Baptista (Foreword). In: Marler, P.; Slabbekoorn, H. (eds.), *Nature's Music: The Science of Birdsong.* New York: Academic Press.

Bradlow, A.; Pisoni, D.; Yamada, R.A.; Tohkura, Y. 1997. Training Japanese listeners to identify English /r/ and /l/: IV. Some effects of perceptual learning on speech production. *Journal of the Acoustical Society of America* 101 (4): 2299–2310.

Brenowitz, E. A.; Margoliash, D; Nordeen, K. W. (1997), An introduction to birdsong and the avian song system. *Journal of Neurobiology* (33): 495-500.

Brinklov, S.; Fenton, M. B.; Ratcliffe, J. M. 2013. Echolocation in oilbirds and swiftlets. *Frontiers in Physiology* 4 (123):1-12.

Busse, P.; Meissner, W. 2015. *Bird Ringing Station Manual*. Warschau/Berlin: Walter de Gruyter GmbH.

Campbell M. O. 2014. A Fascinating Example for Convergent Evolution: Endangered Vultures. *Journal of Biodiversity and Endangered Species* 2(3): 1-3.

Canales, J. 2010. *Tenth of a Second: A History.* Chicago: University of Chicago Press.

Carpenter, E.; McLuhan, M. 1960. Acoustic space. In: Carpenter, E.; McLuhan, M (eds.), *Explorations in Communication: An Anthology.* London: Beacon Press, 65–70.

Catchpole, C. K.; Slater, P. J. B. 1995. *Bird song: Biological themes and variations.* Cambridge, UK: University of Cambridge Press Syndicate.

Chartrand T.L.; Bargh J. A. 1999. The chameleon effect: the perception-behavior link and social interaction. *Journal of Personality and Social Psychology* 76(6): 893-910.

Chomsky N. 1965. *Aspects of the Theory of Syntax.* Cambridge, MA: MIT Press.

Chu, M.; Leonard P.; Stevenson F. 2012. Growing the base for citizen science. In: Dickinson, J. L.; Bonney, R. E. Jr. (eds.), *Citizen Science: Public Participation in Environmental Research*. Ithaca, NY: Cornell University Press, 69–81.

Clements, J. F.; Schulenberg, T. S.; Iliff, M. J.; Roberson, D.; Fredericks, T. A.; Sullivan, B. L.; Wood. C. L. 2018. *The eBird/Clements checklist of birds of the world: v2018.* Retrieved from http://www.birds.cornell.edu/clementschecklist/download/, 29.03.2018.

Clucas, B.; Marzluff, J. M.; Mackovjak, D.; Palmquist, I. 2013. Do American crows pay attention to human gaze and facial expressions? *Ethology* 119: 296-302.

Cordell H.; Herbert, N. 2002. The popularity of birding is still growing. *Birding* 34: 54-61.

Cramp, S. (ed._ 1977. *Handbook of the Birds of Europe, the Middle East and North Africa, the Birds of the Western Palearctic. Vol. 1: Ostrich to Ducks*. Oxford: Oxford University Press.

Curley, Robert (ed.) 2011. *Breakthroughs in Telephone Technology: From Bell to Smartphones*. Chicago: Britannica Educational Publishing.

de Waal, F. B. 2016. *Are We Smart Enough to Know How Smart Animals Are?* London, New York: Norton.

Dewey, J. 1927. *The Public and its Problems*. New York: H. Holt and Company.

Dobson, C. W.; Lemon R. E. 1979. Markov sequences in songs of American thrushes. *Behaviour* 68(1-2): 86-105.

Doupe, A.; Kuhl. P. 1999. Birdsong and human speech: Common themes and mechanisms. *Annual Review of Neuroscience* 22: 567–631.

Dunlap, T. R. 2011. *In the Field, among the Feathered: A History of Birders and Their Guides.* Oxford: Oxford University Press.

Elts, J.; Leito, A.; Leivits, A.; Luigujõe, L.; Mägi, E.; Nellis, R.; Nellis, R.; Ots, M.; Pehlak, H. 2013. Eesti lindude staatus, pesitsusaegne ja talvine arvukus 2008–2012. Status and numbers of Estonian birds, 2008-2012. *Hirundo* 26(2): 80-112. Retrieved from: https://www.eoy.ee/hirundo/file_download/149/Elts_et_al_2013_2.pdf, 30.03.2019.

Feld, S. 1982. *Sound and Sentiment: Birds, Weeping, Poetics, and Song in Kaluli expression*. Philadelphia: University of Pennsylvania Press.

Figuerola J.; Gustamante L. 1995. Does use of a Tape Lure Bias Samples of Curlew Sandpipers Captured with Mist Nets? *Journal of Field Ornithology* 66(4): 497-500.

Flagg, W. 1858. The singing birds and their songs. *Atlantic Monthly* (August): 285–290. Retrieved from: https://www.theatlantic.com/magazine/archive/1858/08/the-singing-birds-and-their-songs/376146/ 22.03.2019.

Flower, T. 2011. Fork-tailed drongos use deceptive mimicked alarm calls to steal food. *Proceedings of the Royal Society B: Biological Sciences* 278: 1548–1555.

Forsman, E. 1983. *Methods and materials for locating and studying Spotted Owls*. Corvallis, Oregon, USA: United States Department of Agriculture, Pacific Northwest Research Station. Retrieved from: https://www.fs.fed.us/pnw/pubs/pnw_gtr162.pdf , 11.05.2019.

Forth, G. (2004). *Nage birds: Classification and symbolism among an Eastern Indonesian people.* London, UK: Routledge.

Gabrys, J. 2013. *Digital Rubbish: A Natural History of Electronics*. Ann Arbor: University of Michigan Press.

Gaunt, S. L. L.; McCallum D. A. 2004. Birdsong and Conservation. In: Marler, P.; Slabbekoorn, H. (eds.), *Nature's Music: The Science of Birdsong*. New York: Academic Press. Pages 343-362.

Geertz, C. 1973. Thick description: toward an interpretive theory of culture. In: Geertz, C. *The Interpretation of Cultures*. New York: Basic Books.

Gill, F. B. 1995. *Ornithology*. New York: W. H. Freeman and Company.

Gill, L.F.; Goymann, W.; Ter Maat, A.; Gahr, M. (2015). Patterns of call communication between group-housed zebra finches change during the breeding cycle. *eLife* 4: 1-23.

Gillham, B. 2005. *Research Interviewing: The Range of Techniques.* Berkshire: McGraw-Hill Education.

Goodale, E.; Kotagama, S. 2006. Vocal Mimicry by a Passerine Bird Attracts other Species Involved in Mixed-Species Flocks. *Animal Behaviour* 72: 471–477.

Gould, S. J.; Vrba, E. S. 1982. Exaptation—a missing term in the science of form. *Paleobiology* 8 (1): 4–15.

Greenwalt C. H. 1968. *Birdsong: Acoustics and Physiology.* Washington: Smithsonian Institution Press.

Gregory, R. D.; van Strien, A.; Vorisek, P.; Gmelig Meyling, A. W.; Noble, D. G.; Foppen, R. P. B.; Gibbons, D. W. 2005. Developing indicators for European birds. *Philosophical Transactions of the Royal Society B* 360: 269-288.

Griffin, D. R. 1981. *The Question of Animal Awareness: Evolutionary Continuity of Mental Experience.* New York: Rockefeller University Press.

—1994. *Animal Minds.* Chicago: The University of Chicago Press.

Hahn, B. A.; Silverman, E. D. 2007. Managing breeding forest songbirds with conspecific song playbacks. *Animal Conservation* 10:436–441.

Hardy, P. 2012. *Download! How the internet transformed the record business*. London: Music Sales.

Harris, J. B. C.; Haskell. D.G. 2013. Simulated birdwatchers' playback affects the behaviour of two tropical birds. *PLos ONE* 8(10): e77902.

Hausleitner, D. 2006. Inventory methods for owl surveys: Nocturnal owls that respond to call playback of recorded calls. Standards for Components of British Columbia's Biodiversity 42 (1): 1-52. Retrieved from: http://www.env.gov.bc.ca/wildlife/wsi/reports/4383_WSI_4383_RPT.PDF , 11.05.2019.

Hediger, H. 1934. Zur Biologie und Psychologie der Flucht bei Tieren. *Biol. Zent.* 54: 21–40.

—1950. *Wild Animals in Captivity: An Outline of the Biology of Zoological Gardens*. London: Butterworth.

Hockett, C. F. 1960. "The Origin of Speech." *Scientific American* 203: 88-111.

Hockett, C. F.; Altmann, S. A. 1968. A Note on Design Features in: Sebeok, Thomas A. (ed.), *Animal Communication: Techniques of Study and Results of Research*. Bloomington, Indiana / London: Indiana University Press, 61-72.

Ibbotson, P.; Tomasello, M. 2016. Evidence rebuts Chomsky's theory of language learning. *Scientific American* 315(5): 71-75.

Igic B.; McLachlan J.; Lehtinen I.; Magrath R. D. 2015. Crying wolf to a predator: deceptive vocal mimicry by a bird protecting young. *Proceedings of the Royal Society B* 282: 20150798

Ingold, T. 2000. *The perception of the environment: essays on livelihood, dwelling and skill.* London: Routledge.

Jarvis, E. D. *et al.*; 2014. Whole-genome analyses resolve early branches in the tree of life of modern birds. *Science* 346 (6215): 1320-1331.

Johnson, J.; Maness, T. 2018. Response of Wintering Birds to Simulated Birder Playback and Pishing. *Journal of the Southeastern Association of Fish and Wildlife Agencies* 5: 136-143.

Johnson, S. 2010. *Where Good Ideas Come From: The Natural History of Innovation*. New York: Riverhead Books

Jüssi, F. 2007. *Linnuaabits*. Tallinn: Ajaksites Kirjastus.

Kaminski, J.; Call, J.; Fischer, J. 2004. Word learning in a domestic dog: Evidence for 'fast mapping'. *Science* 304 (5677): 1682–1683.

Kiiroja, L. 2014. The Zoosemiotics of Socialization: Case-Study in Socializing Red Fox (*Vulpes vulpes*) in Tangen Animal Park, Norway (Master's Thesis). Tartu: University of Tartu.

Kircher, P. A. 1650. *Musurgia universalis, sive ars magna consoni et dissoni.* Romae: Ex Typographia Haeredum Francisci Corbelletti. Retrieved from: https://archive.org/details/bub_gb_97xCAAAAcAAJ/page/n8, 22.03.2019.

Klump, G. M.; Kretzschmar, E.; Curio, E. 1986. The hearing of an avian predator and its avian prey. *Behavioral Ecology and Sociobiology* 18:317– 323.

Krebs, J. R.; Nicholas B. D. 1993. *Introduction to Behavioural Ecology*. Oxford: Blackwell Science.

Kress, G.; van Leeuwen, T. 2006. *Reading images: The grammar of visual design*. London: Routledge.

Kroker, A. 1984. *Technology and the Canadian mind: Innis/McLuhan/Grant*. Victoria, BC: New World Perspectives.

Kroodsma, D. E.; Byers, B. E. 1991: The function(s) of bird song. *American Zoologist* 31(2): 318-328.

Kuhl P.K.; Meltzoff A.N. 1996. Infant vocalizations in response to speech: vocal imitation and developmental change. *Journal of the Acoustic Society of America* 100 (4/1): 2425-38.

Kull, K.; Torop, P. 2003. Biotranslation: Translation between umwelten. In: Petrilli, S. (ed.), *Translation Translation*. Amsterdam: Rodopi, 313-328.

Kuresoo, A.; Pehlak, H.; Nellis, R. 2011. Population trends of common birds in Estonia in 1983–2010. *Estonian Journal of Ecology* 60: 88–110.

Langmore N. E.; Davies N. B.; Hatchwell B. J; Hartley I. R.; Female song attracts males in the alpine accentor *Prunella collaris*. *Proceedings of the Royal Society of London. Series B: Biological Sciences* 263: 141-146.

Liberman, A. M.; Cooper, F. S.; Shankweiler, D. P.; Studdert-Kennedy, M. 1967. Perception of the speech code. *Psychological Review* 74(6): 431-461.

Logan J. D.; Lively S. E.; Pisoni D. B. 1991. Training Japanese listeners to identify English /r/ and /l/: A first report. *Journal of the Acoustical Society of America* 89:874–886.

Logan, C. A.; Hyatt, L. E.; Gregorcyk, L. 1990: Song playback initiates nest building during clutch overlap in mockingbirds, *Mimus polyglottos*. *Animal Behaviour* 39(5): 943-953.

Lõhmus, A. 2002. The lack of old-growth forest– a threat to Estonian biodiversity. *Proceedings of the Estonian Academy of Sciences: Biology/Ecology* 51: 138–144.

Louv, R. 2011.*The Nature Principle: Human Restoration and the End of Nature-Deficit Disorder.* Chapel Hill, North Carolina: Algonquin Books.

Lynch, M.; Law, J. 1999. Pictures, texts and objects: the literary language game of birdwatching. In: Biagioli, Mario (ed.), *The Science Studies Reader*. London: Routledge, 317-341.

Mäekivi, Nelly; Maran, Timo 2016. Semiotic dimensions of human attitudes towards other animals: A case of zoological gardens. *Sign Systems Studies* 44 (1/2): 209-230.

Manovich, Lev 2001. *The Language of New Media*. Cambridge, MA: MIT Press.

Maran, T.; Martinelli, D.; Turovski, A. (eds.). 2011. *Readings in Zoosemiotics*. Berlin: De Gruyter Mouton.

— 2010. Why was Thomas A. Sebeok not a cognitive ethologist? from “animal mind” to “semiotic self”. *Biosemiotics* 3(3): 315–329.

— 2015. Emergence of the “Howling Foxes”: A Semiotic Analysis of Initial Interpretations of the Golden Jackal (*Canis aureus*) in Estonia. *Biosemiotics* 8: 463–482.

Maran, Timo; Kull, Kalevi 2014. Ecosemiotics: main principles and current developments. *Geografiska Annaler: Series B, Human Geography* 96(1): 41–50.

Marler, Peter 1956. The Voice of the Chaffinch and Its Function as a Language. *Ibis* 98: 231-261.

— 1977. The structure of animal communication sounds. In: Bullock, T.H. (ed.), *Recognition of Complex Acoustic Signals: Report of the Dahlem Workshop on Recognition of Complex Acoustic Signals*. Berlin: Abakon-Verlagsgesellschaft, 17–35.

— 2004a. Science and birdsong: the good old days. In: Marler, P.; Slabbekoorn, H. (eds.), *Nature’s Music: The Science of Birdsong*. New York: Academic Press, 1-38.

—2004b. Bird calls: a cornucopia for communication. In: Marler, P.; Slabbekoorn, H. (eds.), *Nature’s Music: The Science of Birdsong*. New York: Academic Press, 132-177.

Marzluff, J.; Walls, J.; Cornell, H. N.; Withey, J. C.; Craig, D. P. 2009. Lasting Recognition of Threatening People by Wild American Crows. *Animal Behaviour* 79(3): 699-707.

Maslow, A. H. 1943. A Theory of Human Motivation. *Psychological Review* (50) 370-396.

McGurk, H.; MacDonald, J. 1976. Hearing lips and seeing voices. *Nature* 264: 746-748.

McLuhan, Marshall. 1964. *Understanding Media: The Extensions of Man.* Toronto: McGraw-Hill, 1964.

Mennill D. J.; Ratcliffe L. M.; Boag, P. T. 2002. Female eavesdropping on male song contests in songbirds. *Science* 296 (5569): 873.

Meyer, J. 2004. Bioacoustics of human whistled languages: An alternative approach to the cognitive processes of language. *Anais da Academia Brasileira de Ciências* 76: 406-12.

Miklósi, Á.; Pongrácz, P.; Lakatos, G.; Topál, J.; Csányi, V. 2005. A Comparative Study of the Use of Visual Communicative Signals in Interactions Between Dogs (*Canis familiaris*) and Humans and Cats (*Felis catus*) and Humans. *Journal of Comparative Psychology* 119: 179–186.

Miller, G. A. 1956. The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review* 63(2): 81–97.

Miller J. R. 2005. Biodiversity conservation and the extinction of experience. *Trends in Ecology and Evolution* 20: 430–434.

Moore, B. C. J. 2013. *An Introduction to the Psychology of Hearing* (6ed.). Leiden, Boston: Brill.

Moore, Gordon E. 1965. Cramming More Components onto Integrated Circuits. *Electronics* 38(8): 114–17.

Morris, C. 1971 [1946]. *Writings on the General Theory of Signs.* The Hague: Mouton.

Mota P. G.; Depraz, V. 2004. A test of the effect of male song on female nesting behaviour in the Serin (*Serinus serinus*): a field playback experiment. *Ethology* 110: 841–850.

Næss, A. 1973. The shallow and the deep, long-range ecology movement. A summary. *Inquiry* 16 (1-4): 95–100.

NAWT 2018. Rocco the parrot hits the headlines. (NAWT: National Animal Welfare Trust). Retrieved from: https://www.nawt.org.uk/blog/rocco-parrot-hits-headlines, 25.04.2019.

National Audubon Society (s.a.). How to Use Birdcall Apps. Retrieved from: https://www.audubon.org/news/how-use-birdcall-apps , 10.05.2019.

Navarro J.; Grémillet D.; Afán I.; Ramírez F.; Bouten W.; Forero M.G. 2016. Feathered detectives: real-time GPS tracking of scavenger gulls pinpoints illegal waste. *PLoS ONE* 11: e0159974

Nilsson, M.; Bartunêk J.S.; Nordberg J.; Claesson, I. 2008. Human Whistle Detection and Frequency Estimation. *Proceedings of the 2008 Congress on Image and Signal Processing* 5: 737-741.

Norberg, R. A. 1978. Skull asymmetry, ear structure and function, and auditory localization in Tengmalm's owl, *Aegolius funereus* (Linné). *Philosophical Transactions of the Royal Society B* 282: 325–410.

Odom K. J.; Benedict L. 2018. A call to document female bird songs: applications for diverse fields. *The Auk* 135(2): 314-325.

Odum, E. P. 1963. *Ecology.* New York: Holt, Rinehart and Winston.

O'Reilly, C.; Harte, N. 2017. Pitch tracking of bird vocalizations and an automated process using YIN-bird. *Cogent Biology* 3:1-27.

Paal, U.; Ots, M. 2018. *Birding Estonia.* Tartu: Eesti Loodusfoto.

Pajusalu, K. 2003. Estonian Dialects. In: Mati, E. (ed.), *Estonian Language (Linguistica Uralica. Supplementary Series 1).* Tallinn: Estonian Academy Publishers, 231-272.

Peirce, C. S. [1866–1913] 1931–1958. *The Collected Papers of Charles Sanders Peirce*. In Hartshorne, C. and Weiss, P. (Eds.) Volumes I–VI. Burks, A. W. (Ed.) Volumes VII–VIII. Cambridge, MA: Harvard University Press. All eight volumes in electronic document format. Deely, J. (Ed.) Charlottesville, VA: Intelex Corporation.

Pepperberg, I. 2009. *Alex and Me: How a scientist and a parrot discovered a hidden world of animal intelligence—And formed a deep bond in the process.* New York: Harper Perennial.

Petrilli, S. 2001. Sign. In: Cobley, Paul (ed.), *The Routledge Companion to Semiotics and Linguistics.* London, New York: Routledge, 2001, 323-324.

Phillips, S.; Wilson, W. H. 2016. Commentary: Experimental evidence for compositional syntax in bird calls. *Frontiers in Psychology* 7(1171): 1-4.

Pickles, J. O. 2012. *Introduction to the Physiology of Hearing*. Bradford: Brill. Retrieved from: ProQuest Ebook Central, 26.04.2019.

Pieplow, N. 2007. Describing Bird Sounds in Words. *Birding* 39(July/August): 48-54.

Pollack, I. 1952. The information of elementary auditory displays. *Journal of the Acoustical Society of America* 24: 745–749.

Prince, B.; Riede, T.; Goller, F. 2011. Sexual Dimorphism and Bilateral Asymmetry of Syrinx and Vocal Tract in the European Starling (*Sturnus vulgaris*). *Journal of Morphology* 272: 1527-36.

Purves, D.; Augustine, G. J.; Fitzpatrick, D.; Hall, W. C.; LaMantia, A.; McNamara J. O.; Williams S. M. (eds.) 2004. *Neuroscience (3ed.).* Sunderland, MA: Sinauer Associates.

Pyle, R. M. 2003. Nature matrix: Reconnecting people and nature. *Oryx* 37(2): 206-214.

Rootsmäe, L. 1994. Common Cuckoo (*Cuculus canorus* L.). In: Leibak, E.; Lilleleht, V.; Veromann, H. (eds.) 1994. *Birds of Estonia. Status, Distribution and Numbers*. Tallinn: Estonian Academy Publishers.

Rosenvald, R.; Lõhmus, A.; Kraut, A.; Remm, L. 2011. Bird communities in hemiboreal old-growth forests: The roles of food supply, stand structure, and site type. *Forest Ecology and Management* 262: 1541–1550.

Sarvasy, H. 2016. Warblish: Verbal Mimicry of Birdsong. *Journal of Ethnobiology* 36(4): 765-782.

Schaub, M.; Schwilch, R.; Jenni, L. 1999. Does Tape-Luring of Migrating Eurasian Reed-Warblers Increase Number of Recruits or Capture Probability? *The Auk* 116(4): 1047-1053.

Sebeok, T. A. 2001 [1994]. *Signs: An Introduction to Semiotics*. University of Toronto Press.

— 2011 [1990]. Zoosemiotics: At the Intersection of Nature and Culture. In: Maran, T.; Martinelli, D.; Turovski, A. (eds.), *Readings in Zoosemiotics*. Berlin: De Gruyter Mouton.

Selstam, G.; Sondell, J.; Olsson, P. 2015. Wintering area and migration routes for Ortolan Buntings (*Emberiza hortulana*) from Sweden determined with light-geologgers. *Ornis Svecica* 25: 3-14.

Sen, S. K. 2009. The Ethics and Science of Bird Call Playback. Retrieved from: https://www.kolkatabirds.com/callplayback.html, 16.04.2019.

Seyfarth, R. M.; Cheney, D. L.; Marler, P. 1980. Monkey responses to three different alarm calls: evidence of predator classification and semantic communication. *Science* 210(4471): 801-3.

Seyfarth, R. M.; Cheney, D. L. 2017. The origin of meaning in animal signals. *Animal Behaviour* 124: 339-346.

Sibley, D. A. 2011. The proper use of playback in birding. Retrieved from: https://www.sibleyguides.com/2011/04/the-proper-use-of-playback-in-birding/, 16.04.2019.

Slabbekoorn, H. 2004. Graphic representation of sounds. In: Marler, P.; Slabbekoorn, H. (eds.), *Nature's Music: The Science of Birdsong.* New York: Academic Press.

Slobodkin, L. B. 1968. Toward a predictive theory in evolution. In: Lewontin, Richard C. (ed.) *Population, Biology and Evolution.* Syracuse, New York: Syracuse University Press, 187-205.

Sondell, J.; Brookes, C.; Persson, M. 2011. Ortolan Bunting *Emberiza hortulana* at Kvismaren, central Sweden–breeding studies and suggested management. *Ornis Svecica* 21: 167–174.

Statistics Estonia 2018. Quarterly Bulletin of Statistics Estonia (2/12018). Retrieved from: https://www.stat.ee/publication-download-pdf?publication_id=44735&publication_lang=en , 19.05.2019.

Storch, I. (ed.) 2007. *Grouse: Status Survey and Conservation Action Plan 2006 –2010.* Gland, Switzerland: IUCN and Fordingbridge, UK: World Pheasant Association.

Stowell, D.; Plumbley, M. D. 2014. Automatic large-scale classification of bird sounds is strongly improved by unsupervised feature learning. *PeerJ* 2: e488.

Struhsaker, T. T. 1967. Auditory communication among vervet monkeys (*Cercopithecus aethiops*). In: *Social Communication among Primates* (Ed. By S. A. Altmann), pp. 281-324. Chicago: University of Chicago Press.

Sueur, J.; Farina, A. 2015. Ecoacoustics: The Ecological Investigation and Interpretation of Environmental Sound. *Biosemiotics* 8(3): 493-502

Sullivan, B. L.; Wood, C. L.; Iliff, M. I.; Bonney, R. E.; Fink, D.; Kelling, S. 2009. eBird: A citizen-based bird observation network in the biological sciences. *Biological Conservation* 142: 2282–2292.

Sulter, A.; Wit, H.; Schutte, H.; Miller, D.; 1994. A Structured Approach to Voice Range Profile (Phonetogram) Analysis. *Journal of Speech and Hearing Research.* 37: 1076-85.

Suthers, R. A. 1990. Contributions to birdsong from the left and right sides of the intact syrinx. *Nature* 347: 473–477.

Sutton-Smith, B. 2001 [1997]. *The Ambiguity of Play.* Cambridge, MA: Harvard University Press.

Suzuki, T. N.; Wheatcroft, D.; Griesser, M. 2016. Experimental evidence for compositional syntax in bird calls. *Nature Communications* 7(10986): 1-7.

Tali, T. 2017. Linnuhuvilise Meelespea. Retrieved from: https://www.eoy.ee/pics/237_Linnuhuvilise_meelespea.pdf, 28.03.2019.

Téglás E.; Gergely A.; Kupán, K.; Miklósi, Á.; Topál, J. 2012. Dogs' gaze following is tuned to human communicative signals. *Current Biology* 22: 209–212.

Thorpe, W. H. 1956. The language of birds. *Scientific American* 195: 128–138.

Tinbergen, N. 1939. The behavior of the snow bunting in spring. *Transactions of the Linnaean Society of New York* 5: 1–95.

Titze, I. 1992. Acoustic Interpretation of the Voice Range Profile (Phonetogram). *Journal of Speech and Hearing Research* (35): 21-34.

Tjernberg, M. 1983. Habitat and nest site features of golden eagles *Aquila chrysaetos* (L.) in Sweden. *Swedish Wildlife Research* 12: 131-163.

Tønnessen, M. 2003. Umwelt ethics. *Sign Systems Studies* 31(1): 281-299.

— 2010. Is a wolf wild as long as it does not know that it is being thoroughly managed? *Humanimalia* 2 (1): 1-8.

Tüür, Kadri 2009. Bird sounds in nature writing: Human perspective on animal communication. *Sign Systems Studies* 37(3/4), 580-613.

Uexküll, J. von 1982. The theory of meaning. *Semiotica* 42(1): 25–82.

— 1992. A stroll through the worlds of animals and men: A picture book of invisible worlds. *Semiotica* 89(4): 319–391.

—2010 [1940]. A Theory of Meaning. In: Uexküll, Jakob v., A Foray into the Worlds of Animals and Humans. (Posthumanities 12.) Minneapolis: University of Minnesota Press, 139–253.

Unwin, M. 2011. *The Atlas of Birds: Diversity, Behavior, and Conservation.* Princeton: Princeton University Press.

Vella, K. 2015. State of nature in the EU. Retrieved from: http://ec.europa.eu/environment/nature/pdf/state_of_nature_en.pdf, 08.05.2019.

Veromann, H. (eds.) 1994. *Birds of Estonia. Status, Distribution and Numbers.* Tallinn: Estonian Academy Publishers.

Viveiros de Castro, E. 1998. Cosmological Deixis and Amerindian Perspectivism. *The Journal of the Royal Anthropological Institute* 4: 469–488.

Wallach, H. 1940. The role of head movements and vestibular and visual cues in sound localization. *Journal of Experimental Psychology* 27: 339-368.

Warren, R. M. 1970. Perceptual restoration of missing speech sounds. *Science* 167(3917): 392-393.

Watson, D. M.; Znidersic, E.; Craig, M. D. 2019. Ethical birding call playback and conservation. *Conservation Biology* 33(2): 469-471.

Webster, D. B. 1966. Ear Structure and Function in Modern Mammals. *American Zoologist* 6(3): 451-466

White R. L.; Eberstein K.; Scott D. M. 2018. Birds in the playground: Evaluating the effectiveness of an urban environmental education project in enhancing school children's awareness, knowledge and attitudes towards local wildlife. *PLos ONE* 13(3): e0193993.

Whitehouse, A. J. 2017. Senses of being: The atmospheres of listening to birds in Britain, Australia and New Zealand. In: Schroer, S.; Schmitt, S. (eds.), *Exploring Atmospheres Ethnographically*. Abingdon: Routledge, 61-75.

Wiley, R. H.; Richards, D. G. 1982. Adaptations for acoustic communication in birds: sound propagation and signal detection. *In:* Kroodsma, D. E. and Miller, E. H (eds.), *Acoustic Communication in Birds*, Vol. 1, Academic Press, New York, 131-181. Retrieved from: ProQuest Ebook Central, 12.03.2019.

Willerslev, R. 2007. *Soul Hunters: Hunting, Animism, and Personhood among the Siberian* Yukaghirs. Berkeley, CA: University of California Press.

Williams, B. 1991. History and semiotics in the 1990s. *Semiotica* 83 (3/4): 385-417.

Williams, S. 2011. For Car Cassette Decks, Play Time Is Over. The New York Times. Retrieved from: https://www.nytimes.com/2011/02/06/automobiles/06AUDIO.html, 05.05.2019.

Wingfield J. C.; Hegner R. E.; Dufty, A. M. Jr.; Ball, G.F. 1990. The "challenge hypothesis": theoretical implications for patterns of testosterone secretion, mating systems, and breeding strategies. *American Naturalist* 136: 829-846.

Wurtzler, S. 2007. *Electric Sounds: Technological Change and the Rise of Corporate Mass Media.* New York: Columbia University Press. Retrieved from: ProQuest Ebook Central, 15.04.2019.

York, J. E.; Davies, N. B. 2017. Female cuckoo calls misdirect host defences towards the wrong enemy. *Nature Ecology and Evolution* 1: 1520–1525.

Young, J. 2012. *What the Robin Knows: How Birds Reveal the Secrets of the Natural World.* Boston, New York: Houghton Mifflin Harcourt.

Yousaf, S. 2019. Birds in data: Counting cuckoos and other stories. Retrieved from: https://factordaily.com/birds-in-data-counting-cuckoos-and-other-stories/, 28.04.2019.

Ziegel, V. 1929. Peoleo laulab. (Üles kirjutanud 13 a, Kõola algk. õpil.) (E 77417 (10) < Laiuse khk, Vaimastvere v, Rohe k). Retrieved from: http://regilaulik.folklore.ee/pohjatartumaa/blog/2013/08/17/10-peoleo-laulab/, 18.03.2019.

Zimmerling, R. 2005. Bringing in the Birds. *Birdwatch Canada* 3: 10–12.

Kokkuvõte

Linnuhäälte imiteerimine ja helisalvestiste kasutamine Eesti linnuhuviliste seas

Käesoleva magistritöö eesmärgiks oli uurida, kuidas inimesed suhtlevad lindudega erinevate helide abil. Täpsemalt analüüsiti töös hääli ja helisid, mida lindudega kontakteerumiseks kasutatakse; samuti erinevaid helitekitamise vahendeid; linnuliike, keda on võimalik heliga ligi meelitada; imiteerimisega seotud käitumist ja suhtumist helisalvestiste kasutamisse. Töö keskendub Eesti linnuhuviliste kogukonnale ning põhineb küsitlusel, intervjuudel ning osalusvaatlustel, mis viidi läbi 2018. a. suvel. Magistritöö teoreetiline raam kombineerib bio- ja kultuurisemiootika vahendeid, et uurida imiteerimise kaudu kujundatud liikidevahelisi interaktsioone.

Lindudel on mitmeid erinevaid häälitsuste tüüpe, mis on seotud ka konkreetsete funktsioonidega nende elutsüklis. Osa liike kasutavad suuremat arvu häälitsusi kui teised ning linnuvaatlejad peavad teadma, millist häälitsust millal kasutada, kuna lind ei pruugi vastata, kui teha seda valel ajal (nt laulu puhul). Kuigi sageli kasutatakse huvialuse liigi ligimeelitamiseks sama liigi häälitsust, leiti uurimuses, et linnuhuvilised kasutavad tihti ka ühe liigi häälitsusi selleks, et ligi meelitada teisi linnuliike. Näiteks värbkaku (*Glaucidium passerinum*) häälitsusi kasutatakse selleks, et pälvida väiksemate lindude tähelepanu.

Küsitluse tulemused näitasid, et kokku imiteeriti 55 linnuliiki 11 seltsist. Enim imiteeritud linnuliik oli kägu (*Cuculus canorus*) ning enim imiteeriti kakuliste (*Strigiformes*) seltsi kuuluvaid linde. Inimhääle omadused seavad piirangud sellele, milliseid linnuhääli saab inimene imiteerida. Käo häälitsust, mis mahub inimhääle helisageduse piiridesse ja mis on ka lihtsa struktuuriga, on inimesel häälega lihtne imiteerida. Samas värbkaku häälitsused jäävad inimhääle helisageduse piiridest välja, kuid inimesed saavad liiki imiteerida erinevate vilistamistehnikatega. Laanepüü (*Tetrastes bonasia*) häälitsus jääb aga ka inimese vilistamisvõime piiridest väljapoole, kuid seda liiki on võimalik imiteerida nt spetsiaalse vile abil. Linnuhuvilised kasutavad lisaks ka spetsiaalset värvuliste ärevushäälitsuste imiteerimist (ingl k. *pishing)*. Anatoomilistel põhjustel ei saa inimesed imiteerida ka liike (nt kuldnokk

(*Sturnus vulgaris*)), kes kasutavad heli tekitamiseks laulukõri kaht poolt, mis inimese häälepaeltega aga võimalik pole. Sel juhul saab kasutada imiteerimiseks helisalvestisi.

Kuna tänapäeval on kerge kasutada nutitelefone ja kaasaskantavaid kõlareid, ning kergelt pääseb ligi ka kodulehtedel ja telefonirakendustes olevatele linnuhäälte salvestistele, siis võiks arvata, et inimesed eelistavad tänapäeval kasutada helisalvestisi häälega imiteerimisele. Küsitluse vastustest tuli aga välja, et häälega imiteerimist kasutati 89 korral ja helisalvestisi 73 korral. Helisalvestiste kasutamine professionaalsete ornitoloogide poolt sarnaneb Eestis muu maailma helisalvestiste kasutamisele – seda tehakse haruldaste lindude seireks, öise eluviisiga lindude loenduseks ning lindude rõngastamiseks linnujaamades. Tööst selgus, et helisalvestiste kasutamine võib täita ka hariduslikke eesmärke. Osa informante arvasid, et helisalvestisi kasutatakse liiga palju loodusturismis, kuid teised leidsid samas, et kui helisid vastutustundlikult kasutada, siis on võimalik hoida lindudega kontakti mitmeid aastaid.

Sama inimene võib heli kasutada erinevates kontekstides (linnuloendusest hobini) ning lindudega võib seetõttu tekkida ka eri tüüpi interaktsioone. Pidev helide kasutus võib olla ka probleemne ja häirida linde. Kuigi kõik küsitlusele vastanud ja intervjueeritud mainisid, et helisalvestiste kasutamine teadustöös on aktsepteeritav, lahknesid arvamused küsimuses, kas helide kasutamine teistes kontekstides nagu hobi-linnuvaatlused on see alati õigustatud.

Tulevikus tasuks uurida, kas pikemas ajaskaalas muutub salvestiste ja häälega imiteerimise kasutamise osakaal, samuti võiks uurimust korrata teistes piirkondades, et saada teadmisi linnhäälte imiteerimise globaalsete suundumuste kohta.

Annex 1: Survey

(Note: The survey was conducted in Estonian)

Linnuhäälte imiteerimise ja helisalvestiste kasutamine linnuvaatlusel

Käesoleva küsimustiku abil soovime uurida, kas linnuvaatlustel kasutatakse linnuhäälte imiteerimist ja salvestisi, millistel juhtudel seda tehakse ning milliste vahenditega. Küsimustik on koostatud Tartu Ülikooli Semiootika osakonnas valmiva magistritöö ning selle põhjal valmiva teadusartikli tarbeks. Küsimustele vastajad jäävad anonüümseks ja täidetud ankeete kasutatakse ainult ülaltoodud teadustöö tarbeks.

Palun tagastage täidetud küsimustik Sugata Bhattacharya meiliaadressil: sugata@gmail.com

1. Millistes lindudega seotud tegevustes te osalete? Valige kõik sobivad vastused:
   ☐ pildistan
   ☐ teen seiret
   ☐ vaatlen tööülesannete täitmiseks
   ☐ vaatlen (ka) vabal ajal
   ☐ teen linnuekskursioone
   ☐ õpetan lastele ja/või täiskasvanutele lindude tundmist huvihariduse raames
   ☐ toidan linde
   ☐ kütin linde
2. Kas olete linnuvaatlustel jäljendanud linnuhääli või kasutanud linnuhäälte salvestisi et linde ligi meelitada või nende tähelepanu äratada?
   ☐ Ei (liikuge edasi 4. küsimuse juurde)
   ☐ Jah

3. Palun märkige järgnevas tabelis, milliseid linnuliike või –rühmi olete lindude vaatlemisel imiteerinud või milliste liikide salvestisi kasutanud. Märkige ära ka see, millist linnuliiki soovisite meelitada, millise häälitsuse tüübi ja vahendiga.

Linnuliik/rühm keda imiteeriti	**Linnuliik/rühm, keda soovisite ligi meelitada**	**Kasutatud häälitsuse tüüp**	**Imiteerimisvahend**
1.		☐ laul ☐ ärevushüüd ☐ kutsehüüd ☐ territooriumihüüd ☐ muu	☐ vile ☐ helisalvestis ☐ imiteerisin ise ☐ muu
2.		☐ laul ☐ ärevushüüd ☐ kutsehüüd ☐ territooriumihüüd ☐ muu	☐ vile ☐ helisalvestis ☐ imiteerisin ise ☐ muu
3.		☐ laul ☐ ärevushüüd ☐ kutsehüüd ☐ territooriumihüüd ☐ muu	☐ vile ☐ helisalvestis ☐ imiteerisin ise ☐ muu
4.		☐ laul ☐ ärevushüüd ☐ kutsehüüd ☐ territooriumihüüd ☐ muu	☐ vile ☐ helisalvestis ☐ imiteerisin ise ☐ muu
5.		☐ laul ☐ ärevushüüd ☐ kutsehüüd ☐ territooriumihüüd ☐ muu	☐ vile ☐ helisalvestis ☐ imiteerisin ise ☐ muu

4. Millistel puhkudel on linnuhäälte helisalvestiste kasutamine linnuvaatlustel Teie meelest kohane ja millistel mitte? Palun põhjendage oma arvamust.

5. Palun kirjutage siia oma:

   Vanus:

   Sugu:

   ☐ M

   ☐ N

   Rahvus:

P.S. Kui leiate, et Teil oleks linnuhäälte imiteerimise kohta rohkem infot jagada ja nõustuksite selleteemalise 30-45 minutilise intervjuuga, palun kirjutage siia oma meiliaadress, et saaksime Teiega ühendust võtta.

☐ Ei

☐ Jah, meiliaadress:

Lisainfo küsimustiku ja valmiva uurimistöö kohta:

Sugata Bhattacharya: sugata@gmail.com, Riin Magnus: Riin.Magnus@ut.ee

Annex 2: Interviews

The list of interviewees is shown below:

- A: (Interview with Interviewee 1, female 37)
- B: (Interview with Interviewee 2, male 21)
- C: (Interview with Interviewee 3, male 35)
- D: (Interview with Interviewee 4, female 33)
- E: (Interview with Interviewee 5, male 47; Interviewee 6, female 46)
- F: (Interview with Interviewee 7, male 18; Interviewee 8, male 45)
- G: (Interview with Interviewee 9, male 35)

The semi-structured interviews had the following questions to guide the interviews:

1. In which contexts and for which purposes have you used imitation /recordings of bird songs?
2. How did you get/ learn to do the imitation/use recordings (literature, websites, sources, friends)?
3. How have you chosen the birds you imitate/use recordings for?
4. When you do the imitation, do you pay attention to your behavior at the same time (being otherwise silent and invisible to the bird, hiding, etc)?
5. What does the success of getting a response from the bird depend upon? Could you bring examples?
6. Which characteristics of the bird species make the bird prone to respond to imitation?
7. Have you noticed that the birds would behave somehow specifically when imitating?
8. We know from the survey that you use these kinds of sounds for these birds, why do you use these kinds of sounds for these kinds of birds?

9. When you do the imitation, do you follow some principles or regulations?

10. Do you think that the imitation/use of recordings should be more regulated?

11. To your knowledge, is it common for Estonian birders to use imitation/recordings of birds? In which contexts is it usually done?

12. Do you see any changes in Estonian birding traditions in terms of using imitation or recordings?

13. Is the ethics of imitation/recordings a topic discussed among birders? Why/why not?

Interview A

(Interview with Interviewee 1, female 37)

RM: Can you tell us a little bit about your background and how you started to imitate birds or where you learnt about imitation.

Interviewee 1: I started to look at birds starting in the year 2000 or so. When bird-watching, there is the inevitability that if want to see or hear something, one has to register or write it down, and refer to some sort of a list to understand what species it might be. There are many birds which are not easy to see, but they are responsive to invitations; so I started to imitate those who are more responsive. RM: But did you have some teachers or how did you learn at all.

Interviewee 1: At the time, when I started birdwatching, there were a lot of people who were birding around me, (though there are less at the present moment), at that moment when I started bird-watching there were friends around me who knew more; and there were people to answer my questions.

RM: You, learned directly from them?

Interviewee 1: Yeah, we went watching together.

RM: Did you learn from books or from listening to recordings on (discs)?

Interviewee 1: I have learnt about some birds from CDs. The Pygmy Owl is one bird which I studied independently. One can hear it in a recording; but it is also easy to hear the bird directly; and it is easy to do the imitation. But, in general this information comes from a lot of bird-watching. The person who wants to do imitations has to listens carefully, and learn and re-learn.

RM: Currently, do you use imitation a lot?

Interviewee 1: I do use it.

RM: But in what contexts do you do so?

Interviewee 1: Right now, I do it mostly for fun; because, I haven't been to bird-watching for many years in this context, I don't mark and note down any phenological observations,

nesting or something like that. But I also try to teach my child and then it's good to bring the bird closer. So, currently, the imitation is done mostly educational purposes in this context.

RM: But, if you go into nature, you will try to see if the bird is there or not?

Interviewee 1: yes, it happens.

RM: How do you choose the birds you want to imitate?

Interviewee 1: I usually choose the birds which are easy to imitate.

RM: You have entered a list of birds in the questionnaire; perhaps, you can repeat the list of the species you have imitated?

Interviewee 1: Currently, the birds I remember are the Grey-headed Woodpecker) , the Pygmy Owl, the Tawny Owl), which should all be there. Currently, those are the ones I can remember.

RM: Have there been species which you have tried to imitate, which have not worked out?

Interviewee 1: Yes. I think that is true, but they do not come to my mind immediately.

RM: Has the number of such species increased over time?

Interviewee 1: Yes, in the beginning, I started with the cuckoo—that was the first one. That was the first success story and the rest came later.

RM: Have you used these techniques for fieldwork or for birdwatching?

Interviewee 1: Yes.

RM: And for which birds?

Interviewee 1: One cannot simple select certain birds. For example, when you use the calls of the Grey-headed Woodpecker, other woodpeckers respond to this call too. And one can get all sorts of the birds from this experience.

RM: Was the monitoring work being conducted for a specific species?

Interviewee 1: You mean what kind of field-work?

RM: Yes.

Interviewee 1: No, it was general field-work. For example, when finding census information for a bird-atlas by working on squares of areas. This is an option used for this case. I also used it for personal bird-watching to determine which birds are in the area.

RM: Yes. How do you choose the place to do this imitation? You go somewhere in the environment and then?

Interviewee 1: Yes, the place must be a bird habitat or a feeding place, and the time has to be right: daytime for daybirds and nighttime for nightbirds--for birds like owls.

RM: But are these any specific features of the environment that must be present for one to do the imitation? For example, that one must hide and so on?

Interviewee 1: Not always. For example, if you want to just record the presence of the bird, then one shouts and notes down its response in the territory; and hiding is not important. But for a photographer who wants to take a picture, or if a hunter wants to hunt a Hazel Grouse, then surely hiding plays a role.

RM: Do you use this imitation for photography or hunting?

Interviewee 1: No, I stopped taking pictures a long time ago. There are a lot of better photographers compared to me; and I have not done photography for ten years, and even less currently. In the case of hunting, there are birds like ducks, geese and hazel-grouses, which can be lured and deceived, say that I have managed not to do it, because I have managed without it.

RM: Have you ever tried this in a hunting context?

Interviewee 1: I have done this with ducks

RM: With a whistle?

Interviewee 1: With a whistle, yes, did not need anything else.

RM: In your experience, what do you think matters, whether this bird responds or does not responds to this imitation?

Interviewee 1: I guess , it's a difficult question. It depends on whether the context is broad or narrow.

RM: Yes, what does this depend on? Considering both the bird and the imitator, are there any qualities of birds that make them respond and, on the other hand, what are the qualities of the imitator?

Interviewee 1: One thing, the imitation should be as close as possible to the sound of the bird. I am not sure how to answer from the point of the bird.

RM: I mean, let's take a particular species, have you noticed that there are some species that are more prone to respond?

Interviewee 1: Well in that sense, males usually, as a rule, because they have more of these territories. Except in the autumn time, when there is goose and duck hunting, both of them react and there is no difference between (males and females).

RM: But if you did this research using imitation, did you take into account that the males react more.

Interviewee 1: No, it was important for me to get into the territory and from there to see if there was a probable or certain breeding.

RM: But what types of voices do you use? Do you also use what is called “pishing” in English?

Interviewee 1: Invitation calls or something like that?

RM: They could be anxiety calls—to bring in different passerines to a place.

Interviewee 1: The anxieties calls are more like songs, in principle, still more in the sphere of vocals, in the voices of the territory, in the vocation and in the anxiety. As for tits, I don't know, I can't recall that someone in my knowledge (here in Estonia) would have used something like that. But has it been discussed before.

RM: This is probably more common in America. There are quite a lot of “pishing” there.

Interviewee 1: For tits?

RM: We've also got a few answers here that people do it.

Interviewee 1: It makes me want to try it.

RM: But still songs first?

Interviewee 1: Songs.

RM: Why songs?

Interviewee 1: I don't know, it's somehow the information I've had and so far, but now I'm going home and looking for this topic, for sure.

RM: But do you remember any amazing experience with this imitation?

Interviewee 1: Yes. It was a very cool experience

RM: Perhaps, you could share.

Interviewee 1: An ordinary bird — a raven and during the autumn, probably the young birds together with their parents ravens around seven birds, and at that moment I really hid myself in the bush and imitated the raven. Then, they all started to fly around this shrub, lower and lower, they wanted to see who was inside.

RM: In the city somewhere?

Interviewee 1: It wasn't. It was in the countryside. For me, too, it was puzzling. That's to say that the ravens went crazy with the hoax.

RM: When they see that they are imitated, have you noticed that they are learning that they are being imitated and then they not respond any more?

Interviewee 1: Then maybe you should go to a particular person repeatedly. But only once with a Grey-headed Woodpecker. I have noticed that if you do a lot of fooling with Golden Orioles, at some point, they will become lethargic. They're probably seeing it's not really that. Then, they go and do their things. But in general, they become more lethargic.

RM: But if you imitate birds, are there any principles that you follow, that you don't do, or how you behave in such a case?

Interviewee 1: In general, I'm still trying to do it as little as possible.

RM: Or that you don't do it for example, in some period?

Interviewee 1: No, because the bird will be disturbed anyway. But, if you do it in the breeding season, then it just takes a lot of energy from the bird, which they could use for much more practical things than to find out that it is a scam.

RM: Should it be more regulated?

Interviewee 1: I can't say that because in my opinion, as much as I have used it, I do not think it is abused.

RM: But do you use any recordings yourself?

Interviewee 1: I've tried, but I like it without using it. I have tried it on owls, but not so much. I like to do it without more use. As to the sounds of owls, if you use the sound of a specific owl, other owls also respond.

RM: But these recordings, did you use the same voices you make yourself?

Interviewee 1: Yes, for example, for example I used the recording for the Tawny Owl?

RM: It worked?

Interviewee 1: It works, but it didn't work for me, maybe there were no owls.

RM: When you did these surveys and scientific observations, did you use the recordings?

Interviewee 1: Then I did not use the recordings.

RM: But do the current bird watching seem to be using a lot of these sound recordings?

Interviewee 1: Here I am not going to answer because, as I said, I haven't been dealing with this bird watching for quite a few years.

RM: But well, at that time, was that the use of sound recordings in the context of bird watching at all talked about, or rather not?

Interviewee 1: I know it just the same story, to disturb as little as possible during breeding, and to disturb as little as possible, that is what to pay attention to. But how much and, to my knowledge, it is more about a human conscience or wisdom to use.

RM: I don't know if you have interacted with bird watchers from other countries?

Interviewee 1: No.

RM: I was thinking about how Estonia is placed in terms of using or imitating the sound recordings with respect to other countries. Because there are probably some countries that use quite a lot of them to record.

Interviewee 1: Mhmh.

RM: Well, probably, then, one interesting question is that because of all the digital technologies that have come, have these recordings started to be used in bird watching--compared to the previous times, when there were not all these cell phones?

Interviewee 1: I think it may be so, because I myself have used the opposite option myself. No, actually I have use it once, it was in the case of a Sparrowhawk, when I played in on the phone and it reacted to this. But at that time, it was to check if it was a Sparrowhawk, as it was making a sound far away. But I have used recordings to detect the voice of the bird by listening to the recording. It is possible to put all the voices in the phone, why should it not be widely used?. I used to use a tape recorder.

RM: With a tape recorder?

Interviewee 1: Yes, with a tape recorder.

RM: To identify birds?

Interviewee 1: If they needed to be lured, the same case as with the Tawny Owl.

RM: Oh, that was with a tape recorder.

Interviewee 1: Yeah, yeah, with the batteries that was at that time

RM: Nowadays it's easier with these mobile phones. But in terms of education, you teach your child about birds. Do they imitate the voice of the birds?

Interviewee 1: I haven't really noticed yet.

RM: You don't teach them to imitate, but simply enjoy bird.s

Interviewee 1: Yeah. If they like birds, this imitation will come.

RM: We are a interested in the behavior of birds in imitation situations. Whether they learn to be deceived?

Interviewee 1: Well, that's complicated.

RM: It's hard without systematically tracking the birds.

Interviewee 1: As I said, I have noticed that they are checking out and they can still go a little bit and answer, but not so much more.

RM: But do you have any desire to learn to imitate some bird?

Interviewee 1: Tits (Tihased in Estonian) That is an obsession. After all, there are some invitation calls, which can be imitated, but I haven't gone so deep. But sometimes the song is very complicated and the invitation call is the easiest to learn.

RM: In the case of woodpecker, this territory call is what you use? And, not drumming?

Interviewee 1: No, drumming can also be used, they also respond very well. Yes, yes.

RM: Are there any alternatives to whistles, the use of vocals and sound recordings that can acoustically attract the birds. Are there any other tools that are used?

Interviewee 1: Has anyone ever said anything before?

RM: These are the main ones. I just mean so that we have not overlooked ourselves.

K. Ok. for ducks and geese a whistle is used, and there is also a small copper whistle for the Hazel Grouse. Have you seen it?

RM: I haven't seen myself, but I know it exists.

Interviewees1: Then drumming for a woodpecker with a branch or piece of wood; whistling; and the imitation of the owl with the mouth. I don't even remember myself that way.

RM: There are visual attracting techniques probably.

Interviewee 1: Showing a predator bird, this is also a variant.

RM: But you yourself have not used that combination of voice and then visual imitation or attraction.

Interviewee 1: It doesn't come to mind.

RM: But in official bird watching, are they not used in combination?

Interviewee 1: What can this combination be like? This visual, some predatory bird or..

R. And, also to play the sound.

Interviewee 1: No, it is out of ethics, it makes the birds very stressful. Whether it is the territory or the enemy, I think they are at a level of stress. I think not to play with it, I wouldn't do it personally.

RM: I have not heard about it too. These are the things I wanted to know. Maybe you have something to talk about, which we did not know to ask. something important concerning imitation.

Interviewee 1: Have you asked the hunters?

RM: No. No hunters were asked. I explain that the demarcation of the research with observation. Says those who are hunting for the Hazel Grouse could tell if they are learning?

Interviewee 1: Generally we know that ornithologists also use the Hazel Grouse whistle for deception and always get the answer. Perhaps the Hazel Grouse is just a stupid bird.

R. But there are no regulations in the hunt for luring?

Interviewee 1: It is not allowed to use electronic recordings, electronic means should not be used. You can either mimic with whistles or imitate yourself.

RM: Electronics should not be used with wild animals.

Interviewee 1: Absolutely. Yes. All electronics is forbidden.

Interview B

(Interview with Interviewee 2, male 21)

RM: We can make a start, I guess. That's both for the Master's thesis but also for an article that we plan to publish.

Interviewee 2: Oh! An article about what exactly?

RM: It's about the imitation of birds and recordings, and how the contact is made between the person and the bird.

SB: So may be you can just tell us how you got started in birdwatching

Interviewee 2: Ya. It was in 2012. So, I was in Tartu Nature House, where I was already participated in some programs there and they had camps and they had hiking there, and one of the teachers there invited me to her new program, ornithology. It was for children, I think, in primary and also in secondary school children. It all started. I participated there until I finished my gymnasium, two years ago now. And I was also in one Erasmus, youth exchange, also about birds, and how human activity affects bird's migration, and this year, I ran programs about nature in three different schools, and I also teach about birds because birds are my favorite topic in nature. Ya, I have birded in this ornithology orientation. I did this one booklet there, where I described basically how to start birdwatching and I did the instruction and all the background information how to make ornithology as your hobby, and I have helped some projects there in the organization. Well, I also study nature tourism, I have a subject there about birds. I had also there a practical part of it.

SB: That's good. And so when you started birdwatching, did you start using just binoculars or did you also start using sounds/recordings?

Interviewee 2: Ya—the teacher said that we should interrupt the birds as few as we can, but yeah, some bird species we use sounds to invite them, hear them. Yeah, we did it quite rare, every time we did it, ten or fifteen people, and only the teacher would play the sounds. Yeah.

SB: and when the teacher played the sounds, what happened? Like did the bird respond back?

Interviewee 2: yeah! Usually, because we choose the place and the time for the bird species. Yeah. We mostly used sounds for owls and woodpeckers.

SB: So how did you choose the birds for which imitations and recordings are used?

Interviewee 2: So, usually, I did not choose them myself, but we discussed where are we now, and what is the time, and what are the potential options that we could hear and then, some part of it was just trying. We just played some sounds and yeah and see what happened.

RM: Do you use on your own, the recordings, these days?

Interviewee 2: No. When I am doing birdwatching on my own, I only use binoculars, because one reason is that I do not have this technique to play the sounds and I haven't felt that it is giving me so much extra that I have to use it.

SB: So, what are the contexts in which you have used imitations and recordings?

Interviewee 2: I think, in all the times, it has been with a group. Mostly in the camps, in the ornithology camps. Also, like some of them have been in the same group, like school children, that we have been in this program, and some of them have been in camps, like I think it was four or five years ago, when I thought that the ornithology organization organized camps for schoolchildren, and there we used more of the sound systems and mostly on owls and it was quite successful.

RM:So there, you used recordings too?

Interviewee 2: Yeah!

RM:So, when are simply there alone, you do not use it?

Interviewee 2: No. Yeah. I have never used it. But, I mostly do birdwatching with a group, so..

SB: So, regarding the use of this imitations and recordings did you find out from literatures or websites or how, you said you went in a group, were there other means you tried to find out this?

Interviewee 2: About?

SB: How to use the recordings and so on?

Interviewee 2: Like where did I get the sounds or?

SB: How did you find out about

RM:how to use the imitations? yes.

Interviewee 2: I think, I did not have so much pre-information. Just had heard about it. And then tried. Like in my first time, we were only school children there, without teachers, and we

tried it, and we were lucky, and afterwards the teacher explained how it can affect birdlife and what like the bird is going to think from the bird's perspective when we play some sounds.

SB: Do you remember what the teacher you, like what happens when you play?

Interviewee 2: Yeah. She always said that we should use the imitation sounds as less as possible because if you have already seen or heard the species, then it is not right to interrupt the bird more. And yeah, she also said that only one person can play the sound.

SB: So, if you are in a group, then only one person should play the sound

Interviewee 2: Yeah..not in a mix.

RM: but the purpose is to make the bird visible?

Interviewee 2: not only, but also heard. The teachers knew, for example the owls' nesting places, so we know that the birds were there, but we just did not see or hear them, and then we tried to use this imitation.

SB: So, you go to a place where there are owls, but you cannot see them, and then when you use imitation, the owl responds back.

M; yeah. It comes closer. It is also like when we hear it really far far away, and we want it to come closer then we have also used the imitation.

SB: Do you know what is the reason the owl comes closer and it responds?

Interviewee 2: It depends, what kinds of sounds do you play, but the bird thinks basically that another bird from his species is in his territory and he will come to check what is happening.

SB: You said, depending on the sound you can play, are there different kinds of sounds you play.

Interviewee 2: yeah. You can play like the regular song or

RM: Anxiety calls or invitation call

SB: The distress call?

Interviewee 2: So, I do not know the terminology

SB: So, this one is which the baby makes to call the parent and the other is to warn the predators. So do you know which one?

Interviewee 2: So, the anxiety call sounds better, so that the bird thinks that someone else is in his territory, and the bird thinks that it is in his interest to come and check. But, also like when a male bird wants to impress the females, then also it is not always the song, but also the sounds.

RM: So when you choose the location of where you will play the recording, how you do do this? Are there some environmental cues that tell you that this is the right place or this is the right time?

Interviewee 2: I think, it is hard to say. Usually, we just try. Try to imitate the birds at different places, because the birds move so much and so far, and we can never know where they are. But when, its nesting time then its different, but then it is not right to interrupt them.

RM: If you compare different situations where you have done these playbacks, could you say on what does the success of getting a response depend on?

Interviewee 2: I think you need to have some information about the bird you want to call or invite, like exactly in the area, and you have to be patient and the right timing also. There are so many factors that are hard to know before.

RM:Do you have some remarkable examples of when it worked well, or vice versa, when it did not turn out at all.

Interviewee 2: I remember once when it was summer and close to Räpina and we had a camp there, and we tried to invite one owl, Eurasian Pygmy Owl (*Glaucidium passerinum*), and we just sat there for quite a long time—we were in a thick forest and we know that they nest there. It was the nesting time in March. It was actually before the nesting time. Yeah. We were like on the edge of the thick forest, and we sat there for a while. It was the first time I was in a group when we tried to use sounds and yeah, it worked. The bird came closer, but we did not see it, but we heard it. Yeah. I think, it was the most memorable imitations of bird sounds that I have.

SB: So, when you first played, first there was no response and then the bird came.

Interviewee 2: yeah. It took time—10-15 minutes.

SB: And then, when the bird came closer on hearing the sound.

Interviewee 2: And he responded.

SB: And then you played the sound again.

Interviewee 2: Yeah.

SB: And then the bird came closer and reposed.

Interviewee 2: Yeah. responded.

SB: And this happened three or four times, and the bird came closer but.

Interviewee 2: Yeah.

SB: But the bird never showed itself to you, or you could not see the bird.

Interviewee 2: No. We could, when he flew, but not well not sitting somewhere on a branch. We all something moving, but could not identify by seeing him. Only by the sound. Then, when he heard answers, then he usually continues it quite long. So, I think it is not so much effort to play it again, so it does not change it again much, because he is going to come closer anyway if he has heard the sound. Tries to find the enemy.

RM: When you do this imitation yourself, do you pay attention to your own behavior? What else do you pay attention to in this situation?

Interviewee 2: yeah, most important is to be as much invisible as possible. And it takes time, but it is also possible that like some other species can respond. I do not have such experiences myself. Like you play one owl sound, then some kind of smaller bird can be eaten, like starts to get anxious about it.

SB: the smaller bird, in most cases they make a sound. How do you

Interviewee 2: yeah. They make those anxiety sounds. It can happen.

SB: In your survey you have mentioned owls, but you have also used sounds for woodpeckers. Have you used the sounds for other species? Or do you know of other species that people use it for.

Interviewee 2: yeah. I think they use. But, I haven't.

SB: Do you know if other species that people use..

Interviewee 2: Actually, I haven't heard. I think the owls are the most common. Because usually they are so far, and it is so dark, and it is hard to see them. But with other birds, they sing anyway, and they are everywhere. Well, there is no point, if it is a really common species. Sounds and imitations are only used for rare species.

RM: Do you think there are some species or some individuals which are prone to answer to the playbacks?

Interviewee 2: Yeah. It also depends on the bird. Some birds might react more and are more curious.

RM: Like some individuals within the same species?

Interviewee 2: yeah. It can differ much I think. It is always a question, like if it is useful? Is it right to go, because it takes energy from the birds and it interrupts them, and if it is nesting it is also a dilemma.

SB: So, in your knowledge, is it common for Estonian birders to use recordings.

Interviewee 2: I think not that much. We would rather use binoculars. Usually, but if we do night tours, during night time, then it is hard to use your visible senses. Sound works. Like during sunset the wind is really weak, and the sound will reach more far, then it has more ethics.

RM: Do you, when you put on the playback, do you follow some principles, so like when you put on the playback, I should only do it on these occasions?

Interviewee 2: I think it is not it is not that systematic, but I try to avoid using sound usage during nesting time, and usually I do not think it is right to just play some sounds and see what happens. I think it is important for you to have some information before.

RM:Do you think it should be regulated more?

Interviewee 2: I do not see a need for that because in Estonia the people who use sounds know the topic of birds quite well and there are not that many people who use sounds overall, so I think that it not that problematic.

SB: Do you see any changes in the birding tradition in the last few years, because now with smartphones it is easier to get access to recordings?

Interviewee 2: Yes. That is popular, we have those apps now, which help identify the bird and to play the sound, so I think it is getting popular using all these sounds, but I haven't noticed that it is going too common, overuse and so on.

SB: So, is that when you are in those groups, is the ethics of using sounds discussed?

Interviewee 2: Slightly, I think. Groups, where I have been, like ornithologists, who know what the birds can think when you play the sound and what are the consequences, or what

can happen, how we can affect the birdlife, so we have not had bigger discussions, but they usually that we just try, sometimes not too much, and may be not all the species that can be there, but only one or two.

SB: And you have mentioned that you also conduct educational groups and trips for people.

Interviewee 2: Yes, I have. Also for the primary school children, that I do in schools, but I have not used imitations there. But, when we did projects about bird-migration, then I also did tours there, and it was daytime, and next to the sea, and I did not see any point in using the sounds.

SB: When you were teaching them, you did not use sounds, and so you did not feel a need to talk about the ethics

Interviewee 2: If I were to make the tour during the sunset or something, and there was a potential of being near owls' living places, then I would use sound, if the weather and the timing is correct.

RM:So you use only recordings then?

Interviewee 2: yeah.

RM: Have you tried imitating yourself.

Interviewee 2: I am not that skillful myself, but with that smallest owl, it is quite, a lot of ornithologists whistle his sounds, which is kind of the same in my opinion, and it works yeah. And some people can make lots of sounds themselves, and it's difficult for me.

SB: So, do you know any sounds which people make to attract birds, other than owls, or any special techniques?

Interviewee 2: I think, I only know about owls, that you can whistle them. Well, I have watched some videos where people can imitate perfectly about 20-30 bird species sounds. I think it could be kind of cool, to test how the birds react, like if you compare the recording and the imitation.

RM: Do you know anyone in Estonia, who is really skillful in imitating?

Interviewee 2: No. I think in Estonia, I have only heard whispering

RM: Why do you call it whispering?

Interviewee 2: vilist…?

RM: you mean whistling?

Interviewee 2: Yeah! Whistling, not whispering.

RM: But with their own mouth, and not with a whistle.

Interviewee 2: And I do not know, but you do not need to make exactly the same sound. You can just whistle. If you whistle easily, then some birds can come to check on what is going on, what are these weird sounds

SB: Is there a special name for this kind of whistling.

Interviewee 2: No. At least, I have not heard any terms about it.

RM: Do you know about pishing? Actually, I do not know the Estonian word, if there is, for making the psssh psssh imitation?

Interviewee 2: I have not heard about it. I do not know if there is a word, but I have also heard that it is also used. They use those.

SB: but you haven't use it yourself. Have you seen people use it?

Interviewee 2: No. I haven't and I do know know how effective it is.

SB: Do you think, we have covered most of the material?

RM: Yes, but if you have something you want to add or if there is something important on this topic, or some experiences.

Interviewee 2: Well. Three years ago, I was in Kabli bird center. You have the autumn bird migration, and they have the banding, exactly, and I was there during my autumn break, and one morning during the sunrise we tried to see if the smallest owl is there. And we spent more than half an hour and we did not succeed. Lately, we had those summer days, and one night, and in Pulgoja, there was the Hoopoe (*Upupa epops*), I do not know in Latin, it is a really rare bird, and there are really really few people who have heard this in Estonia, one or two or something. Day before, it was there, or three days before. I reached there. And we also played the sound, and we checked all the previous observations there. Where the bird was exactly, and we spent half an hour, or even more, and we walked along where the bird should be, but we couldn't.

SB: Do you think the time of the day was important? Is the bird more active in the morning or the evening, and you were there at the wrong time?

Interviewee 2: Not Really!All the factors were right. The timing was when the previous observation was made. The place was the same, and it was nice. There was no wind and no clouds. Yeah! The bird was not interested or in the right mood. I do not know.

RM: Do you know if in Kabli, they also use these recordings to get this survey information?

Interviewee 2: yes. They have those CD players there, and they play. Two years ago, when I was there, there was the Pallas's Leaf Warbler (*Phylloscopus proregulus*), a kind of rare birdie stopped there all day long, but I do not know how much it affects the birds. There was a bird catching net, and there was this CD player behind it

SB: And the CD player was playing the sound of this bird?

Interviewee 2: Pallas's Leaf Warbler (*Phylloscopus proregulus*).Yes. You can check it later. And there were some birds, tits with the long tail, Long-tailed Tit (*Aegithalos caudatus*), and in Kabli, they always migrate in a group. If you catch one or two, then we put them in a box, and put them in a box behind the bird catching net, and then they make the sound that they are in trouble, and the other members of the group will come and try to rescue them, and then we can catch them

SB: So you use one bird

Interviewee 2: to catch the others. Yeah. A bit mean. But we do it quickly and yeah.

SB: So this is in autumn when they are migrating south.

Interviewee 2: they have this huge net, which goes smaller. But, I do not know if this technique is also used for other species. But with those long-tailed tits, it is working really well because they have really strong relations in the group.

SB: So it is a really social bird.

Interviewee 2: yeah

SB: So it would not work with a bird, which does not have these social relations. They may not care about the other birds.

M. Yeah. But, it is curious for you to know if the CD plays the one song, Pallas's Leaf Warbler (*Phylloscopus proregulus*), which is quite rare, but which can invite the other birds from different species, how does it work?

RM: You are fast. And it is part of the official methodology to use the recordings in Kabli to register the birds?

Interviewee 2: actually, I do not know. The head of the bird center there has used it, all the years, I know.

[…]

RM: All right. Many thanks then.

Interview C

(Interview with Interviewee 3, male 35)

SB: My name is Sugata Bhattacharya, and this is Professor Riin Magnus, and we are in the department of Semiotics, and with this project, the main idea is that we want to find out about the interaction between humans and birds, and in particular, how humans use sounds to attract birds towards themselves, and what kinds of sounds they use and the ethics of it and so on. So, I know that in your survey, you have mentioned that you use it for work, but also do it for nature and city excursions and so on. So, just to start off, like, in which contexts and for which purposes, have you used imitations or recordings of birds.

Interviewee 3: mainly for research. Mainly research for myself. So, for the Corn Crake (*Crex crex*) what we did, we went to the site in the Karula National Park, and we were waiting there about about a few minutes, we heard the bird, corn-crake, if it is there or not, and when it was quiet, then we start recording, this playback recording, and if sometimes, if they are there, they answer for the call, so you can recognize that this species is here, or the other case, when it was quiet, we do not know, if they are there or not, and we assume that they are not there. But, of course, some birds do not answer for the recordings. This was the corn-crakes, and for the Ortolan Bunting, what we (*Emberiza hortulana*) did was, it was very hard to catch the bird. So, what we did was that we put mist-nets, close to the bird-territory when the male is singing, with the net there, we had the recording there, and we had one dummy. (Model bird, something like this there). We put this one there, and we start recording, and the bird come and attracted to the dummy, and we can catch them, and we put these devices, geolocators, so we study migration. So, this is what we did, this is the main thing I have done. And of course, for the leisure, I can't remember, I guess, a couple of times, what we, my friends, usually do, they go out, they go out for the woodpeckers or the owls, or something, they put their recordings, so if the bird there or not. This is the main in my case, which I can explain.

SB: Thank you. So, how did you get to learn about imitations, and using these recordings? How did you start or where did you get the information?

Interviewee 3: This was like in the early 90s, when I started bird-watching, so the supervisor of that time, which I remember, we had my first owl trip, around the city of Elva, so we went there in, we went there in February, and he played recordings, and tried to get something back. So, I got the first time, we got the Tawny Owl (*Strix aluco*), so this was the start.

RM: But, you have used your own voice?

Interviewee 3: yeah. Whistles. yes. Whistles. We also do this quite. For the Grey-headed Woodpecker (*Picus canus*), the sound is "Too too too too", so the sound is. But, this is for leisure, for fun, for something like that.

SB: So, how have you chosen you imitate or use recordings for?

Interviewee 3: They should be interesting for you. They should be rare something. Important for you or something like this. You want to hear them or you want to see them. Something like this.

SB: So, I guess for your professional work, you are interested in these species, when you go for your work, you only play the recordings for only these birds.

Interviewee 3: yeah. Yeah. No other.

SB: So, when you do the imitation, do you pay attention to your behavior? If you are remaining silent or if you are hiding?

Interviewee 3: my own behavior?

SB: yeah. Or other people with you.

Interviewee 3: Can you specify a little bit more.

SB: So for example, when you play the recording do you try to hide yourself somewhere so that the bird cannot see you?

Interviewee 3: No. Usually no. Of course, when we did the catching of the Ortolan Bunting, we put the mist net there, there was the dummy and this recording device, and we went away. This was for the catching. For the Corn Crake we did not do it. And when you do it for fun, you do not hide yourself or something. No. Never. Hunters: they do it; which I have heard.

SB: So with the Ortolan Bunting, you would set it up remotely. Do you have some kind of camera to observe that they are coming? How do you know when to..?

Interviewee 3: No. We just go there and check the nets. Usually when they are aggressive birds, there is some kind of a sentence: if you do not catch the bird within five minutes, you will not catch it at all. It is not 100% true. But Most. Most of the cases, it comes directly to the net. Yeah.

SB: So, for example let's talk about the Ortolan Bunting, so you know that they live in a particular forest?

Interviewee 3: No. Farmlands

SB: Farmlands. OK. When you go there, do you know where to put the set-up? From previous experience?

Interviewee 3: Both. We search for new places, and we see that this can be the right habitat, and we stop the car again, and listen to see if the bird is there or not, we start recording if the bird is there, and we put the mist net there. But there is some very specific population in some areas, so we usually go there for the best places. We know that the bird has been there for maybe 20 years or even more. So, we go. We usually stop for those places and when see something, that this can be very good place, we stop the car.

S; So for example, with the Ortolan Bunting, how do you know what are the characteristics of a good place for you? So you said it is a farmland?

Interviewee 3: Farmland habitat. Usually what they prefer mixed habitats, so mixed field cultures. Different grasslands, rapeseed and winter cereals, what they prefer usually. So mix of these, and should be old farmyards, burrows, active farmyards, and some bushes and trees, and small wooded lots or stone heaps or something like this. This kind of mixed habitat, usually.

SB: So like, sometimes you see these huge Estonian countrysides with just one crop that is not a good place to find them.

Riho. Yeah. Mostly it is true. Sometimes, they can also be in this type of habitat. But they prefer mixed habitats usually, based on our research.

SB: And, so where do they build their nest? Does that also factor?

Interviewee 3: Nest is not a factor. Nest is on the ground. Yeah. I haven't seen any nest usually. It is usually hard to find so. I don't know anything about nests. They stay on the ground, and the field edges usually. I never found a nest.

SB: Usually. I see. What are the factors that influence getting the success from a bird? Like if you are playing the recording, what are the things that will improve the chances or getting the response from a bird?

Interviewee 3: 50-60%. No. No. You cannot say like this. It depends how much you make this playback sounds. How many stops you do, or something like this. In the right places, it is easier to get a feedback. In poor places, when birds, where the birds does not exist, the

feedback is zero. So, you cannot say. yeah. It really depends where the birds actually are, what is the distribution.

SB: So, you usually base it—so if you find a good habitat, that is where you will get a lot of responses usually.

Interviewee 3: No. But much higher chance to get it.

SB: And is there any particular season?

Interviewee 3: Breeding season is the best one of-course. So, they usually

SB: They migrate here in the..

Interviewee 3: Both are migrating birds, and both migrating from sub-Sahara, very far, long-distance migration. So, what we usually do, is during the breeding time, in the breeding time, most of the birds in different periods, when they have chicks in their nest, they are not so aggressive for the recordings. When they start breeding, searching females, they have first eggs or something, they are more. of course, breeding ontologies are also important factors. One season, we were too late. They all, already had females, so we were quite unsuccessful I would say.

SB: OK. So. Usually, when you play the recording, you only play the male bird voices, and you get the males.

Interviewee 3: Yeah. Sometimes, on just few occasions, when you catch the birds you get the females. For the Corn Crake we did not catch the birds, at all, we just wanted to hear them. Depends on the project.

SB: because, you mentioned that you use songs. You are playing the song of the bird, so wouldn't we expect the females to be attracted to the sound and come to see the male?

Interviewee 3: But. They might come, but they are hiding somewhere. So, you can see them sometimes, but not always. Usually, males are aggressive and you can see the males. For the Ortolan Bunting at least.

SB: Because, because with a song there can be two factors. One is that the female wants to find the mate, and female shows itself, and with what you are saying, it is more that the male wants to chase the other males away from their territory.

Interviewee 3: yeah. Yeah. Something like this.

SB: So that is what gives you more success with these two species.

Interviewee 3: May be when we do it not so, how to say, we usually start in very good places, somewhere where we know the birds exist, maybe if we go somewhere where we do not think that the species exist, then we get more females.

SB: Can you just repeat that?

Interviewee 3: What I wanted to say, usually, when we start we go those places when the birds have been already last year or something like this. Usually, when we get there, we get males. If we go, to the not so attractive places, a little bit less attractive places, then we might might get more females. But, yeah, I never tried it. So I don't know. Usually, we work in the male's answering or coming to the net.

RM: But, why would it be like that? Why would you assume that in these cases, you get the female.

Interviewee 3: In this you might get the female who does not have the male. I do not know. This is just the expectation. Is it true or not? There might be studies for that.

SB: And what kinds of sounds do you use for these birds?

Interviewee 3: Songs.

SB: So birds have different kinds of songs.

Interviewee 3: So what we did in the Ortolan Bunting, we are using sound recordings from Finland. We also tried from Sweden, and also from Germany or something. But the best recording, is the Finland recording. For the Corn Crake, what we did, when the bird is calling, the calling is also a little bit more aggressive. The Corn Crake voice is like "crex" "crex" "crex" "crex". Something like this. But they also prefer a little bit, this is also what we think, they want a little bit more aggressive voices—higher frequency and higher speed crex-crex—. So faster sound. Do you understand? They wanted like this. This is what I remember for the Corn Crake. Ortolan bunting, when the sound is a little too slow or something, they are not so..they hear an aggressive female they will also be aggressive.

SB: You mean aggressive male?

Interviewee 3: yeah. male. Yeah. Exactly.

SB: so maybe let us stick to the crex crex. In that case, there is a variation in the voice. And they respond to a more aggressive voice?

Interviewee 3: yeah.

SB: So, is that voice more characteristic of a younger or what does it?

Interviewee 3: I just don't know. Is it a younger bird? Can a younger bird do a more aggressive voice, or some smarter males can do it, or some aggressive males can do it, I have no idea. There must be some kind of studies, but I have no idea. This is what we do, when we do it in the field work, and we try to be more productive, so we use a little bit those tricks, but what is behind it.

SB: Do you know how this came about? In the sense, how did people find out? Because you have different crex crex recordings.

Interviewee 3: We got this information from a guy who was from Germany or France or something. Just based on personal contact.

RM: but you chose this Finnish recording

Interviewee 3: For this Ortolan Bunting. Yeah.

RM: Does, it matter that the recording could not be from very far way, like Southern Europe recording.

Interviewee 3: This can be true, tis geographic variation, or the geographic, how far this is. so the birds in Western Estonia, they a little bit different songs, than they have in eastern Estonia. So birds have also dialects. But, for our case, the Finnish one was good.

SB: so. Have you tried using different recordings, or have you tried using Estonian bird recordings?

Interviewee 3: I think, we did, but again, what I remember is that we were very unsuccessful. This was dependent not just on the voice itself, but just that we were too late for this breeding season. So you cannot make direct relations between, I think, on that the year was 2013.

SB: And when you play these recordings, what kinds of devices do you use? A smart-phone or a speaker.

Interviewee 3: No. no. We have loudspeaker. Loudspeaker what we have used.

SB: So they are battery powered and ..

Interviewee 3: you have maybe "MP3", and then you have this kind of a small-speaker, loudspeaker was the name. And the other device was..I do not know the English name, but you put the memory stick. I have one recording, and then it makes it powerful sound or something like this. So both are like loudpspeakers.

SB: So, it is something like a about 10cm by 15 cm.

Interviewee 3: this is the smaller one. But the bigger one is like this.

SB: so that is more like 30cm. A little bigger

Interviewee 3: yeah. Something like that.

SB: are they battery powered, because in the field you do not have a power supply

Interviewee 3: yeah. Both with batteries.

SB: when you do these imitations, do you follow some kinds of principles or regulations.

Interviewee 3: I do not think, that we have official regulations. But, I know that we have some kind of ethics for our own selves. It is written, somewhere in the internet. I haven't read it. but this is, and I have my own ethics, and I try to do it as less as possible. Sometimes, yes for fun, like I told some of my friends, they go out in the car, and they start playing recordings, this is quite annoying for me. So I have my own ethics. But for the science, I have done it many many times, and this is what, I think it is, what I remember, we have written the ethics in the.. should disturb as less as possible or something like this. But I have heard in Finland, when they have some rare bird, so hundreds and hundreds of people go to see this rare bird, and recordings, and play recordings, and so on. And this is very frustrating for this poor bird.

SB: So, what happens to the bird? So basically, it is spending a lot of time trying to ?

Interviewee 3: When he is..depends on that individual behaviour. But, when it is used to answering all the time, it is in stress, I guess. All the time in stress. That individual.

SB: usually, you do not have to do it because you are not going for rare birds, you are studying particular bird.

Interviewee 3: I go, but I just don't use playbacks. I go bird watching, and I also search these rare birds, but I don't use recordings.

RM:Competitions for example? Do you use recordings or I think it is not even allowed in the competitions.

Interviewee 3: competitions? Whistles are allowed.

RM:Do you use whistles for example?

Interviewee 3: Whistles? Yeah. But again, we do it more for fun. We do it quite rarely. Maybe a couple of woodpeckers and that's all. Because, owl sounds I am not good at. Some people can do it, but I am not so good. so.

SB: For example, with the woodpeckers, when do you use the imitation? Do you use it when you have seen the woodpecker, when you have seen the bird or when?

Interviewee 3: when you want to see the bird, then you use it. When you already seeing the bird, then you do not have to do it. It's pointless.

SB: No. sometimes, when I go, and a bird flies by, and I know that it a woodpecker, but I did not get a good view of it, then do you use it to attract it?

Interviewee 3: No. In my case. No. I can't remember.

SB: because, with other hobbies like photography and so on, people might want to get the bird closer.

Interviewee 3: Yes with photography it is a little bit different. Of course, they want to specify on the pictures, and as close as possible, so for them yeah. But I don't know.

SB: So you personally don't use it to attract, I mean other than these two birds for your field work you do not use anything

Interviewee 3: yeah. Yeah. Very very rarely.

SB: how do you decide that this is a good spot for a woodpecker? So if you have any signals from the environment, how do you know when to use the woodpecker sound?

Interviewee 3: I think, it is just habit, that it should be right. Previous experience when you have seen the species, then you might think that this is the right habitat for this specific woodpecker, you can do the whistles.

SB: Do you think the use of imitations and the use of sound recordings, should it be more regulated.

Interviewee 3: yes. I told you that we have the ethics code, but I do not know if you can put in the law or something. I am not sure if it is possible or not. I have no idea, but I think it is good that we have at least that ethic written down. At least something. This is something good.

RM: For you would there be a case, where you wouldn't in principle use recordings? Or some time of year for example?

Interviewee 3: Not allowed to use?

RM: Or you personally wouldn't

Interviewee 3: Of course, the breeding time is the worst time to do it. Then the birds, have eggs or chicks, they have to feed them or something like this. They have to take care of the nest. Also, protect the nests. So, if you disturb them, then it is not good for the breeding success. So that's why. When we usually do our fieldwork, it is also the breeding time. So there is some kind of a trade-off. Of course, the breeding time should be the most quiet part.

SB: Is it easy to tell, when the breeding time is?

Interviewee 3: When you know. Of course different species have different breeding times. Owls starts in the February. May breeding time is the main time. Ok, April. Middle-April uptown the end of June.

SB: So you go more by the calendar, rather than the..so if you observe birds in the field, can you tell if they are breeding or not?

Interviewee 3: Depends on the species. Sometimes yes, and sometimes of course no. depends on the species, and depends on how big the flock, and how many birds are there. If there are more than ten birds, then it is usually a migrating flock. If its two pairs, and they are feeding, then they can be pairs. Depends.

SB: When you see a bird, there is no characteristic that says it is the breeding season?

Interviewee 3: Singing. Singing is one of the characteristics that is protective of its territory. The singing, but the birds can sing also during migration, so it is not 100% true. You just feel in your senses, that this is breeding, this is not.

SB: So to your knowledge, is it common for Estonian birders to be using sound recordings to attract birds to themselves.

Interviewee 3: Twenty percent. Maybe this is too high. Because I do not know all of them. I know those people who are birding close to Tartu or something from my hometown. Those ones I see more often, and yeah. No. I cannot say the percent, it depends on the person I think. Some person does it more, others don't do it all. Something like this.

SB: When you started off birding, you mention that you learnt about using recordings for owls and woodpeckers. Is that how you remember? And do you remember how the tradition

has changed, because I think, even ten years ago, five years ago, smartphones and apps were not so common.

Interviewee 3: In the nineties, we were using those recordings quite rarely. Of course, for fun or the owls when we started. Then there was one project in which I was also little bit involved also for the woodpeckers. Bird of the year project in 1999. So, I did also a little bit. I wasn't professional, I was a school kid in that career. So we did it. But this was also scientific, definitely scientific.

SB: So at that time you were not using sound?

Interviewee 3: In the nineties, we were not using much. I mainly remember the woodpecker project in 1999. And in the 2003, 4, 5 and so on, after that we have some small increase. But it is not linear increase like. Small increase and then it's quite stable. Those who started in that period, they still do it, and the others if they didn't at that time, then they do not do it at the moment.

SB: Say in the 1999 woodpecker, do you remember using a loudspeaker or was it just the voice imitation?

Interviewee 3: No we were using loudspeakers

SB: with a cassette player? Or CD.

Interviewee 3: Yeah it was a cassette player. CDs were quite rare.

SB: I see. So you feel that nowadays, people use MP3 players and smartphones.

Interviewee 3: smartphones. In the most cases smartphones. Because also mp3-players are not so popular anymore, so. I have. I have use this MP3 player and loudspeaker. And smartphone, this is what I have seen.

RM: Do you think the hobby birders are using more recordings, because the recordings are so accessible and so on?

Interviewee 3: It might be true. It might be very hard to make a difference to see who is doing for hobby, and who is doing it professionally, because they do both. But, I think those who have this for hobby, they seem to use it a little bit more. But, then again, you have to measure it somehow and you have to say it. It is just my guess.

SB: Is the ethics of using recordings discussed among birders?

Interviewee 3: yeah. We started about those discussions, I think ten years ago or something.so that is why we have this..

SB: so do you know where is it on a website?

RM: that is the same as […] sent us.

Interviewee 3: yeah. Probably, might be the same document.

SB: do you know why or how it came about?

Interviewee 3: I think it came about. It wasn't a problem here, and it is still not a problem here, but it is problematic in Finland. That is why the recording information. Because there are much more birders than here. We have may be 20-top level birders or something. In Finland, you have 2000 or something. The amount is huge there. So if they want to "twitch" some rare species or something, and they use these recordings, that is why there is a problem. And in Estonia, it is not a big problem.

SB: I see. And do you know why there are a lot more birders in Finland versus in Estonia?

Interviewee 3: This I don't know. I think we were part of the Soviet Union, and they have more books, and the equipment and they have also opportunities to travel more. So this is the main reason I guess.

SB: Do you know if using recordings, if this culture, if people have learnt from some places, or how it has spread? For example, you mentioned that people in Finland had more chances to travel, so maybe did they pick up this tradition from people elsewhere? Or do you know, like where they use it historically, like the how the use of recordings began?

Interviewee 3: No idea.

RM: but in terms of this use, of the use of recordings and the ethics of it, I mean, among Estonian birders is there a consensus about when it should be used or are there polarized opinions about it also?

Interviewee 3: I think in some cases, some birders can be more aggressive, they want to use more. I think we are quite balanced. We cannot say that it is a big problem. Just that in some cases, it is not too ethical for my personal..but again depends on the person. Own ethics.

SB: Do you see the use of recordings is more common in certain cases like tour operators? Or like bird-guides?

Interviewee 3: yeah. Of course. They are doing that for work. They do, they have a tour of one week or something, they go to those places, and search for birds, and they use whistles and recordings, so on. Those people do it more. I guess. I think we have may be five or up to ten persons for whole of Estonia who are doing bird tours, so the amount of people is quite small.

SB: Say compared to a country like Finland.

Interviewee 3: I do not know Finland. The bird tours in Finland are very expensive, so people do not want to go to Finland. They go to Estonia, or Holland, where it may be much easier to get woodpeckers or owls. But now for owls, Estonia is quite expensive, so people might go to Spain. Estonia was less expensive in 2000 or something, and that was attractive to birders from Finland, and also from Western Europe, but now the prices are going higher and higher all the time, so it is not so attractive anymore.

SB: So people would rather go to places where it is cheaper.

Interviewee 3: yeah. Of course.

RM: Do you actually, yourself, use or do you know from others if you use pishing? “pssh” “pssh”

Interviewee 3: “pssh” “pssh”. Yeah. This is, again, again people do, but it is to so common I would say.

RM:But do you use it?

Interviewee 3: No.

RM:No?

Interviewee 3: No. Can’t remember.

SB: but you have heard about it?

Interviewee 3: yeah. Yeah. Yeah. I don’t know, but I do not think this is very successful.

[…]

RM:Do you think yourself, there is something important concerning the use of those recordings or those imitations, which we did not know to ask. What do you think?

Interviewee 3: I think you have covered everything.

SB: So, may be I had one final question. If I want to observe this, what places can I go to see it done? I have heard it is used at the Kabina (no Kabli), bird-banding station too sometimes.

Interviewee 3: In Kabli?

SB: Sorry. Kabli. Is there a place where people can go to see this being done.

Interviewee 3: OK. We have done it also done in Vaibla. It is a bird-ringing station in the northern coast of Lake Võrtsjarv. And what we do, we do it for the swallows. In the ringing stations, there are lot of mist nets in there. Close to the lake, and we use it for the swallows. Those who are come there, the night-stayover or something like that.

SB: During the migration?

Interviewee 3: During migration. And we attract the house swallows. Our national birds. It is very easy. We put the recording there, they come. But I do not know how often they do it. We did it in mid 2000 something.

RM: And you used the recordings of swallows then.

Interviewee 3: yeah. yeah. yeah. During migration time. In Kabli, I am not so sure. I have been in Kabli, maximum of five times. Very short visits. But it can also be in Pulgoja. Not very far from Kabli. They might use it also, but I am sure. You should call or ask […].

Interviewee 3: and they have also done it at the Sõrve birding station, in Saaremaa in 2000. The rare species. For rare migrants. What they did, what I have heard, they have placed the recording outside, playing almost 24 hours to get very rare species. And once they even they got it.

SB: So, do you know if these results have been published somewhere?

Interviewee 3: No. No. No.

SB: Do they keep a list or log of these species. What happens if they catch a species?

Interviewee 3: they put a ring, and making pictures and that's all.

SB: but, do they, don't they log what birds they are banding? Do they record it some database, which birds they are banding? For example, say they find a rare bird using the recording.

Interviewee 3: they ring the bird. That's all.

SB: but nobody writes down that this bird was ringed? The name of the bird? The species of the bird, age, size, and so on.

Interviewee 3: this is written down, but it is not written down that we used recording to catch this species. This is not written down. But of course, they write down the number of the ring. Age, if they can identify it. Also the sex, if they can identify it. Species of course. You cannot ring if you do not know the species. Same for the swallows. We watched 100 birds, let's say. We ring them. We measure. You can measure also the wing, leg, tail, weight, fat might be, and yeah you write it down, and you release all the birds. What you usually don't write down is that I had used recordings for this catching this bird. This is not registered.

RM: but only for scientific research, then you would need to.

Interviewee 3: Yes. Ringing stations are mostly for ringing, but sometimes people take this data to analyze bird measurements or something like this. But for the recordings itself, it is something

SB: so what was used to get the bird, the mist net is not usually

Interviewee 3: I can't remember.

SB: Is the data for birds recorded somewhere. If I had to access it, is it in a database? Say to survey what birds do they bird.

Interviewee 3: I am not sure if they share it. It is not an open database. All information about ringing birds in our ringing station, when I usually work, but it is not for public. If you have a very specific question, you can ask. People have a lot of work, and especially in this time of the year.

SB: Do you know the name of the organization that does the banding in Estonia?

Interviewee 3: Estonian Ornithological Society.

RM: but, I guess that if they do not register these recordings, then the data would not give us much.

Interviewee 3: when I ring the birds, the table, what species, what, when where, the measurements and so on, and then I just send it. I never write down that I used recordings or something like this for what I did. Most people do this. When you remember or something, then some species, I can remember. For the Ortolan bunting, most of the Ortolan buntings which I have ringed have used recordings. Sometimes, they can also go to the nets without

recordings. Some other birds or something. Generally catching the birds, you can get them. In my case, I know that I have used recordings.

SB: Are there any guidelines on how to use these recordings or..?

Interviewee 3: no. No. No guidelines, this is the only ethic. This is the ethic document.

SB: Well. OK. It is escaping my mind. So, I was wondering if you are aware of any studies? Like you have mentioned a 2007 paper which studied the percentage response and success, but they usually do not do this at the banding station.

Interviewee 3: That like I told you, they use recordings for the ringing stations also, but it is not recorded when they are doing it, if they are doing it. If they feel like, OK, we should do it something like this. There might be some specific project for some specific species or something like this. They might have used it. In 2005, they caught one species, may be it was the Dunnock (*Prunella modularis*) English, but this was like Helsinki University project or something like this. I might be wrong in details. Which I know is that they do, when want to catch something specific species, like I have done. Yeah, but something where everything is registered and so on, does not exist.[…]

SB: I was wondering, do you have time or bandwidth, when you go to the field, for me to just come along and see what you are doing or..?

Interviewee 3: Well, I do not have any plans at the moment. At the moment, like I told you, if you do not do the research, then there is no point. And what you do is to play the recordings, there is nothing actually demonstrate much. You can do it outside on your own. So this is. that's why I am really skeptical about it. You should also, have you interviewed the bird-guides? They do it like more. Like […]

SB: Thanks.

Interview D

(Interview with Interviewee 4, female 33)

SB: So, I have seen that from your survey that you have used imitation to imitate a number of different birds. How did you get interested in bird watching, and how did you learn about using imitation to attract birds.

Interviewee 4: Well that is difficult to explain how I did get into birdwatching. I had in childhood already some interest in birds, but it faded away and it was a very long pause in this and when I was making my bachelor's degree in […], here, so I was again interested in birds. So I just I bought binoculars and a field guide and started making notes. But the imitation or the use of sounds, well I think I learnt that from other bird watchers to see more birds or

SB: When first started did you just use..were you just going to a place and just using binoculars, and then you went with more experienced people who taught you that. Or?

Interviewee 4: Yes. More experienced people. But now, if I look at it afterwards, I think that the more experienced people, that some of them, I think they use sounds too much. Right now, I think, you have to be more responsible in using sounds.

SB: So do you think when you started, I am not sure when, but you think this using of recordings became more common with the coming of smartphones and apps

Interviewee 4: Definitely, yes. I have watched birds only six years. So, I did not know what they did before, but I think definitely that it is, technical improvement and progress, is one aspect of this.

SB: When first started, do you remember using smartphones. Or were people using smartphones or were people not using recordings. If you still think about it, like six years ago that smartphones were not that common. They are very common now.

SB: do you remember, do you think there was a change when you first started did you use apps

Interviewee 4: I started to use apps and smartphones , I think two years ago, and, but, three or four years ago, when also were also birding with more experiences bird-watchers, we went into the woods or something, and they used for instance, from the car—CDs or MP3s in this car. Open the doors and they are really loud. And also, some birdwatchers had some kind of, I think , some kind of Dictaphone or some kind of some small radios. Some kind of Speakers.

What they can take into hand, and they just hold it and use it. Also a lot of songs, what they can do by themselves. Imitating the birds.

RM: These days, when you do the birding, do you use both the recordings and the imitations. Like imitating the bird yourself and also using recordings.

Interviewee 4: Right now with imitating, rather than I think it is a softer kind of making sounds. But I use recordings only on very rare occasions. When, I really need to check something. Is this bird or not? But not for fun or something.

RM: Ok. Were there some experiences which lead you to this decision that you don't use those recordings anymore?

Interviewee 4: After some birdwatchers were saying that it is not so ok to use recordings so much. Especially in breeding season and last year, I wrote to the Estonian Ornithological Union, some ethical principles for watching birds for birdwatchers because for most of them, these principles are about ethical behavior. What you should do, or what you shouldn't do. And I was reading also about using sounds, researching the internet about this topic, and also the scientific papers. I was trying to find what they are. I did not find not so much. Only one or two scientific papers about using bird sounds and how it affects the birds. I was interested in how the bird is feeling with the sound and how it is doing.

SB: If you use the sound from a recorder, how it makes the bird anxious or how it disturbs the bird?

RM and Interviewee 4: There is a sort of interference with the use of recordings during touristic activities and then when the real survey comes in, the birds are not responsive anymore. And if it is used during the breeding time, then the birds get used to this, and they are not responsive to the other birds anymore. (paraphrasing from the discussion in Estonian).

RM: In which contexts do you use imitations or playbacks at the moment?

Interviewee 4: If we have birdwatching rallies, competitions, then I use imitations. I try to minimize using it and with phenological information, I know which kind of bird should be there. I want to check if he is there and so I use it to see if he is active there. Every bird, which I observe, I will write it down and put them onto the databases. https://elurikkus.ee/en

RM: Do you do it professionally or as sort of a hobby.

Interviewee 4: yes. Mainly as a hobby.

SB: If you see a bird, if you visually see it, you don't use the imitation.

Interviewee 4: No. I don't need to use it because I see it.

SB: Ok. When its say April and there are no leaves you may not need to use it, but say in June or July, when there are lot of leaves in the trees and you can't see the bird?

Interviewee 4: If I hear the bird, I don't have to see the bird. And we have in Estonia, we have a lot of tourists, who watch or want to see the birds. And the guides have to do lots of these imitations or chase the bird. They have to show the bird, but tourists they are not pleased, if they do not see the bird; they can hear the bird is singing, but they have to see it. Well, I think it's a problem, because, I don't have the need to see the bird. If I already have heard him, so then I don't have to imitate it, or to call it closer and so on.

SB: Do you think, photography is a part of this. Tourists might have cameras and they want to capture birds. Do you think this is the reason?

Interviewee 4: No. Like some people have to take pictures? No. More like have to see the bird.

SB: This is a problem with tourists, or are ctheseases when people go with a guide to see the birds in areas. They are amateur birders who go with a specialist to see a lot of birds in one area.

Interviewee 4: Yes. But also, there are lots of bird-tourists, who are on their own, and without a guide. And also they definitely like to see the bird.

RM: And so it is common for tourists to use the recordings.

Interviewee 4: Well. I haven't seen myself. I believe they are using recordings.

RM: Foreign tourists for example.

Interviewee 4: Yes. yes.

RM: How do you choose actually the birds you imitate or use the playback.You had listed five species in your survey.

Interviewee 4: Well. I imitate them when I feel its need to imitate. Well. Nowadays, I rather, I don't imitate all the time. I should say. If I imitate, then only in competition situations. If I am by myself, I don't use the speakers. We have in August the Estonian open competition. I

think we use in that situation. And, in spring there are a few competitions which are not big competitions.

RM: But, then there are hundreds of birds whose recordings you could potentially use, but there is a set which you actually use. So, how is this choice made?

Interviewee 4: These are the birds which I can imitate myself. I don't use the speakers. I don't and can't imitate the ones I do not know. Some special songs or somethings. I can't do it.

RM: But, when you use playback, then the number of birds must be bigger.

Interviewee 4: Yes. It is more. I have used speakers earlier. When I suspect one bird, and I have to be sure, is it one species or another species then, I use recordings. Garden Warbler (*Sylvia borin*) and the Eurasian Blackcap (*Sylvia atricapilla*). And well, it was in spring, and they were singing, and so one of them was singing, and I was confused. I used the sound from the smartphone-speaker to see which one was singing.

SB: So, did you use that to just listen to it, or did you play it loud to get a response from the bird

Interviewee 4: First, I used it to just listen quietly (holds hand by ear), and if I don't get it, then I play the sound for the bird.

SB and RM : But, do you also get the wrong response sometimes, or are you not sure. Like the other species responds to it.

Interviewee 4: Its a really good thought. Yes. I don't know.

SB: So these two songs, of the Garden Warbler (*Sylvia borin*) and the Eurasian Blackcap (*Sylvia atricapilla*) are different, so one will not respond to the other sound—because they are confusing for you?

Interviewee 4: No. I don't think so. May be Yes. Because some species can respond to other species song. Maybe one owl—the Pygmy Owl (*Glaucidium passerinum*)—is making sounds, then the tits are responding to they are getting anxious. But, this this situation, I wanted to see this bird, which one is it? If it black-headed warbler, then I can recognize it immediately. It has black head, which the other does not have. But if they are just singing, and there is no response, then it is of no use.

SB: So you were using sound in this case, so that you would get to see the bird.

Interviewee 4: Yes.to see the bird. I was confused which one was singing. For me, the songs area a bit similar. If you are a beginner, you can be mistaken easily.

SB: So, when you played this, did you play the song of the bird, or some other call of the bird.

Interviewee 4: No. Only song. The song. Yes.

SB: The other question, I have is. Say like you have talked about woodpeckers. And suppose you go to a forest. And you see a woodpecker fly by. You see, and you kind of know it is a woodpecker, but you do not know which one it is exactly. So is that a case, where you would use imitation to get the woodpecker.

Interviewee 4: Yes. If I have a suspicion that this is a woodpecker, exactly, then I would use this imitation of his song, but the other woodpeckers would not respond to it at all.

SB: So because with woodpeckers, there's two, there's the "drumming" and there is the song. So which one do you like to use.

Interviewee 4: I imitate the song, and they respond with the exact song, and not drumming.

RM: And for the woodpeckers, it is species specific. No other woodpecker would respond.

Interviewee 4: May respond. There are some woodpeckers who respond other woodpeckers, but I am not a woodpecker specialist. So, I can't tell which one, but I have heard that in the survey of the woodpeckers, I don't know some kind of interval, they are using the sounds to survey the woodpeckers and there are sounds which they use and they know it, that the other woodpeckers may also respond to this. […] is for example, one of the woodpecker specialists.

RM: but, when you actually use the imitation, do you somehow pay attention to your behavior. Do you somehow hide? Or, try to be invisible to the bird. Does it matter? And the place of imitation. Does this matter? Do you choose it somehow?

Interviewee 4: No.

RM: Should there be some bigger trees around ? How do you choose the place where you do your imitation?

Interviewee 4: It depends on the situation. Sometimes, I like sneak closer and into bushes. I am try to be really quiet, and then I use this recordings, but usually then I would like to first

just watch with the binoculars, just to see birds. If I don't see them, then I use the recordings, and to make sure which bird it is.

SB: Suppose you go to a place, where you do not hear any bird sounds. How do you decide what to use? For example, if you don't see or hear a bird. Do you have a list of how you go through it, or do you wait for some sound or something from the environment?

Interviewee 4: First, I wait. Sometimes. I have noted that if you are waiting for sometime—I think 15 minutes or half hour—the birds are becoming active, and they are making more sounds.

SB: so, when you first go to a place, you wait there for 15-30 minutes, because when you first go there the birds go quiet.

Interviewee 4: Yeah. And if you start right away starting away with the sounds, they may become more anxious and they are just quiet. They don't want to respond at all. It may be this case. But, after that if I don't which species there are, there is one specific bird sound, we imitate. It's not imitation. It is "pishing". You maybe have heard about it. There are also some scientific papers about using pishing, and so I use the pishing. Then, there are some small warblers which respond, they come closer to see who it is? And may be doing some noises. It is a I think, it is more useful in end of summer, and autumn. It's like "pssh psssh pssh".

RM: Is it common among Estonian birders to do pishing?

Interviewee 4: Yes. Not may be so common. I do not know it, but I learnt it from experts. I think people also know. They are not pishing all the time. It's just is some situations, maybe you can, in the bushes, there are some warblers, moving around, and you can't see, you do some pssh, ssush, psssh and you are waiting, and maybe it's coming out, to look, what is it.

SB: And you mentioned end of summer and autumn, Is there a reason why pishing is more effective?

Interviewee 4: I do not know. I haven't done any empirical experiments. Its just my assumption, I think, in the spring they are singing more, and may be they tend not to care about what is around them. Their hormones are high—and they don't care about anything.

SB: so your technique of birding, is kind of to go to someplace, wait for a while, like be quiet for a few minutes, and then do the birding, as opposed to me as an amateur, I just go there and try to see what is there, and walk and come out. When you go, how long do you spend

birdwatching. In the sense in that one spot, like you are there, you are waiting for 15-30 minutes, and then do some sounds, and how long are you in that place.

Interviewee 4: In that place? OK. It depends. Well, if I want to, depends on the site, how big it is? How many birds there are, but I prefer to do full-lists of birds: to write down every bird, every bird I can see and hear, and well for instance, I do bird-watching lot in the fish-ponds, say in the Ilmatsulu fishing ponds, so I am there about two or three hours.

SB: Do you go early in the morning or the evening, or is there a time?

Interviewee 4: I prefer early in the morning. Sunrise. Starting sunrise, but it depends again, if I have the opportunity, before sunrise even. About one hour or half hour before sunrise. I think its best, but there are different species which are active in different times over the day and night.The best time is in the mornings. Early in the mornings. But, there also there are species, which are active early in the night, or I don't know.

SB: Like these owls that you have mentioned here—you only do this at night.

Interviewee 4: Yes. (and looking at birds in the survey filled out by her). The Common quail (*Coturnix coturnix*), its active, most active in the four o' clock in the early morning. Before sunrise, or around that time. And, I think for the Pygmy Owl (*Glaucidium passerinum*)—the small one—for this the early morning is the best.

SB: So, although you have listed five birds here, you have used sound for a lot more birds. Can you tell us about some of them?

Interviewee 4: Yes. The Common Cuckoo (*Cuculus canorus*)

SB: This is one kind of woodpecker in your survey, but do you know the other woodpeckers?

Interviewee 4: Well, myself, imitating no. I have tried also imitating the Tengmalm's Owl (*Aegolius funereus*). And the Golden Oriole (*Oriolus oriolus*).

RM: What in your experience does the success of getting the response depend on? Could you bring in examples, where you were successful, or examples of good conditions where birds came closer and gave their response. Are there some criteria for being successful in this imitation?

Interviewee 4: Yes. Right time. Right Place. And you have to know the bird phenology, when it is active, when it likes to respond, where can you can see it or hear it. Of course, maybe some skill—how well do you imitate this bird.

RM: Have you noticed for example that you have improved your skills in imitation and they are more prone to come now?

Interviewee 4: No. No. No. Lot of these birds, I need to whistle, and I am really bad in this, so. But, what criteria? I think it is all right time and right place.

RM: But are there some characteristics of the bird or the bird species itself which make it more prone to respond to the imitation? Either species or like also inside one species, some individuals who are more prone to come closer?

Interviewee 4: No. I haven't done any observations on that, but I think maybe species that haven't found the mate, they are, maybe more prone to respond, but I am not sure.

RM: But in terms of species, like are there some species, which would never actually never give a response to the imitation?

Interviewee 4: No. I can't say it. I don't know. Those species are not worth to imitate if you don't know they are not going to respond at all. So, I think people are using the imitations of the species because they have the experience that the species may respond, but it does not mean that the species respond right away or at all. They may also be silent. You can't be never totally sure that they are responding.

SB: So, I had a question about you were talking about the ethics. So were talking about the ethics for birding and so on. Have you written something about this, or have you, or how have you tried to make this, your knowledge public to people?

Interviewee 4: I made this "Principles for Bird-watchers", and this is on the Estonian Birdlife website, and I think, there was also one article about these principles, which I wrote in the Estonian Birdwatchers Magazine. In the website, it is like, "Do The", "Do not do this", and this is the point, and I have handled different categories and topics: It's really long. The article is some kind of explanation.

RM: Do you think that imitations or the use of playback should be more regulated in Estonia?

Interviewee 4: Well, we try to do it, but it is also in the principles to regulate it. I don't think it's really a big problem in Estonia. I think it maybe more problematic in Great Britain or Finland, but in Estonia, we have so many people here and very few bird-watchers, and so if any of them use sound recordings, or speakers, I think, it's not so bad. But, we have a lot of tourists coming in with the guides, and the guides were a bit pessimistic about regulating the

use of sounds because they have to show the bird and they have to use something, and this is well, their job, they have to do their job. I can understand it.

RM: But this topic of ethics, actually, is this discussed among Estonian birders also?

Interviewee 4: We tried but it was no use, but I think with these principles, we started something or reminded that the use of recordings it should be more regulated.

SB: So you put the regulations on the website, did you also send it as an email. How was it sent?

Interviewee 4: Yes . Email, or to the "Linnuhuvilised" list (https://www.linnuhuviliste.ee/).

SB: What other steps do you think can be taken, so if you wanted to spread this information.

Interviewee 4: Well, nothing much to do. Maybe with the principles, we have written, some shorter version of this, and well, I believe that every birdwatcher should also think what he is doing and I think, it is important to tell other birdwatchers, that well, that "I am not OK with using these speakers", or at least, "I don't want to use speakers, and I don't accept it". This is really hard to do, because if other birdwatchers are using this, or want to use it, it's really hard, to say that—"You don't use it", and then they are getting mad, and think—"What are you some kind of ethical, I don't know, police?"

RM: […] So there might be some situations, like tourism, or the competitions, where time is pressing is quick, and you have to use the recordings somehow.

Interviewee 4: yeah.

Interview E

(Interview with Interviewee 5, male 47 and Interviewee 6, female 46)

SB: In which contexts have you used the recordings of bird sounds?

Interviewee 5: Most frequently, I want to get the birds nearer to get information about their presence, usually I want to photograph them or I want to get them close for my birdwatching clients. To get them closer to a visible distance. Usually, when you are doing some census or monitoring work you need to know whether the birds are in an area or not. For that monitoring scheme, we have certain fixed monitoring spots for woodpeckers and owls, and hazel grouse and we are reaching this point, and we are playing the standard playback tape for about five minutes, and we are recording all the responses for all the specific species and this is a useful method for a census, and you repeat it so that you can get comparable results. But on the other hand if you go to somewhere, which is a new place, and you want to know if there might be some birds which exist there or not, you can imitate the bird using a playback to get an idea of whether there is a specific bird there of interest or not. But sometimes, I whistle or just imitate the birds also for fun. Just to make some contact.

SB: So how did you get to learn to use the imitations or recordings. Was it literature, websites, sources, friends?

Interviewee 5: Well, I think I first started to whistle by myself; there were not much portable or recording devices available. So years of experience, and also examples and demonstrations by friends mainly. I also started to use different options for playback. I also started to do some bird recording recently, but I have not had the time to do it too much. I am quite keen on the natural soundscapes that we have for bird vocalization for our native sounds, natural sounds, how we interfere with each other, and how we make bigger and bigger soundscapes, informational or scientific soundscapes or just relaxing songs. In Estonia, we have the master Fred Jüssi, who has been influential for many naturalists and birders of my age. He had this famous radio broadcast called Textbook of Nature (*Loodus aabits* in Estonian), and mainly he introduced bird songs and other natural sounds, but on the other hand we did not have that much nature related information. The broadcast was useful, and was done in a very good way. The recordings, considering the technical limitations of the time, were done extremely well.

SB: Was this radio program what brought you to birding or was there...?

Interviewee 5: It was general. It was a nation-wide broadcast. We had one or two radio stations, if at all. Not much to listen to anyway. It was very widely broadcast. Everybody knew about them. I was happily listening.

SB: How have you chosen the birds that you imitate or use the recordings for?

Interviewee 5: With years of experience, you get an idea of which birds you are more likely to get, and on the other hand, by the limitation of your physical vocal apparatus you can certain types. I am not a very good whistler, so it is not the best part of my talent, but I can howl like an Ural Owl (*Strix uralensis*), which is quite rare among birders, and is quite effective as well. But some people are really talented. One of my colleagues from Bulgaria. His grandfather was the old birdkeeper of the Ottoman empire, and he is incredibly talented or trained, I do not know, both probably, whistling and imitating the caged birds or songbirds.

SB: So this is through his family tradition?

Interviewee 5: Yes. This is kind of a family tradition, and although he is not an ornithologist and biologist, but he knows quite a lot about caged birds which his father kept, and also taught some of these birds songs which I cannot…So there are different ways to...

SB: So, although you mentioned woodpeckers, you are not good with a woodpecker whistle?

Interviewee 5: Well, some of them are quite easy, but some birds in general are quite melodic, and these ones I am not good at (imitating), but ordinary whistling, a Grey-headed Woodpecker (*Picus canus*) is quite easy, anybody can do it. The Pygmy Owl (*Glaucidium passerinum*) is not very special either.

SB: So, which is a tough bird, which you want to do?

Interviewee 5: Nightingale is one of the most melodic birds. Most of the birds you cannot imitate of course.

Sb: When you do the imitation, do you pay attention to your behavior at the same time? Like whether you are silent or you are invisible? Maybe we can take the case of one bird, and we can discuss.

Interviewee 5: It always depends on the context. In general, if you are just going, you try to keep silent, because otherwise you do not hear their response. Usually, or specially it is more difficult if you have a birdwatching group. Generally, in a group you have to persuade them in order to maintain silence. But on your own—silence of course. If a bird is near, you try to

get camouflaged or out of sight if possible, but not always are they so shy. A few weeks ago, I was able to just walk under a tree, a young decaying tree in the woods, where I did a survey, and there was a rare woodpecker, which was feeding on the tree, and they are quite tame birds as well, and I was just staying there for a while and seeing the bird, and the bird was not afraid, and continued to peck the tree. Just put my phone under the tree and started recording it. So sometimes, I try not to do just vocalization, but you tap or knock on the wood or tree with some small twig or branch. Sometimes, they become curious about what is happening. Especially in springtime, if they are highly territorial.

SB: What does the success of getting a response from a bird depend on?

Interviewee 5: It highly depends on the seasonality, and in the breeding season it is the best time for woodpeckers and owls and grouses. It depends on the weather conditions as well. Some species like grouses like cool mornings, and the same for woodpeckers. Owls are more active in the twilight or the evening time. And weather conditions are very important, you need to have a calm evenings and a warm one. It is not that you are able to get them every time and on every evening. So it depends a lot on seasonality and weather mostly.

SB: So you get more responses in the breeding season, and with the owls start quite like March?

Interviewee 5: Late February or early March. It depends on the progress of the season. In mid-summer most of the birds are quite shy. Although, from time to time the birds can do some demonstration or drumming or calling, because they have to kick out the flirting juveniles. It is increasing in autumn as well. Sometimes in autumn, birds are quite active as well. I just heard the calls of drumming of a Black Woodpecker (*Dryocopus martius*), just today, in the evening before I came here in the woods. There is a small peak in the autumn, but of course it is not very much near to the spring activities.

SB: So this was an exception?

Interviewee 5: No it is not normal, but spring activity is very high but autumn activity is semi-high let us say.

SB: And summer is low.

Interviewee 5: Most low usually. If the birds are breeding they are busy taking care of their young and usually it is their worst responding time. They have a hard life and perhaps they are not interested in what is happening around them.

SB: Which characteristics of the bird species make the bird prone to respond to imitation?

Interviewee 5: First these birds should have vocal territorial activity. Some birds are singing melodiously, and one cannot just imitate them. like snipes they are diving through the air, and their sides start vibrating, and you cannot imitate them easily. And many common birds, you are just not interested. So you are checking more exotic birds like species of woodpeckers and owls and grouses, and there are bird species which your clients want to see or there are protected species which you are monitoring them at the same time. So you pick the more interesting species, but you also pick the ones which have more promising territorial vocalization or drumming to detect more easily.

SB: Have you noticed if the birds behave specifically when imitating? Do they change their behavior?

Interviewee 5: Yes. Of course. Woodpeckers for instance, if do playback or you do your own imitation, then they become quite nervous about what is going on and why is my neighbour intruding my territory. So they come closer to find the enemy or check what is the situation.

SB: So how do you know that it is getting nervous?

Interviewee 5: You can see their nervousness calls and they are flying closer and closer to the place of vocalization. Usually, you do not see them when you go in the woods. If you start playbacks or imitations, then they start flying. Sometimes they are circling around you nervously, having these nervous calls. So, for an experienced ornithologist, it is obvious that they are not happy with the situation of an intruder.

SB: Why do you use certain kinds of sounds for certain kinds of birds? For example, like you are saying, a bird may have many different kinds of sounds. How do you pick which sound to use?

Interviewee 5: Usually, we use the territorial sounds or songs or calls which birds use most frequently for advertising their territories and occupation of territories, so it is quite natural. Sometimes, some birds also use ordinary calls, but usually it is less effective or less certain. Most often you use these territorial calls or songs or drummings. These are usually working best.

SB: When you do the imitation do you follow some principles or regulations?

Interviewee 5: We have some general guidelines or agreements amongst the birders society or community. We try not to play back too much, too intensively and if a bird chooses not to

respond you stop after a few tries. You try to avoid going into one place too many times in a season. A few times in a season is OK, but if everybody goes to one place all the time, then it might be a problem.

SB: So you are disturbing the same birds over and over again?

Interviewee 5: Yes. If they become nervous during the breeding season, over and over again, I think it might affect their well-being and their reproductive behavior or something. It is not a good idea to trouble or disturb them too much. We try to, with rare birds, not an ordinary bird in Estonia, and it is stationary there for a while, we agree that we will use playback to attract the bird out from the dense vegetation or woodlands or trees, then we agree that we are coming together with different birdwatchers that we do not disturb it too much, just once, or a few times as well.

SB: When you have a rare bird sighting, is it broadcast on the internet or how do you?

Interviewee 5: You have this sms system, now we have this online system, it was a certain kind of a communication app, telegram. We usually get the information, and we also have the web, which is like the twitchers and keen birdwatcher's society, and on this web, we list the more interesting sightings.

SB; So, how do you decide the part about how to behave with the bird? When somebody posts about the bird, people already know that they have to behave correctly?

Interviewee 5: it is always difficult to tell, that yes you have an understanding that some species are more nervous or shy with human presence. Some species are very tame and some in the middle, and you usually..

SB: So you mentioned that the woodpecker was very tame

Interviewee 5: Often yeah. Some species are. Some species are shy, it always depends

SB: On the individual?

Interviewee 5: On the other hand, there are several species of woodpeckers which come into our garden as well, and they get used to people sometimes. Always it depends on the context as well. You always try not to harm or disturb the birds too much. Usually it is a few times, or a one time observation anyway.

SB: Do you think the use of imitation or recordings should be more regulated or do you think it is done correctly in Estonia?

Interviewee 5: I think some old school birders have been writing concerns about this playbacking in general, but I have a good example. In my home woods we had a pygmy owl territory two years ago, near a main road, and it was a cooperative bird. It was always game to see what was happening—if you did playback a few times there. And I have been able to show this bird over the course of five years, I think, with fifty, sixty, may be one hundred birdwatchers throughout the world with my groups, and nothing happened every next year. The bird was in exactly the same place and behaved in exactly the same way. I can expect that this does not harm his habitat and his well-being. It was perhaps a short time annoyance perhaps in his behavior, but in the long run it did not cost anything, he was calm. But what happened after the fifth year, is that a harvester came and took down this woodland, and the woodland was gone. So you should always consider the magnitude of the effect, but usually it is in reasonable limits. But, I criticize back to these people, if it is a problem why they do not criticize the massive clear-cut harvesting; this is happening in an increasing scale in this country. I think this is a major problem. We cannot compare our bird watching and bird watchers community with some countries like England or some others like the States, where for one wooded area, or a rare bird species, there are tens or hundreds of people gathering. That might be a problem, if everybody wants to get there. But we still have so many birds, and so few birdwatchers and bird watching groups that I do not think it would be a big issue, at least for now. May be, if bird-watching or bird tourism will become large or exploding or several times more, then it might be becoming problematic, but at the moment I do not think so.

SB: Yes, I have also heard stories of how hundreds of people go to see one bird, but that usually does not happen, or has not happened in Estonia?

Interviewee 5: No. For the rarest birds, sometimes you can see with a group of ten, or fifteen or twenty bird watchers, but that is all. It is not a concern—it is not so common. All together in the Estonian Birding Society we have altogether thirty forty people in the country, and out of them may be twenty or twenty-five are keen birders and are going everywhere. We are not all living in one city or one area, but are spread throughout the country. So, it is still not so frequent to see another birder in your favorite spot.

SB: Is it common for Estonian birders to use recordings or imitations of birds?

Interviewee 5: I think it is moderately common. It is not everybody, but nowadays, the young birders, they quite use it.

SB: So you would say all birders know about it, but do not use it.

Interviewee 5: Not all. May be two thirds.

SB: May be half to more.

Interviewee 5: Between half and two thirds. Cannot tell exactly, but certainly not all of them.

SB: So you have already mentioned the contexts in which it is done. Like you have mentioned that it is done for research, amateur bird-watching and you also do it for your tour groups, but do you also do it for any other?

Interviewee 5: Just for fun sometimes, to communicate with nature. There is a group of Golden Orioles (*Oriolus oriolus*)in our country house, they were hanging around our garden and surrounding woods, and sometimes it is just easy.

Interviewee 6: You want to know who lives near your house.

SB: So with this bird, which is a new bird, how do you know which kind of recording to use?

Interviewee 5: If I listen that this bird is there and whistle back, or if I go to some specific place where I in my experiences this type of bird would live in a potential habitat for this species, then I use this kind of sound. So it always depends on the context.

SB: With this bird what kind of sound did you?

Interviewee 5: I am using melodic whistling. (demonstrates). Ordinary whistling

SB: And what happens? Do you whistle when you see the bird, or when it is hiding?

Interviewee 5: Usually, when it is locally available, and usually I do not rely on my ears because often you do not need to see the bird. You can just stay in your house, and the bird is outside, and moving around and calling, so it is. Usually, you hear them first, and if you want to see, whether it is a young bird or an old bird or check if you are not certain about the species, but most of the time you do not need to see them.

SB: So with this Golden Oriole you feel that the birds are hanging out around your house and when did you first start using the sound?

Interviewee 5: First, I heard and it was not seen, but just to tease them and joking.

SB: And when you imitate them, what happens? Do they respond back and come closer to you?

Interviewee 5: I think, once the male was responding, but it happened a couple of times. The second time, the young birds did not care at all. Because it was caring about the food being brought by its parents, which I was not able to do.

SB: Do you see any changes in Estonian birding tradition in terms of using imitations or recordings over the years? Like say nowadays with smartphones has it become more common than earlier.

Interviewee 5: Probably yes. Because in the old times it was quite junky and cumbersome to bring in these CD players. When we had smaller ones, like when the digital era came, and some people have even used tape players, which I have not. And when people had some dedicated mp3 players like ipods, stuff like ipods, but nowadays you can use your ordinary smartphone and you have these blue-tooth speakers which are very handy as well. So everything is becoming more and more handy. And sometimes if I hear it out of the country, especially if I hear bird songs or calls which are not familiar to me, then I use the internet as well, and I check from dedicated bird webpages, how different bird songs or species can look like or sound, so I can almost do a live comparison which is sometimes really handy. You need a good internet connection of course.

SB: When you say live comparison, you mean that you hear the bird and then you play it back from that website?

Interviewee 5: yes. Sometimes, some exotic calls, like I remember this spring, I heard the begging call of a young Sparrowhawk (*Accipiter nisus*), and I did not remember if it was a Sparrowhawk or some similar species, and I was checking from the web, and playing it back for myself just to confirm. So it is becoming handy and easier and easier to do this. But, I do not think that people are overusing this. People are using this, when they have a need for this.

SB: Lastly, from your perspective, is the topic of ethics and imitations a topic which is discussed among birders sufficiently?

Interviewee 5: Yes. From time to time it comes into talk. The basic rules are established. I do not think that somebody is just overusing this frantically or doing the playback in an unethical way. I do not know.

SB: You have not seen it.

Interviewee 5: I have not seen it or heard about it. Of course, you cannot tell about everything and every people, but I think, as I have mentioned it is not probably the main bird conservation issue, not even ranking in the top ten issues (laughs).

SB: The last is an open question to you, if I have forgotten to ask something or if you have seen something special as a bird guide. For example, as a bird guide do you feel the need to use recordings when you are showing it to people and so on. Any other comments you might have.

Interviewee 5: Well, we think and consider about the feedback. And also the common people are becoming more and more interested in bird songs and bird-soundscapes, and they want to know and learn more, and I have been teaching this to students in last spring in Tartu at the University of Tartu. These courses I have done in the past, but it is always tricky to tell people if there are scores of some birds around you in spring, and how to remind them and how to memorize them, and these days having your digital birdsongs and having people the chance to listen to recordings on earphones, and not just saying that this is the whistle of this bird. And the use of a dedicated microphone with a dedicated parabolic-antenna, so that you can zoom into a bird song, so that people can confirm and people can listen to this with more focus—that would be a novel technique for this kind of activity—but this is just an idea which I have not yet tested.

SB: I know that people use the parabolic reflectors for recording. You are saying that this could be used if people are just going for birdwatching.

Interviewee 5: for listening yeah. Some elderly people have hearing trouble and these people would be interested as well. Once I remember, I had a client from the UK, his working career has been passed as hearing safety or hearing health inspector or expert in UK, and he came here to see and hear about hazel grouse, which is a bird species which has a really really high pitch, quick and sudden whistle whistling, which you have not heard before, and which you are not prepared, it's very hard to get. He also had a problem of a high pitch hearing loss. Unfortunately, it was a bit ironic that everybody else in the group heard the bird, which was calling quite intensively in the woods. And he missed it.

SB: And what is name of the bird?

Interviewee 5: Hazel grouse (*Tetrastes bonasia*).

SB: And as a bird guide, do you feel that you need to use recordings to attract birds when you are with groups? And has that changed with things like photography?

Interviewee 5: I do not use it very often. I still need it because people are usually professional birders, and people want to see them close and well, so it definitely gives you a big advantage.

SB: Is it an expectation of the clients then?

Interviewee 5: Well, certainly they have certain expectations about some species, and in the UK you only have a few woodpecker species; they are happy to see them more, and so it is definitely a good tool to secure good birdwatching options. So, as I told you, you are visiting different places, and you are seeing different territories of woodpeckers. I just do a few trips per year, and I do not think that with my intensity it is harmful.

SB: Like you were saying, even with the owl, you only go a few times in the year. And it is not like you go there, and you do it everyday for the breeding season. So.

Interviewee 5: Yes, if you do it daily or nightly, then it will be trouble, but just a couple of times in the season, I think it is nothing serious. Because, you do not need to forget that birds have fights and territorial disputes in nature, naturally. Some years, the Greater-spotted Woodpecker (*Dendrocopos major*) can be seen in large numbers, and you can to some place randomly in the woods, and you can always hear them whining and they are fighting with each other, and it seems that they loose a lot of energy and probably it is a natural way to regulate the population, because probably there are too many woodpeckers and not enough resources for breeding. And even staying over winters. It is quite tough sometimes.

SB: OK. should we conclude or do we have something else to say.

Interviewee 6: There is a birding station, and we use sound to attract birds during the migration time.

SB: Was it at a ringing station?

Interviewee 5: Yes. we are ringing birds as well.

SB: And with children you talked about warblers?

Interviewee 5: Yes, it is reed-warblers, and it is a new method. When I was working in ringing stations, they did not use it. But nowadays, they use this playback of songs, and it is quite impressive considering that these long distance migrants travel in the nighttime, that

this happens between 500-700m altitude, and if you play a song that they are dropping into your reed beds. They have to drop down somewhere anyway during the morning, because they migrate during the night, but if they specifically choose your area then your ringing catch will be higher.

SB: So you use that with the children? You were teaching the children about nature and birds.

Interviewee 6: For the last seven years, we have in Saaremaa, a children's bird camp, we study the bird voices, and we watch the birds with binoculars and scopes, and do trips. Not only birds, but trees and plants.

SB: So it is in the forest away from the city?

Interviewee 6: And then we do some bird ringing too.

SB: So did you use a mist net?

Interviewee 5: Mist nets. Yeah.

Interview F

(Interview with Interviewee 7, male 18 and Interviewee 8, male 45)

SB: In which context and for which purposes have you used imitation or recording of bird songs?

Interviewee 7: Well, it is quite the same for both of us. Mostly, ringing and catching the birds, but also, for example, I just go to the forest and watch birds, or to the sea-side or wherever. And I want to attract the birds closer to me; for example I see them, and I want to take photos of them, then I can make some sounds or imitate myself. Usually, I do not use recordings to attract birds so that I could take photos of them. Only when I need to register the species or when I am making a list of birds. For example, when I have, not an expedition, but I am watching birds systematically for one day for example, I can attract birds by imitating their sounds. For example, I can imitate some owls and woodpeckers, and also some sounds can be used to attract different birds like the Grey-headed Woodpecker (*Picus canus*), whose sound is good to attract the Black Woodpecker (*Dryocopus martius*) or the White-backed Woodpecker (*Dendrocopos leucotos*) because they just go crazy when other woodpeckers start making noise.

Interviewee 8: We have used mainly for ringing. As the kid goes bird watching more often than me, I am mainly involved in ringing; so I have used recordings for ringing mainly.

RM: So you said, that you do not want to use recordings when you want to make a photo; are there any other restrictions—for example if you are doing this in a different purpose?

Interviewee 7: Ringing is for scientific and research purpose; taking photos is just my own curiosity and hobby. And I don't want to; often taking photos of the birds still disturbs them. I try to do it less but it still disturbs them sometimes. If I imitate some bird-calls or attract them with sounds, then it would disturb them more; so I do not want that.

Interviewee 8: So you would like to take photos in a more natural environment.

Interviewee 7: Ya. Ya.

SB: How did you get to learn to use imitations or recordings? Was it through literature, websites, friends?

Interviewee 7: Well imitating them myself comes with experience; or from other bird watchers. For example, making owl songs comes when I went together with some people

who were researching owls and we were out searching for them, and we used those techniques, and so I learnt that; so it is from others' experiences and teachings.

Interviewee 8: I think, it is hard to learn it from literature;

Interviewee 7: Ya.

Interviewee 8: It is so practical, at least imitating. Regarding, using recordings, it can be learnt from scientific papers too.

Interviewee 7: Which species sounds are the best to learn. And different sounds of tits and warblers you can listen to that song, and whistle it yourself; it takes some practice.

SB: For example with the bird-banding station in the past, people did not use loudspeakers; but you have started to use them. How did you learn about this technique?

Interviewee 8: Well, we started, I think, because of the availability of technology. I remember, years ago we even planned, when there were no small MP3 players, we used a big radio with a CD player, but it needed lots of batteries, and so we tried to put some long wires for the loudspeakers; but technologically it was not in widespread use. So, as technology became available, we started using it.

RM: When did you start using recordings at the ringing stations?

Interviewee 8: Now, for the past four years, we have use this intensively. When we ringed before in the years 2000-2008, we used the old radio. And before that we started about 15 years ago, but in the last 4-5 years we have used intensively.

RM: Which are the birds for which recordings are used?

Interviewee 8: First birds, for which we used the recordings were swallows, like the Barn Swallow (*Hirundo rustica*), just on some evenings when they gather on the reeds, we try to attract them. But for the last four-five years we use various reed warblers and others like the Garden Warbler (*Sylvia borin*) or the Blackcap (*Sylvia atricapilla*). Plus, in the autumn: the Siskin (*Sylvia atricapilla*) and the Long-tailed Tit (*Aegithalos caudatus*).

RM: Why particularly these species?

Interviewee 8: The long-tailed tit is very easily attracted by these recordings

Interviewee 7: And also siskins and redpolls (*Carduelis flammea*).

Interviewee 8: If they hear the voice, they fly down.

Interviewee 7: They migrate in flocks of about twenty birds, and they communicate with each other so much that if there are recordings somewhere, they are just so curious. I do not know what it means to them.

SB: Say with the common red-poll, is it also possible to communicate with them in other situations?

Interviewee 7: Like attract them. Ya. Sure. Well, I do not try to attract them when I do not ring, but I think it is easy.

RM: But, have you tried playing the recordings to some species which are not actually responding or it has not worked for certain species?

Interviewee 8: Hard to say, because we have tried to use the recordings on some very rare birds; so probably they are just not there.

Interviewee 7: There is one interesting thing I heard from a friend of mine who is also a bird-watcher, that they heard from another bird-watcher who also rings birds that it is sometimes quite effective. Especially in Autumn in Estonia, the song of the Desert Warbler (*Sylvia nana*) ; we do not have the bird in Estonia but the song works really well sometimes, but only sometimes; and the birds go crazy. They do not start to attack, but they are really interested in the sound.

RM: Does it work for other warblers

Interviewee 8: Other Warblers, yes.

Interviewee 7: And tits also, and different birds. Then it only works sometimes, and if it works; they go crazy.

RM: And you have tried this?

Interviewee 7: I have tried this a few times, and once it worked. The birds were curious and they tried to understand what it is. I do not know why.

Interviewee 8: It is usual that closely related species are attracted to others. For example, the recordings of the Blackcap; it attracts other warblers: Garden Warblers; Lesser Whitethroat (*Sylvia curruca*) and Common Whitethroat (*Sylvia communis*) and others too.

Interviewee 7: And lately, when I have ringed in my home garden, I have used the sound of the Siskin to attract them, and mostly siskin come to the net, but different warblers and tits come also because they are curious or something. I do not attract them, but they still come to

the net; and it is not a place where the migration is going really intensively—it is just my home garden in the middle of a small village.

RM: but for this Desert Warbler did you use the sound of anxiety or a song?

Interviewee 7: Song.

SB: How do you classify the different sounds of birds and which recording of the bird to use?

Interviewee 7: I have heard that if you want to catch or get the bird, then songs are mostly used. And we have mostly used songs and not calls

Interviewee 8: Calls for example, for the Long-tailed Tit; this is more like a call.

Interviewee 7: Almost only songs; and I think, the songs are not as disturbing for the birds compared to attracting them with some calls, alarm calls, then it can be stressful for the birds.

RM: When you imitate yourself with the voice, then you imitate the songs mostly?

Interviewee 7: Songs. yes. mostly.

Interviewee 8: For tits, it is calls.

Interviewee 7: For tits it is calls; it is an exception.

Interviewee 8: If you whistle, then it is easier to whistle a call.

SB: When you do the imitation, do you pay attention to your behavior at the same time? Like trying to be silent or trying to hide?

Interviewee 7: No usually not. So with owls, it is in the night and it is mostly dark. With the woodpeckers; they do not care if you are there, because for example if you make the sound of the Grey-headed Woodpecker, and the bird is somewhere near, it comes to a nearby tree and starts screaming sometimes. But I do not hide myself; I think I would hide myself, if I wanted to take pictures of them—so it would make sense, but I do not use that technique.

SB: So you are OK with the bird coming close enough to you, for you to take a picture? Or how does it depend? Like in a birding competition you want to see the bird.

Interviewee 7: Yes. It is important to see or hear the bird. And we just do the sound, and if the bird comes, then we just go away; and if it does not come, we do not stay there too long

Interviewee 8: In the competition you can only use your own voice.

Interviewee 7: Well, sometimes you can use recordings. For me, it is always that do not want to disturb the bird too much.

SB: So according to you what does the success of getting a response from a bird depend on?

Interviewee 7: It is possible to attract some birds, but it is impossible to attract others to respond to you. For example, some birds may come near you, but they may not start singing, at least in my experience.

SB: Can you give examples of such birds.

Interviewee 7: In my opinion, for example, warblers do not start singing after you attract them with recordings; but there could be exceptions.

Interviewee 8: At the Vaibla bird station, we attract the reed-warblers with reed-warbler songs. They come down from migration and move around, but they do songs there. They just come.

SB: So once, they are captured in the mist net, they are not singing.

Interviewee 7: May be, they do some calls

Interviewee 8: But they are quite silent.

SB: What are the characteristics of bird species that make them prone to respond to imitation?

RM: Which characteristics of a species, or are there some individuals in a species which are prone to come?

Interviewee 7: Some species are more curious and want to come and see you, while there are others which are shy and do not want to be seen.

RM: Is it a problem in the ringing methodology that some species come more often than others?

Interviewee 8: Actually, we use attraction for those species which are known to respond to attraction, and we do not use it for species which are known not to come.

RM: And there are not so and so species (which might be intermediate); you know concretely, that there are species for which you can use recordings?

Interviewee 8: To say it in a more scientifically proven manner, we need to conduct different experiments with different sounds and see who comes and who does not. But, it would take a

lot of time; and the reasons as to why they do not come could be totally different: maybe they are not there or the weather is bad or something like that. So, it would be quite a lot of work to show that one species responds more than the other.

RM: But, in terms of individuals, have you seen that some individuals are more prone to respond than others?

Interviewee 7: Ya. Some birds are curious, and some are aggressive. It is individually different.

Interviewee 8: It is hard to distinguish this from a distance. There are several tits in your garden; from a distance you cannot say that one is more curious and that one is more shy.

Interviewee 7: And it depends on various aspects.

Interviewee 8: And maybe it is not shy.

Interviewee 7: And it is hungry and wants to first get something to eat; and then come to see something interesting.

Interviewee 8: I am pretty sure that there are individual differences amongst them like in the case of humans; some are more curious.

RM: Also depending on the age of the birds and what sex also.

Interviewee 7: And based on what the bird has experienced previously, these things can make a difference.

Interviewee 8: For the bigger birds, they have a longer life-span, and they have learnt from life.

SB: Have you noticed changes in the behavior of birds when you imitate?

Interviewee 7: They are curious; I am not sure—but may be, they think that it is another bird, that need to come and see; curiosity, or if they want to protect their territory; they want to show the other bird that they are better.

Interviewee 8: They also might be a bit nervous; jumping around, if they see the voice but they do not see who is singing; it may be confusing for them. They may look around and try to see another bird.

SB: Do you know how to use a particular sound for a particular bird. For example for one bird, you use songs; for something else you use calls: how do you find this information?

Interviewee 7: If you imitate yourself, then it just comes with experience. For example, if you are imitating the tits, then if you do "pssh—pssh", then it works for all the species. But I do not know how to do the different songs of the Great Tit (*Parus major*), and I do "pssh—pssh", and it works. And the same sound works for all the warblers, because the same sound is kind of the same their alarm call, but a bit different; and they are curious about the bird which is making the sound.

Interviewee 8: So birds are not only attracted to a particular sound which is related to one species, it may be artificial—which may not be the exact production of any particular species or any particular call—but it is somehow curious.

Interviewee 7: I do not know if any bird makes the "pssh—pssh", but it is a mixture of different sounds, and it works quite effectively in the autumn or the spring, but not during the breeding time when songs are more effective. Or before the breeding time also songs are effective.

SB: Where did you hear about "pssh—pssh"?

Interviewee 7: From another friend of mine who is also a bird-watcher. It all comes from friends; I have not read about this in literature.

Interviewee 8: it is hard to explain the exact informant.

RM: Do you also use the sound of a predator bird to attract some warblers or tits?

Interviewee 7: It would be quite hard to imitate. Well, maybe owls.

RM: you could use recordings for this purpose.

Interviewee 7: I have not used.

RM: or vice versa; sounds of some prey birds to attract some predator birds.

Interviewee 8: Predators are more visually attracted by their prey; and not so much by sounds.

Interviewee 7: I have been with a bird ringer who wanted to catch, not owls, but a Lesser Spotted Eagle (*Aquila clanga*), and the method was not luring the bird with sound but there was a net, and next to the net was a decoy, an Eagle-Owl (*Bubo bubo*) or a stuffed animal. It was not successful that time, but the method works; and they do not use recordings but use decoys of other predator birds or smaller birds. In another bird-station in Luxembourg, we saw another method to catch smaller birds of prey like a kestrels and Sparrowhawks

(*Accipiter nisus*); there was a cage with a mouse in it, a real mouse and not a decoy, and it tried to catch the mouse and then got stuck.

Interviewee 8: Predators are more attracted visually; but for owls if you imitate mouse sounds or some.

Interviewee 7: At the Kabli bird station they use owl sounds to attract different owls: Long-eared Owls (*Asio otus*), and the sound of Tengmalm's Owl (*Aegolius funereus*). It's effective.

RM: But was this the song?

Interviewee 7: It was during migration during the night.

SB: They use the sound of the Tengmalm's Owl, but do they get all kinds of owls or do they only get this kind of owl?

Interviewee 7: The birds are migrating anyway, so when they use the sound or the recording of the Tengmalm's Owl, they get this bird.

SB: So, this is species specific.

Interviewee 7: well, I am not experienced with catching owls, so I am not sure in this case.

SB: When you do the imitations do you follow any principles or regulations?

Interviewee 7: We do not have any regulations; it is like you need to do it in the right manner.

Interviewee 8: For ringing, we do not have any regulations. The main principle of ringing is that

Interviewee 7: you want to disturb the bird as less as possible.

Interviewee 8: If there is some monitoring project, and if the methodology clearly states that imitation is not allowed, then we do no use it. But for me, I am mainly involved in ringing and not in other monitoring projects, then we just use it.

Interviewee 7: And of course, if you hunt birds, then you cannot use electronic devices, you can make the sounds yourself.

Interviewee 8: Hunting code or like that.

Interviewee 7: Well you have to pay a fine if you do it, and someone finds out.

SB: With hunting people use these whistles which you can buy.

Interviewee 8: Whistles are probably allowed because it is a mechanical device, but you cannot use electronic recordings.

SB: So that is the law in Estonia. So do you think the use of recordings and imitations should be more regulated?

Interviewee 8: I think it is well regulated, but regarding hunting it is violated in some cases by foreign hunters who come here to Estonia, and

Interviewee 7: they have a different hunting culture.

Interviewee 8: and do not follow it. For hunting there is regulation, but it is not checked.

Interviewee 7: I think it is not a big problem in Estonia, because we do not have this small bird catching cultural background; I think it is more of a problem in these Mediterranean countries like Italy and France.

Rm: But they use recordings extensively there.

Interviewee 7: They use recordings to catch birds, and eat them and sell them. It's mostly illegal in some countries, or the poachers are illegal; or they do not have the licenses to catch the birds, but it is bad there in the Mediterranean countries.

SB: So, with the Ortolan Bunting (*Emberiza hortulana*)—a common bird?

Interviewee 7: Yes, that is the problem in France. So I read that the minister of environment in France declared that there are new regulations and laws about the hunting of different birds like lapwings and larks, but the point is that the number of birds which one is allowed to kill or catch increases a lot; for example one was allowed to kill or catch six thousand lapwings for a year, and I think that really makes a difference for the populations of these species, because these species are declining in Europe, or the numbers of this bird is declining, and France is bad.

SB: So the numbers of these birds in France are falling

Interviewee 7: Well, the number of these birds are falling all over Europe

Interviewee 8: because they are migrating

Interviewee 7: They are hunted, and their numbers diminish, and such big countries as France are not doing anything to protect them; instead they are passing laws that allow one to kill them. The reason for these laws is that it has been like that culturally.

Interviewee 8: Historically.

Interviewee 7: Historically important to do these things on and on. Not thinking about the birds.

Interviewee 8: So, a small amount of birds that we ring, some people might protest against ringing and call it torturing or something like that; but actually, the ring for a bird is proportionally like a bracelet, and it does not bother the bird so much.

Interviewee 7: They have bigger problems also.

Interviewee 8: Much much bigger problems.

SB: So in your knowledge is it common for Estonian birders when they go birding to use recordings and in which context?

Interviewee 7: I do not think that if they just go and look for birds, and not for scientific purposes they use electronic devices.

RM: But imitation?

Interviewee 7: Sounds for owls and woodpeckers. Yes that is more common. Well, we do not use electronic devices so much. It is more like you hear a sound and you try to understand what kind of bird it is; and then you play the sound for yourself to compare.

Interviewee 8: Compare.

Interviewee 7: And it might somehow attract the bird, if it is near, but not like.

Interviewee 8: But for ringers, it is quite common.

Interviewee 7: In the winter, I do not use sound, I just have the feeder outside, and birds come to the feeder and I am not sure if the sound will work in the winter.

SB: So over the years, have you seen any changes in the Estonian birding tradition with respect to using sounds. Was it less common earlier and it is more common now?

Interviewee 8: I think it is mainly related to the development of technology and the availability;

Interviewee 7: it is hard for me to say because I have only watched birds for only five years.

RM: But the use of recordings has not brought along the forgetting of imitating with voice; so they exist side by side?

Interviewee 8: I do not think they replace each other. I am thinking of attracting birds for ringing purposes and for mist-nets, then one does not sit near a mist-net and whistle all night and day. So one does not do it, if one does not have an electronic device. And, I also do not think that anybody would replace whistling with electronic devices, when you just come close to a forest. They do not replace each other; they complement each other.

RM: But for how long are the recordings which you play in the ringing stations?

Interviewee 7: Upto one minute.

RM: One minute. And then there is a pause and then you play them again.

Interviewee 7: All night long. And all day.

RM: And for how many days for example?

Interviewee 7: In Vaibla, at midnight we switch on reed-warbler songs; because reed-warblers are night migrants, and they fly over, and if they hear the sound, they come down to the reeds. From midnight to about the noon of the next day, to about a bit later, then we charge the batteries for some hours, and in the evening—from six p.m. to midnight—we use swallows, hoping to attract them to come to overnight to the reeds.

RM: And then you switch on, and put on the warbler again.

Interviewee 7: And we would not do it, if were catching the birds during the breeding time. It is because they are migrating and they it does not disturb them so much.

Interviewee 8: Our ringing season is from mid-July to the end of August, purely a migration time.

SB: In competitions and such events, is the ethics of recordings discussed much?

Interviewee 7: Ya. It was discussed about half a year ago in the bird-watching community, about the different aspects and ethics of bird-watching, and attracting using recordings was also widely discussed among bird-watchers.

SB: Was it discussed in an Internet forum?

Interviewee 7: it was discussed in a email list. Different people sent their opinion.

SB: Was it Linnuhuvilised? (https://www.linnuhuviliste.ee/)

Interviewee 7: Yes. Linnuhuvilised. Yes it was half a year, or a year ago.

RM: Did you see that there were polarized opinions or were people with strong opinions about it or was it more of less balanced?

Interviewee 7: There are some people who think that attracting birds with recordings is totally bad, and it should not be used at all because it disturbs the birds too much, but I think those who do research or scientific experiments with the birds, they just need to use it.

Interviewee 8: There are much more disturbing things to birds than a few bird stations.

SB: So, when you go for competitions, there are clear rules for what you can or cannot do? Like say you can use recordings, or you cannot?

Interviewee 7: I think all the competitions related to bird-watching have rules that you cannot use electronic devices; you can just imitate yourself.

Interviewee 8: But that has not been discussed; I do not think everybody understands.

Interviewee 7: I do not think that is a problem. Of course, there are some people who violate the rule that one should not use electronic devices to disturb birds. Well, we have these devices in Tartu that disturb birds—so I do not know.

RM: When you go out yourself, and go birdwatching, do you initiate a duet with a bird; that you respond and then the bird responds?

Interviewee 7: yes. That is possible. Especially with woodpeckers. Grey-headed woodpeckers: quite a nice bird to have a chat with.

SB: Can you describe what happens?

Interviewee 7: You just whistle the sound; and then the bird comes near and starts doing the same sound; and then you do it again; and then sometimes some other birds also come, or another individual of the same species comes; and they are trying to understand what you are, and where you are; and what you are doing; and they get quite curious. It's interesting.

RM: They probably see you but they still continue to communicate.

Interviewee 7: They see you, but they probably cannot understand.

RM: What is happening?

Interviewee 7: What is happening—yes.

RM: Do you have any other such remarkable instances which you remember about these moments of imitation?

Interviewee 7: Extraordinary examples are what has happened during owl-watching or hearing because they make quite cool sounds; and you usually do not see them; but when they come really close to you. It is dark but you can shine a torch on them, and then you can see the bird; and that is quite awesome, because you do not see big owls—Ural Owls (*Strix uralensis*)—different owls during the day; so it is possible to see them during the night. It takes time, but it is like a lottery—you can go out on a trip and for the whole night drive around and try to attract the birds, or see/hear the birds, and you might not hear anyone: but sometimes you hear many of them. Like a lottery.

Interviewee 8: Sometimes a dialogue with birds is just for fun too—not only for attracting. For example, my wife, she corresponds with cranes often at our summer cottage, in Saaremaa, we have cranes who are quite near. She says:"Waaanh..Waanh". She responds to them.

RM: And they respond back?

Interviewee 7: And they come and fly over the house.

SB: So, they respond back?

Interviewee 8: She does it well—she is not a bird-watcher, but she is somehow related to cranes.

SB: So, she can imitate their call?

Interviewee 7 and Interviewee 8: Ya.

Interviewee 8: And it is similar to the original sound.

RM: And they come down to check.

Interviewee 7: They fly over and try to respond, and try to understand. It is interesting.

Interviewee 8: So, it might be for fun as well.

RM: Is it possible to initiate such dialogue with owls too?

Interviewee 7: Usually, when you make the sound of an owl, and the bird responds then you usually do not try to attract the bird more because it might disturb the bird; but I think that it is possible to start to dialogue with the bird because they still try to understand what you are or what is making the sound.

Interviewee 8: Last spring, when we went to hear owls, we did not hear much but once after imitating the owl, a strange noise came from the bushes and somebody said it was a

Interviewee 7: Female Ural-owl. And it was interesting because we had some other friends, and one who was experienced with imitating owls, and did the exact same sound, and then the bird did not answer.We were thinking about going away and then Interviewee 8 did some weird sounds, which was not accurate at all, and then the bird got really mad and started screaming.

SB: but you knew that it was a female owl?

Interviewee 7: they do different sounds; well, I did not recognize it as a female, but my friend who is more experienced recognized it as a female owl.

SB: So he had been making the female owl sound?

Interviewee 8: it was the same sound that it responded back

RM: Has it happened that some animals have responded instead to those sounds?

Interviewee 8: Maybe a fox.

Interviewee 7: When you go out on a trip to find owls at night, many different animals are doing their different sounds at the time; then you try to attract the birds, so I have heard.

RM: But it is simply that they are around, but it is not that they respond

Interviewee 7: I do not think that they do respond.

SB: I think, we have covered the questions. Do you have any other comments you make or you feel that we have missed out on something in our questions?

Interviewee 8: your topic is interesting, and it would be interesting to read your work. and keep in contact and send us your work. And welcome to Vaibla station next summer.

SB: So, you are done for Vaibla this summer? But they are still doing it at Kabli

Interviewee 7: They started in Kabli or start around the first of September. I also ring birds in my home garden also. For example, in September, I have ringed 200 birds in my garden.

SB: So, you have a mist net there?

Interviewee 7: I have two mist nets.

SB: Do you use a recording device?

Interviewee 7: Yes. I have a recorder; I attract Siskins

SB: Because at Vaibla it is more warblers and swallows.

Interviewee 7: At the moment, I am attracting Siskins. Before that, for some time, I attracted Blackcaps, but mostly siskins, and of the 200 birds, 100 are siskin, then about 30 are Blackcaps, and a few tits and the rest are the Common Chiffchaff (*Phylloscopus collybita*).

Interviewee 8: For example, yesterday at home, when I went out in the morning just to get my bicycle, I heard some Long-tailed Tits flying over, and so I took my phone, and found a recording and switched it on, and quickly opened the net, and caught, and the random recording of the Long-tailed Tits had the sounds recordings of Chiffchaff too, and in the two minutes of trying to get on my bicycle, I got two Long-tailed Tits and three Common Chiffchaffs.

SB: When you use a Siskin recording, you usually get only siskins? You do not get another bird?

Interviewee 7: Mostly siskins, similar birds or Common Redpolls might be interested in the song also. Other species like leaf warblers or the Common Chiffchaff are just curious

Interviewee 8: European Greenfinches (*Chloris chloris*) too.

Sb: So yesterday, you were doing it at home, setting up the net. What were you doing with your bicycle (I did not understand)?

Interviewee 8: We have these nets in the home garden, and I just hoped to get some Long-tailed Tits before I go to work.

SB: And because, he had been catching Siskins and other birds, and this was a bird which you had not ringed at home; or is it a rare bird?

Interviewee 8: No. It is not so common, but we have had Long-tailed Tits too; but as the flock flew over I thought that as the Long-tailed Tit is easily attractable , then I hoped that I could get some before I go to work.

SB: And you got some other birds? And where do you get the knowledge that some birds are attractable: is it through your knowledge or is it through some database?

Interviewee 8: It is not through some database; I think it is from experience, and from experience since I was a kid, and since I visited Kabli station, and I knew that

Interviewee 7: Long-tailed Tits are easily attractable

Interviewee 8: Not only attracted by electronic recordings, but very characteristic to the Long-tailed Tit is that if one bird goes to the net—it starts to make a song or sound—a little bit nervous—then other birds come to the net also.

SB: Because it is a very social bird.

Interviewee 8: Ya. Ya.

Interviewee 7: Exactly! Probably those birds are really social to each other. Those are easily attractable to each other when we are catching them.

SB: So, when you get one, then the birds in the same flock may come to see what is happening.

RM: In Kabli, they started using recordings earlier than Vaibla or not?

Interviewee 8: I do not know; but they use Goldcrest (*Regulus regulus*) and

Interviewee 7: Firecrest (*Regulus ignicapilla*)—for example when the Firecrest is more rare; but the sound is quite similar to the Goldcrest; so you can can attract a Firecrest with the Goldcrest song; or vice-versa—because they are flying together.

SB: So, it is a mixed flock.

Interviewee 7: Ya. A few days ago, they got one individual a few days, and this was the first for this year, but as the number of Firecrests breeding in Estonia is increasing, it is probably getting more common here; and in the future when Goldcrests are there, Firecrests are also among the flocks when they migrate.

SB: So, this is perhaps the final questions. So, in the past, before all these portable devices, people knew that if you use sounds you could attract birds, but people did not do it because of the technology limitations. So, when you studied ornithology, you already knew about this?

Interviewee 8: Ya. The common practice in Kabli, 30 years ago, was that you do not take the Long-tailed Tit from the net as the first bird goes in, but you just wait a few minutes, say 5-10 minutes—maybe you can attract others to come as well; and then when all the flock has flown in, then you take them out.

RM: But why was that? It was because the bird which had first caught makes the sound which attracts the other birds?

Interviewee 8: yes.

SB: And this is good for this particular one bird.

Interviewee 7: And also, to keep the flock together. And also, when Long-tailed Tits are ringed, we release them together—not separately—so that the flock stays together.

SB: So you need a lot of people to release them?

Interviewee 7: And also, the flocks stay together for a long time; for example if you ring ten Long-tailed Tits, and you get a recapture, then you get the same ten long-tailed tits.

Interviewee 8: We once caught a flock of long tailed-tits in Vaibla; that was ringed months ago in Western Estonia, and the birds were still together.

SB: And so this other place was north? And you caught it in the same season?

Interviewee 8: Yes. I do not remember the time difference exactly, but it was about a month, near Haapsalu in Western Estonia, and then they stayed together for hundreds of kilometers. It was five or six.

SB: Yes: this has been interesting

Interview G

(Interview with Interviewee 9, male 35)

SB: May be, we can start with the Estonian open you mentioned. This was your first time at a competition, and you heard a lot of people making imitations?

Interviewee 9: Well. Our team. But I know that all teams do it; I was just surprised by the different imitations used by our team members.

SB: You had team members who were new to you or had not gone birding with them?

Interviewee 9: Some were new.

SB: So, you were surprised that they could use imitations for species which you did not know about? Like it was a learning experience?

Interviewee 9: It was a learning experience; but even just the way they imitated randomly to see if there is a response.

SB: Do you know what kind of sound did they make?

Interviewee 9: Mostly just whistling; and it was interesting to see that everybody does it the wrong way. You never know if it works or if it is not effective. The only way to find out is to go out there in the nature; and mimic; and to see if they respond; because they do not have to respond. They can choose; may be you are not good enough, but they just do not want to respond, or may be they are not there. You never know. You have to do it, over and over again, to get a little understanding; like do you do it right, or is it about the birds.

SB: Was there a case where somebody did a wrong whistle, and your team got a response?

Interviewee 9: You never know if you make the wrong whistle; only the birds know.

SB: But say you make the sound of a woodpecker, and you know that it is not the accurate sound of a woodpecker; but yet some bird responded to that inaccurate sound.

Interviewee 9: There is not exactly a wrong way to do it. There is probably a better way, or perhaps not so good, but the bird still may respond.

SB: So, we will start with the list. In which contexts and for which purposes have you used imitations and recordings of bird songs?

Interviewee 9: Mostly for learning purposes. If I want to become better at imitating birds, or I want to teach someone else about a bird's responses or sounds, or even allows itself to be

looked at; I think it is a good way to introduce other people to species. I have been an assistant to a bird-survey, someone does it for their work, and I just go with them: Bird-monitoring.

SB: Do you know which species you were doing?

Interviewee 9: This was a long list; but mostly this was for protected species (which is usually the case); some woodpeckers and Hazel Grouse (*Tetrastes bonasia*) and maybe owls; because owls are different. We tried in some places, but mostly woodpeckers. Woodpeckers have this territorial drumming sound—which is something you can only make with sound-recordings; I have not heard anybody imitate it.

SB: The drumming?

Interviewee 9: Yeah—the drumming…

RM: Just knocking on the trunk of a tree—it would not work?

Interviewee 9: Maybe it would, but the drumming is territorial; they have the length of this drumming; the strength of the drumming; and different species react to drumming differently; but if you imitate it, it may not work; especially if you are after this protected species only; you do not want other ones.

RM: But for the hazel-grouse you use the whistle?

Interviewee 9: No. It was also sound recording; but I know that there is also a whistle for that.

SB: How did you get to learn about using imitations? What sources: was it literature; websites; friends; other birders?

Interviewee 9: Other birders, mostly I think.

SB: So when you started birding, you learnt these techniques from other people?

Interviewee 9: Ya.

SB: How have you chosen the birds you use the imitations or recordings for?

Interviewee 9: Well. The owls for instance are hard to see anyway; to meet them somehow this is the easiest and popular way. They are usually quite large, and they make this lower sound—easier for humans to imitate.

SB: So, you use recordings; I mean I know that I have been on a trip with you; so have done imitations.

Interviewee 9: If I really want to have a contact with them, then I use recordings, but if I am out on my own, then I imitate; then I do not care so much if I see them; it would be nice to see them; but it is also that I want to practice my technique of imitating; so if I already make them answer with a sound recording then after that, I may not even know if my imitation works so well or not. If I get a response first with imitating, then I know that my imitation works.

SB: So usually if you go for a survey you will use the sound recording?

Interviewee 9: Ya.

SB: But if you are by yourself, then you usually use your voice.

Interviewee 9: Because for the survey, you need more certain data; you want to be more effective.

SB: You feel that sound recordings are more effective than imitating; because it is more accurate because humans cannot reproduce exactly.

Interviewee 9: Another thing is that you can use really loud technical equipment, that you cannot do with your voice.

RM: What kind of equipment do you usually use for your recordings?

Interviewee 9: Some speakers; nowadays we have so many different ones. You can have a soap-box sized speaker in your pocket, which is blue-tooth connected with your phone, and it's easy.

SB: When you imitate do you pay attention to your behavior at the same time? Like hiding?

Interviewee 9: Maybe just to be still. Not to move around. Not to be too easily noticeable, but I do not think that there is any point to hide myself.

SB: What does the success of getting a response from a bird depend on? Can you bring some examples?

RM: When you have succeeded well or vice versa.

Interviewee 9: I just think that the better you become at imitating, the greater chance is that they respond. Was this the answer for your question?

SB: That is a good point that you say that over the years a person gets better; but for example do you also consider other factors like time of the day or weather conditions; or what time—like for example with the owls.

Interviewee 9: For sure, because you know like for instance that owls are active at the night time. Most—but not all—some are in the evenings and mornings. There is not much point in going to look for owls in the middle of the day; the chance that one sees one is minimal. There are also other factors like wind, so if the wind is a great distraction, then you cannot hear the owls, and the owls cannot hear you. The wind is the same factor with all the species you try to have contact with.

SB: Which characteristic of the bird species does it make the bird prone to imitation?

Interviewee 9: I think, the time when they are more territorial; like the mating season, so to say, because if they already have nestlings then they are too busy; they may be too tired to respond. And if it is cold winter time, they are just more anxious to survive and not so anxious to fight for every bit of territory; and to answer to every intruder, which could easily just be another bird passing by, and they themselves do not bother to find out if it is a serious competitor or not.

RM: Do you also do imitations during excursions or for fun, and do you sometimes establish a duet with the bird, or when they respond, do you also respond; so that there are some mutual responses. For which species for example? Can you describe some occasions?

Interviewee 9: yah. Most easier ones are these smaller owls: The Pygmy Owl (*Glaucidium passerinum*). And this Grey-headed Woodpecker (*Picus canus*). I think, these are the two with whom I can have a long duet.

RM: So, they have come very close, and they know that it is actually not another bird; and so they continue?

Interviewee 9: They are a bit curious. Who is this strange looking bird which makes my kind of sound?

SB: So, can you explain what happens: you first try to imitate them—and they imitate back?

Interviewee 9: Then, they usually come closer to find the source of the sound. They are usually not sure, like where is the other bird—maybe they only see me, or the people with me. So, they fly around close by, to see from different angles; they usually fly by, over me. And I know that owls can even get aggressive; even the small pygmy owl can give you a

slap—if you are really good at the imitation and you want the bird to become excited. But usually, you do not want that. Maybe if you have done it once, you know that it is enough; like you know how irritated the bird can be. So, there's no point to irritate the bird so much.

SB: So, when you use these sounds for the birds, do you know what kinds of sounds to use for which bird?

RM: Like the song or the territorial call. When you choose for some particular species—some anxiety call and for the other a song?

Interviewee 9: Yah. No. Mostly. Like for an owl it is hard to know which is the song, and which is the anxiety call.

RM: What about for tits and others which have different calls?

Interviewee 9: For tits, for example, if you use this same pygmy owl sound in the day-time, it makes all the small birds anxious; it makes them loud, and to come out and reveal tmemselves from their hidden-lifestyle and become excited; because they are nervous about the possibility of the presence of a dangerous predator; so they come out. Sometimes, tt is a way to see them.

SB: So, if you make you make the sound of the owl, you can get other species which you do not want, like species which are their prey.

Interviewee 9: For example, you can see this Eurasian Nuthatch (*Sitta europaea*) very easily. Or tits. Or the Goldcrest (*Regulus regulus*). You can also excite, you can get woodpeckers too. I have experienced that I have whistled the pygmy owls, the small ones, but then the Ural owl (*Strix uralensis*) comes to look if it is a possible meal—what is going on?

SB: Interesting. So it is all kinds of relations or webs.

Interviewee 9: Yeah. When there is an owl, then the small birds tend to get excited, and then the others know that there is a predator lurking around. Sometimes, it can be very frustrating for an owl. So, the owls, usually hide themselves a little bit; because it can be dangerous for them. For example if the crows discover them and chase the owl away; then they attack the owl. In the night-time, the owl can come and take one of them; but day time they have the pay-back time. Same, with Northern Goshawk (*Accipiter gentilis*), a Goshawk can come and take or chase crows, and at the same time if the crows have a strong pack, then they can collectively start chasing the Goshawk, or even an eagle. Usually, smaller predators like

Sparrowhawks (*Accipiter nisus*), you can often see them attacking larger birds of prey, predators like eagles and buzzards. But maybe this is too far already from imitation.

SB: This is interesting! When you do the imitation, do you follow some principles or regulations?

Interviewee 9: I am not sure if there are any regulations. I think, it is more like the birders themselves discuss which is ethical to use, or when it is ethical to use, and when it is too disturbing.

SB: For example, at this competition you were at, did you discuss before the event or did you get information in the rules for the competition?

Interviewee 9: Yes. About imitation, there was only one rule—that you have to do it yourself.

SB: So, no electronic devices

Interviewee 9: Yes. No electronic devices. And another thing is that ,it is not too good to use the electronic devices too often. When, it is birding tours, there definitely may be some sensitive species—may be, they have already begun their nesting—then they have to use extra energy to respond to this imitation call; and if it is done too often, it may become a problem for them.

SB: Do you think the use of recordings should be more regulated, or is it not a problem?

Interviewee 9: I do not know. It should be regulated in some ways; I know that it is regulated with hunting—so you are not allowed to use electronic devices while bird hunting.

SB: So that is in Estonia.

Interviewee 9: Yes. I am sure that it is not everywhere.

SB: the rules are not the same everywhere.

Interviewee 9: I know that you can get fined if you are discovered using electronic devices. But whistles and even your own voice imitations are still OK.

SB: Even for hunting. To your knowledge is it common for Estonian birders to use imitations or recordings of birds?

Interviewee 9: For birders, I think it is common. So, I see myself as an average birder—definitely knows the average level of this imitation and bird-life and so on.

SB: Do you see any changes in the Estonian birding tradition in terms of using imitations and recordings?

Interviewee 9: Well, with the development of electronic devices it will become more and more common for people to use them. It may get problematic in some ways, but usually, the species which are rare are more far from you—from human settlements anyway. So, people rarely go there and disturb the birds with sound recordings.

RM: But, did you start off with voice-imitations, and then after started to use sound recordings? Or was it in parallel?

Interviewee 9: In parallel.

Rm: Not that as a kid you already imitated, and then later when you did it professionally?

Interviewee 9: No. Well, sometimes—it has happened with the Tengmalm's Owl (*Aegolius funereus*), one of the more rare owls, it is harder to find, then you probably do not have many practices with this species.

SB: you have not practiced yourself?

Interviewee 9: Well, you can practice yourself, but you do not know if they respond to it. You may be too high, too low—whatever could be the strange way for the bird. So, there is a greater chance that you want to use this electronical device.

SB: So, the more common a bird is, the more likely you see it, and you use your voice.

Interviewee 9: You see it everyday. Like people they have their own callings. Sometimes, they just stop on the street, and they stop and there are lots of tits; people do their own strange voices to see if they have a response.

RM: You have seen this on the street?

Interviewee 9: Yes. At least, I remember in Elva, there was one guy who was communicating with birds—who was quite patient—he had some food in his hand, and he also made some voice for the birds; I do not know if the birds recognize them or not, and in the end he won some trust, and some of the birds came and ate from his hand.

SB: Is the ethics of imitations or recordings a topic which is discussed amongst birders? Why or Why not?

Interviewee 9: It has been discussed. I am not sure of the outcome. And I know that they have reached the conclusion, that sometimes, it is necessary—when you want to collect some

data about some species, then it is the easier way to understand if you have the bird in the territory or not; because to see it visually is often complicated; for example in the woods for instance. If you get the response you know that the bird is there, but if you do not get the response you can never be sure that the bird is not there. I am not sure how you know that you have gone too far with it; if you have gone past the ethical limit of bird disturbance. It is very much just about your common sense—when you are a birder—not to disturb too much, because in the end if you disturb the bird too much, it may leave the territory and you do not have the bird any more.

RM: Do have any case of remarkable cases or occasions of imitations which you can describe—with some species or some specimen—some occasion which you remember very well with this imitation, which is remarkable?

Interviewee 9: May be not an occasion, but I was out with a really professional birder. He was doing this sound "pssh-pssh"—pishing—and I was thinking what is this bird which he is calling; I have never heard any bird. And once I asked: What are you doing? Who are you trying to like mimic. Then, yeah, I learnt pishing. I think it works best on warblers, somehow—they get more excited; but also that you never know what you can do to get bird's response. Sometimes, if you stop the car and slam the door—then the bird can get excited; like for Corn Crakes (*Crex crex*), it can start to make noise; or some other birds too can be similar.

RM: But you do not use the recordings or some visual imitation in combination, or a visual attraction with some other forms of attraction, besides the recording

Interviewee 9: No. But can you give me an example

RM: Like putting some dummies or decoys

Interviewee 9: Some decoys? No. I know that it's been used sometimes to ring some birds, and to put some transmitters, to be sure to get some response—in the middle of nowhere—where you have to catch the bird anyway. And I know that it is considered usually, unethical to catch the bird somewhere from a nest, because the bird may leave the nest. So, they use this imitation, and this stuffed bird-puppet, together; but I have never done anything like this. I do not need such a strong response; and I think it will wear off in the end. For example, if you take an owl-puppet and put it somewhere. All the small birds start reacting, and they will start attacking it; even better if you make the sound of the owl—then they will probably

gather faster, but if you put it out very often, maybe in the end they get will used to it. This is an owl—which does not attack. I do not know; maybe but they also learn.

SB: Right..Is there anything else that you want to tell us?

RM: We are done with the questions, but is there anything we did not know to ask or, which you think is important in the context of this imitation.

Interviewee 9: No, I think in the end it is a good and practical way to educate people; to bring people to nature and to bring the birds to them. But, may be, it is not so ethical if you do it for the money. So, if you have tourist groups, who you are taking day after day, may be to the same place to see this rare bird.

RM: Have you tried to teach people to imitate birds?

Interviewee 9: It is so different with people. It may be their first contact with the birds; so they are just amazed to see how to hear it; and about imitating, it is more about themselves. If they want to imitate it electronically, it is very easy. If you want to imitate the bird with your own vocals, then it is about own practice—how much do they practice, and how much do they go out trying to get a response. And if they get a response is it a strong response, or is it like mild—just like one squeak. The more dialogue you get with the birds, the more belief you have in yourself that your imitation is good.

RM: Would you say that it is hard to teach another person to imitate birds?

Interviewee 9: Yes. When with whistling, a lot of people cannot whistle. How do you teach them?

SB: Thanks a lot.

Interviewee 9: I did not bring it here. This time, I was out with this survey person. I do not know, I was just outside.

SB: Were they surveying Corn Crakes or were they surveying woodpeckers?

Interviewee 9: Woodpeckers, this time.

SB: But they used recordings.

Interviewee 9: They used recordings.

SB: So you were just observing what was happening.

Interviewee 9: Well, often the field-work is very interesting, because it is quite intense the way they are trying to get feedback from the birds, or the way they try to locate them. You never know what comes out if you go to the forest anyway. It is always very interesting. In the very early morning time, when there is nobody out there—there were a lot of animals.

SB: I remember, we saw some elks that one time we had gone owling.

Interviewee 9: And it was the only time, even for myself—we heard wolves. It was also the first time for me, the experience to hear wolves.

RM: But the wolves were not a response to your call; they were simply around.

Interviewee 9: I do not know that; they may have been. We do not go to call wolves with an owl noise; but they sure responded.

RM: It was not that they were calling before, and somehow.

Interviewee 9: Yeah. When we went to this place, we came out of the car, and I do not know—it was a quiet moment. Maybe it was just a pause between their calling, but may be it wasn't. They were quite close; they heard us. And when we made noise, they listened. And then, when we listened, they made noise. So this is also interesting. I was just there with my friends there—also trying to hear wolves; this autumn. Two weeks. Of course, they did not hear anything.

SB: So they went to the same place near where we went.

Interviewee 9: No they went by boat, so they did not get to this place—but to the same area.

RM: But you did not suggest to them to imitate the owls to hear the wolves? (Light-heartedly)

Interviewee 9: (Chuckles.) They were better at howling anyway than we were; it is fun to communicate with wolves. But my owling is perhaps, well—no good. It is better to imitate the owls and maybe the wolves respond.

SB: I remember seeing your naming on the email list serve, Linnuhuvilised, and they sent out the results of the birding competition.

Interviewee 9: It was not so much about my knowledge and level of imitation. But I was just studying, but I was an extra pair of eyes to look around. It was very intense.

SB: It started at 03:00 in the morning.

Interviewee 9: Ya. And it is like 14 hours, and we even ate while driving; and making stops all the time and going through different biotopes; trying to see and hear the birds.

SB: So you learnt that more species can be imitated—more than you had thought.

MA: Ya. Because there are so many warblers and other small birds; that are these clicks and peeps; and they are not so common to recognize the bird with.

SB: Just that one little sound.

Interviewee 9: But I learnt that it is very doable—but it is just that you need to practice yourself.

SB: So if you make the sound of those birds, the warblers respond back?

Interviewee 9: Yah.

SB: Or you hear something, and then you know that..

Interviewee 9: They can respond; it even does not have to be the same species; they can be in a mixed group. They are often probably in a mixed-groups, and they still respond to each other to let them know that everything is OK. I think, it may well be the way that they move around. Also, they fly south. There are two main ways to go: either you take long trips at once, or you have this slowly moving, like from biotope to biotope, making smaller flights; then they have these mixed groups; they interact with each other and make a lot of noise—all the noise—to make sure that others are still in the group and that others are still OK. I think this works somehow.

RM: But are there some species which would simply rather not respond, but come to silently see who is making this sound.

Interviewee 9: It easily may be, but it is hard to see them.

RM: If they silently come to see.

Interviewee 9: Because mostly, you use the voice when you are unable to see the bird; if it is in the forest or if it is in the night-time. Otherwise, in open landscapes, I do not know that these birds-sounds are commonly being used. I think you can—but you have these larger open landscapes where your sound probably won't reach, or you have to make it so loud that it is not comfortable. I do not know—may be, I just do not know about these things.

RM: But it is quite logical that this might work.

Interviewee 9: I have to go out and become a field-work assistant more with different people; but because of my work and my children; I do not have the time, but I would really like to.

SB: because you have a normal life—that is not your full-time work.

Interviewee 9: It is not my work at all; right now it is just a hobby.

SB: For us it is good too because we get different perspectives from different people.

Interviewee 9: OK. About the list, it often works this way, that we hear a bird singing, and then you try to mimic it, and then you try to understand if it shut up, or did it become interested—who else is doing this sound; but it can be like whatever species.

SB: Although you have listed some species here—there can be more species.

Interviewee 9: Definitely.

Sb: Like if you are out bird-watching and you hear something, it can be spontaneous.

Interviewee 9: Ya. I think it is common that people imitate, not birders, they imitate, maybe even sub-consciously, just to interact with your environment. I think, people have done it from very early on. I think hundreds of years ago, people knew about their environment much better, like with the species with which they interacted with; and they also very often came into a dialogue with them. It is the same topic which I had talked about in the car—the bird names which comes from the sounds—they imitated the names, and they also called the birds by their song; so they can get into dialogue with this bird with this song.

SB: Like you said, in Estonian, different people had different names for different birds in different regions.

Interviewee 9: Ya. Some very common birds had loads of names—very often related to their sound.

SB: In some ways, that is a different way of classification. Nowadays, we have one English name and one Latin name, but at that time you had many different regional names—it was different culture in some ways. In one place in the world you had so many names.

Interviewee 9: One day, I thought that this "*Crex crex"*—the Latin name, for the corn-crake—is also the sound, and many others. OK, a very interesting topic to discuss.