DISSERTATIONES
SEMIOTICAE
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TARTUENSIS
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NELLY MÄEKIVI

The Zoological Garden as a Hybrid Environment – A (Zoo)semiotic Analysis

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UNIVERSITY OF TARTU
Press

Department of Semiotics, Institute of Philosophy and Semiotics, University of Tartu, Estonia

The council of the Institute of Philosophy and Semiotics of the University of Tartu has on October 8, 2018 accepted this dissertation for defence for the Degree of Doctor of Philosophy (in Semiotics and Culture Studies).

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The thesis will be defended at the University of Tartu, Estonia, on December 3rd, 2018, at 12:15 in University of Tartu Council Hall, Ülikooli 18

This research was supported by the Centre of Excellence in Cultural Theory (European Regional Development Fund); the Graduate School of Culture Studies and Arts (European Social Fund); European Social Fund's Doctoral Studies and Internationalisation Programme DoRa (carried out by Foundation Archimedes); Estonian Research Council's institutional research project IUT2-44; Estonian Science Foundation Research grant ETF7790 "Dynamical Zoo-semiotics and Animal Representations"; Estonian Science Foundation Research grant ETF8403 "Animals in changing environments: Cultural mediation and semiotic analysis" (EEA Norway Grants EMP 151); Personal Research Funding project PUT1363 "Semiotics of multispecies environments: agencies, meaning making and communication conflicts".

ISSN 1406-6033
ISBN 978-9949-77-893-5 (print)
ISBN 978-9949-77-894-2 (pdf)

University of Tartu Press
www.tyk.ee

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

Having completed my dissertation (finally), I would like to express my most profound gratitude to my supervisor, Timo Maran, who has been patient with my wonderings, who has given me innumerable suggestions and encouraged me every step of the way. Timo has provided me with valuable advice and constant motivation since my bachelor's studies. He has guided me to improve the depth of my research over a decade, and as a result, he has largely shaped my academic approach towards nature and cultural phenomena. I can honestly say that this dissertation would not have been possible without the support offered by Timo.

I extend my acknowledgements to the people in the Department of Semiotics, for creating the conditions that enabled me to pursue my academic interests, and offering me various viewpoints to strengthen the foundation of my research. Their open-mindedness is the most valuable resource any student could ask for.

I am thankful to the Tallinn Zoological Gardens for including me in their endeavours to develop as an institution, and for unveiling the inner workings of a contemporary zoo. I am especially grateful to Tiit Maran, the director of Tallinn zoo, for long conversations about the essence and mission of the zoo. Tiit has shown me the kind of commitment and devotion necessary to find a balanced approach to managing a zoological garden. I also appreciate the representatives of all the other zoos who have taken the time to show me their facilities and share their worries and accomplishments. I am grateful to Runar Næss for granting me the invaluable experience of volunteering at his zoo as an animal keeper for a brief period. Special appreciation is due to all of the zoo animals because their life-stories have been an endless source of inspiration; they are at the core of my inquiry.

The work carried out by our Estonian-Norwegian research group has been an irreplaceable source for learning. Specifically, my thanks go to Morten Tønnessen for his straightforwardness and challenging questions that sometimes kept me awake at nights. Also, I am grateful to Silver Rattasepp for his witty comments, great quotes, and bad puns, but primarily because of his sincere belief that it is crucial to study the issue of human-other animal relations. I thank Riin Magnus for her thorough and thoughtful approach in investigating my (sometimes sketchy) claims, and for her encouragement in finishing my dissertation. My colleagues from Charles University in Prague and the University of Hradec Králové deserve appreciation for reassuring me that the study of the zoo and the communication of other animals is appreciated in different research fields, strengthening the value of zoosemiotics as an interdisciplinary approach.

I am indebted to my students for thought-provoking discussions, exciting stories, and their effort to understand zoosemiotics. I want to especially thank the students who have found their passion in zoosemiotic studies – their enthusiasm has only amplified mine.

My family and friends have a special place in my heart – I express my deepest sense of love to them because they believed in me when I did not. I am especially grateful to Urmas, who has shown me nothing but patience, understanding, and moral support. Most importantly, he has never let me quit, and has celebrated even the smallest of my accomplishments.

PUBLICATIONS INCLUDED IN THE DISSERTATION

I Mäekivi, Nelly 2016a. Communication in the study of zoological gardens. In: Maran, Timo; Tønnessen, Morten; Rattasepp, Silver (eds.), *Animal Umwelten in a Changing World. Zoosemiotic Perspectives.* Tartu Semiotics Library: Tartu University Press, 204–221.

II Mäekivi, Nelly 2016b. Modelling *ex situ* animal behaviour and communication. *Biosemiotics* 9: 207–226.
DOI: https://doi.org/10.1007/s12304-016-9264-5.

III Mäekivi, Nelly 2018. Freedom in captivity: Managing zoo animals according to the 'Five Freedoms'. *Biosemiotics* 11(1): 7–25.
DOI: https://doi.org/10.1007/s12304-018-9311-5.

IV 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.
DOI: http://dx.doi.org/10.12697/SSS.2016.44.1-2.12.

Dissertation author's contribution in the collaborative article (IV) are chapters titled *The Case of Zoological Gardens* (pp. 217–219) and *Staging of Animals and Changing Attitudes* (pp. 219–226). *Conclusions* were co-written. Both authors reviewed each other's chapters and made minor changes.

INTRODUCTION

The zoological garden as a contemporary institution is a genuinely intriguing and multifaceted research object providing a myriad of interconnected semiotic aspects to inquire. It is a hybrid environment *par excellence* – an environment, where cultural and natural elements are intertwined throughout the zoo's endeavours, such as wild animal management, education, and species conservation. The environment of any zoological garden is dependent on a diverse array of factors, e.g. the zoological garden's historical background, designed physical surroundings, functions, portrayed self-image, and other relevant aspects. All of these factors contribute to creating communication context, shape intra- and interspecies (including human) communication, and communication with the environment.

Additionally, as human beings we perceive, form, and transform the zoo environment according to our ethical beliefs, and what we consider as an acceptable way to represent wildlife. In turn, this complex environment, together with human perceptions and attitudes, influence the managing of wild animals, and thus their communicative abilities. When discussing the zoological garden as a research object, we acknowledge that there are several types of institutions falling within this category, e.g. accredited zoological parks, species conservation parks, aviaries, safaris, insectariums, and rehabilitation centres for endangered species, where, to a lesser or greater degree, humans are in control of the environment and the lives of other animals. In this dissertation, we will look at the most prevalent form of the zoological garden – a contemporary (city) zoo. We will consider only the type of the zoological garden that is accredited by zoo associations[1]. We find the accreditation aspect to be significant due to the commitment that accredited zoological gardens make to conservation, education, and scientific work.

Research on zoological gardens is ample. Many sources consider several elements that are important in creating the zoo environment, but to outline the various topics, we will point to particular aspects in an isolated manner. There are accounts on the general history of zoos (e.g. Baratay, Hardouin-Fugier 2004; Kisling 2001a; Rothfels 2002; Hancocks 2001) and studies dedicated to the history of concrete zoos (e.g. Bruce 2017; Mäeniit 2014). Prominent themes in the research of the zoological garden include ethics of zoos (e.g. Norton, Maple, Stevens 1995; Gray 2017), general philosophy of zoos (e.g. Lee 2005; Garrett 2014; Acampora 2010), and welfare and management of zoo animals (Maple, Perdue 2013; Hosey, Melfi, Pankhurst 2009; Young 2003; Kleiman, Thomson, Kirk Baer 2010). There is plenty of literature related to the zoological garden as a cultural object undertaking the inquiry about self-representation of zoos and their functions in society (see, e.g. Conway 2003; Zimmerman *et al.*

[1] For example, by the Association of Zoos and Aquariums (AZA), European Association of Zoos and Aquaria (EAZA), World Association of Zoos and Aquariums (WAZA) or other regional institutions.

2007; Mullan, Marvin 1987; Plowman, Stevens 1999). Another researched topic is the perception of the zoo by visitors and the public (see, e.g. Mullan, Marvin 1987; Ebenhöh 1992; Ryan, Saward 2004; Falk *et al.* 2007). Special attention has been paid to the architecture of zoos (e.g. Plaatsman 1996; Ebenhöh 1992; Hancocks 1971). Humans (particularly the visitors) have occupied an important place in the studies of interspecies communication with other animals (e.g. Garrett 2014; Patrick, Dale Tunnicliffe 2013; Hediger 1969; Carmeli 2003; Hosey 2008; Hosey, Melfi 2014, 2015). The issue of human influence on other species' behaviour and communication has also gained much attention (e.g. Hosey 2005, 2013; Carlstead 2009).

There are also plenty of case studies elaborating on the aspects mentioned above. To accommodate those case studies two journals are being issued: *International Zoo Yearbook* (published yearly since 1959[2]) and *Zoo Biology* (published bimonthly since 1982[3]). Additionally, there are special issues of several journals dedicated to the zoological garden (e.g. the *Journal of Applied Animal Welfare Science* (vol. 18) 2015; *Applied Animal Behaviour Science* (vol. 147) 2013; the *International Journal of Comparative Psychology* (vol. 26, issue 1) 2013). The zoological garden also occupies a place in popular science and non-scientific writings, where authours provide relatively personal accounts and anecdotal information (e.g. Robinson 2004, French 2010; Turovski 2008).

Despite the varied literature on the zoo, the zoological garden as a research object in humanities and in semiotics, for that matter, has not gained the attention it deserves. About 10% (i.e. 700 million) of the entire human population visits zoos every year (Barongi *et al.* 2015), which is undoubtedly indicative of its cultural relevance, yet the research in the humanities is scarce (see also Garrett 2014). Often zoos are mentioned in passing, or only one-sided accounts are provided (e.g. Malamud 1998; Jamieson 1985). In the framework of semiotics, publications on zoos are also sparse. Much of the work about zoos has been carried out by Swiss zoologist and Zürich zoo director Heini Hediger (cf. 1964[1950], 1969). Unarguably, he has laid the foundation for and inspired the few other zoosemiotic representations of zoos, e.g. Aleksei Turovski's (2000) and Yoram Carmeli's (2003) writings. Jakob von Uexküll's research influenced Hediger on animal perception and communication, and this might be seen as a reason for why Hediger paid so much attention to social and territorial aspects of other species. This is especially so with regards to human-other animal interaction[4], animal subjectivity, and the environmental conditions needed to keep wild animals in captivity. Hediger has also heavily influenced the development of zoosemiotics and social sciences in general (e.g. Edward T. Hall employed Hediger's notions of personal and social distance in

[2] URL: https://zslpublications.onlinelibrary.wiley.com/hub/journal/17481090/aims-scopes.

[3] URL: http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-2361.

[4] Hediger does not explicitly write about animal communication, but about animal expressions, which he considers to be paramount in understanding zoo animals' innate states and behaviour, especially when interacting with humans (see. e.g. Hediger 1969).

anthropology under the concept of proxemics (see also Favareau 2010)). Hediger's findings were notably influential on Thomas A. Sebeok's work, guiding Sebeok's studies on animal communication (see also Sebeok 2001). Sebeok identified the primary modelling system not to be human language but a nonverbal, i.e. zoosemiotic one, where the organism perceives his/her meaningful environment in a way that forms a counterpart relation with the organism's effectual capabilities (Sebeok 1991).

Thus, it is even more peculiar that Hediger's own topic of interest has not gained the recognition it deserves, leading only to a few isolated cases of zoo studies in the semiotic framework. Besides the abovementioned zoosemiotic and biosemiotic approaches there exist only a handful of writings (emphasising human perceptions of the zoo or visiting zoos) that explicitly claim to apply semiotics or closely relevant disciplines in studying the zoological garden, e.g. Spotte (2006), Garrett (2014), and Lindahl Elliot (2005, 2006).[5] It is worthwhile to include some authors who have a different academic identity, though the way they analyse the zoo is very close to semiotic thinking. For example, David Hancocks (2001) provides an analysis of the zoological garden as a cultural mirror of human societies and our relations with nature; Geoff Hosey (e.g. 2005, 2008, 2013) researches (positive, negative, and neutral) interactions between humans and captive animals (see also chapter 4.3). He also studies human-zoo animal relationships and the effects that visitors have on captive animals, by emphasising the importance of animals' subjective experiences, and referring explicitly to Hediger (cf. Hosey 2013).

The underrepresentation of the zoo as a research object in semiotic literature is even more peculiar when considering that semiotics has all the necessary means to carry out the relevant research. For example, besides the writings of Hediger, the zoosemiotic approach to intra- and interspecies communication is offered by the research platform of Sebeok (e.g. Sebeok 1972, 1990a) and the animal's relations to his/her environment can be described by Almo Farina's and Andrea Belgrano's (2004, 2006) concept of eco-field. Jakob von Uexküll's work on Umwelt and animal subjectivity (e.g. Uexküll 1982, 1992) is an integral part of any zoosemiotic inquiry and has proven to be of great importance in discussing the subjective experiences of animals in captivity. Dominique Lestel (2002) has written about hybrid communities, which provides an important starting point for studying captive environments where people and other animals influence each-other. Also, Nils Lindahl Elliot (2005, 2006) offers a multisensory, as opposed to the purely visual, approach to a zoo visit. Thus, the semiotic resources exist but have not been used to their full potential.

This dissertation serves to offer a semiotic analysis of the contemporary zoological garden. We bring forth the complexity of the zoo as a hybrid environment and point to the many different factors (such as ethological, social, and cultural), which must be considered in the analysis of the zoo environment

[5] Additionally, some essays and articles explore biopower in the context of zoos, e.g. Churlew 2011, Berger 1980.

(cf. paper I). We examine human perceptions of other animals (cf. article IV), how these perceptions have potential and real outcomes on the lives of other species (cf. article III), and discuss animal intra- and interspecies communication in the zoo (cf. article II).

The research questions of this dissertation aim at clarifying the interconnectedness of different aspects of the zoological garden by offering a holistic approach. Each of the publications included in this dissertation concentrates on a different issue or perspective that creates the hybrid zoo environment.

The research questions of this dissertation are the following:

- What kind of perceptions do we have of animals in captivity? What aspects are instrumental to those perceptions (i.e. how does our own Umwelt influence our perceiving of other animals; what role do other animals' communicative capabilities or species play; how does the design of the exhibit influence these perceptions)?
- How does human perception and attitudes influence the management and keeping conditions of animals in captivity?
- How might animals' Umwelten be influenced by keeping said animals in captive conditions (i.e. what are the main aspects that influence animals' communicative capabilities in captive environments)?

The focus of this dissertation is thus to analyse the zoological garden as a complex communication environment and to give a holistic overview of the zoo as a semiotic research object, i.e. to make it evident that different facets contribute to the functioning of the zoological garden. There are several aspects we need to consider when discussing the zoo as a hybrid environment. A very simplified portrayal of this complex environment showing the interconnected facets that influence each-other (to a lesser or a greater degree) is presented in Figure 1.

When mapping this semiotic landscape, we can concentrate on specific instances to show in what way certain aspects influence others. We can concentrate on one of the facets, e.g. analyse how FUNCTIONS OF THE ZOO, PRACTICAL ANIMAL MANAGEMENT factors, HISTORY OF THE ZOO, and the ZOO ANIMAL's agency or communicative capabilities affect HUMAN PERCEPTIONS. We can also analyse the interconnectedness of different factors by moving from one cluster of aspects to another. For example, from the HISTORY OF THE ZOO, we can derive the FUNCTIONS OF THE ZOO as we know them today; these functions, in turn, determine PRACTICAL ANIMAL MANAGEMENT, e.g. what kind of exhibit design is preferred or which welfare aspects are emphasised (see, e.g. articles II and III). PRACTICAL ANIMAL MANAGEMENT has a direct impact on the ZOO ANIMAL's communicative capabilities (see, e.g. paper I). The ZOO ANIMAL's Umwelt and body plan together with zoo ANIMAL MANAGEMENT, in turn, affect HUMAN PERCEPTION of animals kept in captivity (e.g. whether they have welfaristic or conservational or other attitudes (see also article IV)). These PERCEPTIONS influence the status of other animals. Also, these HUMAN PERCEPTIONS determine whether people visit the zoo and thus how much REVENUE the zoo earns, which, in turn, affects the available FUNDS for

creating keeping conditions and fulfilling the FUNCTIONS OF THE ZOO. We need to stress that this example is just one of the possible ways to show the interconnectedness of different factors and that the real situation is significantly more complicated, with mutual influences between various factors, and not unidirectional impacts. Tensions may also be found within different clusters of factors themselves, for example, it is common to simultaneously hold different perceptions of zoo animals by different interest groups, and these perceptions are often conflicting (see article IV). Also, the functions of the contemporary zoo seem to create tension, because it is difficult, if not impossible, to implement educational, conservational, scientific, and recreational responsibilities of the zoological garden simultaneously (see chapter 3 for a discussion about functions of the zoo and balancing its goals).

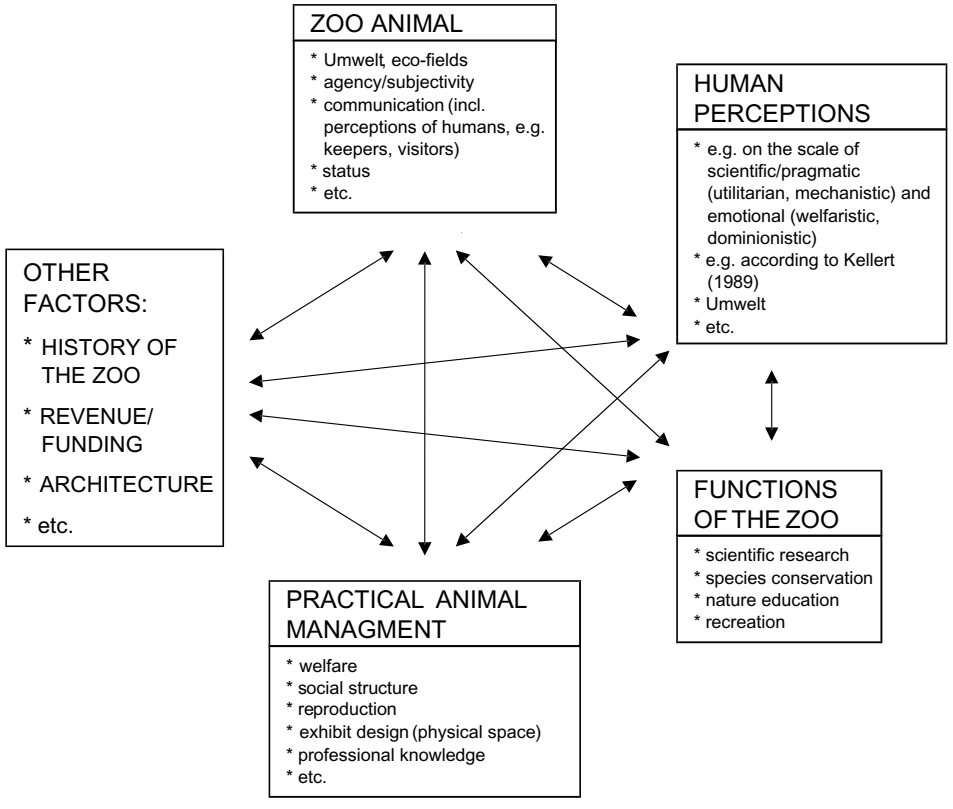

Figure 1. A simplified representation of different interconnected aspects that create the zoo as a hybrid environment.

The publications included in the dissertation mainly concentrate on ZOO ANIMALS, HUMAN PERCEPTIONS of other species, and PRACTICAL ANIMAL MANAGEMENT (see Figure 1) and less on the FUNCTIONS OF THE ZOO and OTHER FACTORS. The chapters included in this dissertation's framework introduce some of these factors that have been dealt with less in the publications. The framework serves a complementary function by introducing the HISTORY OF THE ZOO (chapter 2) and discussing the FUNCTIONS OF THE ZOO, i.e. the missions and aims of a contemporary zoological garden (chapter 3).

More specifically, the first chapter explains the general methodological approaches in this (zoo)semiotic inquiry by grouping different semiotic concepts that are relevant in included publications and explicates their relations to each other and the research field. Chapter 2, as mentioned, offers an overview of the history of zoological gardens in order to show the evolution of the zoo from antique animal collections, to the *menagerie*, to the contemporary zoo. This is intended to reveal how the zoological garden has morphed into its current form. More precisely, this chapter already encompasses the complexity of the zoological garden as a cultural institution, and shows that although the self-representation of the zoo has undergone significant changes, some of the historical perspectives of the institution continue to persist to this day. Closely related to this issue are the current functions or aims of the contemporary zoological garden, which are covered by chapter 3. Although there is plenty of literature about the goals of zoos, i.e. education, conservation, scientific work, and recreation, there is much disagreement about whether zoos are achieving their goals. Since zoos attempt to work towards all of these goals simultaneously, a question arises regarding how severely these aims conflict with each other, and where balance can be achieved. Additionally, chapter 3.7 addresses the multiple natures of the zoo and how the zoo environment itself serves as a message for its visitors. Chapter 4 addresses further issues that are raised, but not adequately covered in the publications of this dissertation. The final chapter gives an insight into the status of zoo animals and questions their wildness and why it matters. The inquiry into the status of the captive animals is partly a matter of animal communication and Umwelt, but also a matter of human perceptions, animal management, and the goals of the zoological garden. In chapter 4 we shall also consider several instances that are important when discussing the zoo as a hybrid and communication environment. One of the instances, covered by chapter 4.1, is stereotypic behaviour as one of the most common behavioural peculiarities attributed to captive conditions (see, e.g. Mason, Rushen 2006). Chapter 4.2 provides an Umwelt analysis of stereotypic behaviour to explicate the relations between perceptual and effector cues. Chapter 4.3 covers another aspect that is under-represented in the publications, namely interspecies (direct) communication between humans and other animals.

The framework of this dissertation is aimed at giving the necessary background information on the topic of the zoo, and serves as a means to further explicate the connections between different publications.

1. SEMIOTIC FRAMEWORK OF THE DISSERTATION

> [S]imply take a look at culture and nature as semiotic phenomena, no matter what theoretical framework is needed. Indeed, Tartu has taught us that semiotics is more a '*forma mentis*' than a set of principles and as such puts every scientist in a frame of mind to search for interpretive mechanisms in representation and expression. (Danesi 2014: 539)

Positioning oneself as a researcher when dealing with the object of the zoological garden is a complicated matter, because the topic of the zoo itself invites an interdisciplinary approach due to its complexity, thus involving several disciplines, such as discourse analysis, animal studies, and visitor studies. The identity of the researcher may also not always be restricted to one discipline. We, however, see ourselves as operating primarily in the field of semiotics.

In the following, we will give an overview of zoo biology as (historically) the primary approach in the study of the zoological garden as a complex research object and how semiotics – as the main frame of this dissertation – relate to one another. Also, we will provide an overview of the central concepts employed in this dissertation.

1.1. Zoo biology and zoosemiotics

Hediger established zoo biology as a distinct branch of biology[6], specifically to study the zoological garden. The branch evolved into interdisciplinary research by including, ecology, morphology, ethology, animal husbandry, psychology, and other relevant fields. Hediger dealt with questions of animal psychology, proxemics, keeping conditions, and human-other animal communication. Hediger stressed that the "[…] zoo is by no means merely a business concerned with zoology […]; it is concerned far more with human problems" (Hediger 1969: 2). He defined zoo biology's central problem to be "[…] the reconciliation of the demands of the public and the requirements of the animals" (Hediger 1969: 4).

The current understanding of zoo biology, however, has gravitated towards addressing the issues of other animals, not humans in the context of the zoological garden. Zoo biology has mostly steered away from explicating the problems that arise due to interactions between humans and other animals in this hybrid environment. Our claim is supported by the results of a review of articles that were published in the journal of *Zoo Biology* over the course of

[6] Another father of zoo biology, Indian zoologist Ram Brahma Sanyal, has been noted as probably the first to write about the living conditions required to satisfy the biological needs of animals (including space measurements and enrichment elements) (Strehlow 2001: 165).

eight years[7]. This review concluded that the journal's most covered topic was reproduction studies, followed by nutrition, growth, and development studies (Rees 2011: 339–340). It is curious that research about visitor studies, conservation psychology, anthrozoology, discourse analysis, human-other animal interaction, and human-other animal relationship (HAR) did not even reach the 1% threshold.

It can be argued that the once central facet of zoo biology, which was meant to deal with the complexities of encounters and relations between humans and other animals in the zoological garden, has been separated from the core of zoo biology and has found its outings in different research fields. We claim that semiotics helps to bring human (cultural) perceptions of other animals and human-other animal communication back as a relevant research area in any multifaceted study of the zoo. The semiotic approach enables to explicate the relevance of humanities and cultural studies in the context of the zoological garden. As a research tool, it proves to be especially necessary in cases that scrutinise human-other animal encounters and with issues where humans are involved in the lives of other animals. Semiotics allows us to incorporate a plurality of views into one research matter – to give multiple views from different perspectives and to consider the mutual interconnectedness of these factors within a common framework.

The zoosemiotic study is itself an interdisciplinary research field, e.g. it engages:

> [I]n dialogues with ecocriticism, Actor-Network Theory, posthumanism and other contemporary schools of the humanities, as well as with more practically oriented research topics in visitor studies, animal welfare studies and human-animal studies, not to forget ethology and conservation biology. (Maran *et al.* 2016: 7)

Primarily, we employ a zoosemiotic approach, and we do that in its broadest sense, i.e. "[…] zoosemiotics investigates a field of knowledge that includes both natural and cultural elements […] acknowledging the complex intertwining of culture and biology in human-animal relations" (Maran, Martinelli, Turovski 2011: 2). Semiotics enables us to study the communication of other animals and their relationships to humans and culture (including human representations of other animals). In the context of this dissertation, the agency of other animals, i.e. their semiotic capacities, are essential in analysing human-other animal relations (see also chapter 1.3.3). Zoosemiotics also enables us to uncover the nonintentional aspects of communication, e.g. some interpretations that come so 'naturally' that they seem involuntary (e.g. believing that some animals are 'smarter' or 'worth more' than others).

[7] 349 papers published between 1996 and 2004.

Additionally, zoosemiotics stands close to the biological sciences, because it considers the multitude of species with their specific behavioural and communicative abilities, "[t]his means that zoosemiotics does not treat an animal just as a general singular […] but focuses on the physiology, ecology and communicative capabilities of every species studied (Maran *et al.* 2016: 11). Thus, this dissertation also includes literature on conservation biology, ethology, zoology, and other relevant fields, because we acknowledge the importance of synthesising knowledge from semiotics with animal ecology, behaviour, psychology, etc. We are also confident that semiotics makes it possible for us to frame the topic of the zoological garden in a way to show that semiotic phenomena in the focus of different subfields of semiotics (e.g. ethological and anthropological zoosemiotics, cultural semiotics, and ecosemiotics) may create tensions and contribute highly to the general understanding of what constitutes a zoological garden. This understanding relates to how the zoo is perceived by humans (e.g. public, conservation biologists, animal advocates, and other interest groups) and how this environment shapes animal Umwelten. It is worth mentioning that Sebeok stated that one of the future applications of zoosemiotics could be wildlife management (Sebeok 1965: 12), which is the everyday activity of any zoo.

1.2. A side note on zoo semiotics and zoosemiotics

We have discussed what we mean by zoosemiotics, however, since the subject matter of the dissertation is the zoological garden, we find it unavoidable to provide a side note on the relation between semiotics of the zoological garden, i.e. zoo semiotics, and zoosemiotics as discussed above.

It is apparent that the semiotics of the zoological garden can also be categorised as 'zoosemiotics'. It is not uncommon to spell zoosemiotics as zoösemiotics to avoid confusing zoosemiotics with zoo semiotics, because, in essence, zoosemiotics and the semiotics of the zoo may be considered as two different phenomena (see also Kull 2016). Semiotics of the zoo may encompass all the biological, cultural, social and ecological factors that are relevant in the context of the zoological garden; zoosemiotics, on the other hand, is a field of study applicable to different contexts, having its focus instead on animal intra- and interspecies (including human) communication, human representation of other species, and other similar concerns. So, zoo semiotics is limited by its very clearly delineated research object – the zoological garden. However, the approaches to this object may be diverse, such as focusing on the semiotics of architecture, the semiotics of marketing and design, and edusemiotics. In these research fields, the context of the zoological garden represents a specific case. Zoosemiotics may intertwine with other research fields, including with the previously mentioned ones, as long as they contribute to our understanding of animal semiosis and human perception of, influence on, or relations with other animals.

This dissertation is necessarily both zoosemiotic and zoo semiotic – our research is a semiotic study of the zoo; thus, we are dealing with zoo semiotics. However, our approach is concerned mainly with semiotic studies of animals (including humans). Thus, we are also undertaking a zoosemiotic inquiry.

1.3. Concepts employed in the semiotic study of the zoological garden

Several fundamental concepts are used in the dissertation. What is noticeable about these concepts is that they function in a way that further emphasises the interconnectedness of different factors that contribute to the topic of the zoological garden. For analytical purposes, we categorise these concepts into different sections.

1.3.1. Object level and metalevel

In zoosemiotics, the question of object level (or preferably the subject level of an animal from another species) and metalevel (or our interpretation of the subjective experience of the other animal) has always proven to be one of the most difficult to deal with. Other species, besides humans, interpret their environment, create relations with conspecifics, have interspecies interactions, and make choices. However, when analysing the communication of another animal, the question arises: "[i]s him/her a semiotic animal, or are we simply imposing upon him/her a semiotic dimension?" (Martinelli 2010: 82). This conundrum is similar to the distinction of emic and etic (see Martinelli 2010: 82–84), where we can consider another animal's subjective perspective and experience to be an emic position and the researcher's interpretation of the animal's subjective experiences an etic position. This dissertation bases its approach on the belief that the study of another animal's Umwelt enables us not only to have an insight into the animal's operational world but also into his/her perceptual world. This is due to the manner in which an animal communicates with others and the environment being conditioned by the way that he/she perceives others and his/her surroundings. In the study of the zoological garden, we deal with the issue of object level and metalevel to inquire into how the communication of other animals is influenced by human perceptions (cf. article III) and how to model an animal's 'normal' behaviour from the emic and etic perspective (cf. article II). In this dissertation (chapter 4.2, cf. papers I and II) we also employ Umwelt analysis to access the subjective worlds of other animals. In addition, we discuss the difficulties of applying the purely anthropological zoosemiotics' approach (cf. articles III and IV) to show that when animals constitute a pure source of meaning their Umwelten are still affected in the setting of the zoological garden.

1.3.2. The zoological garden

The zoological garden constitutes a different entity for the zoo visitor, zoo employee, zoo advocate, zoo opponent, and all the different species living in the zoological garden. The zoo is indeed a hybrid environment. This concept is drawn from Lestel's (2002) notion of hybrid communities, but in the given case the emphasis is on the environment and the context of communication. More specifically, Lestel focuses mainly on human-other animal (direct) communication, stating that in hybrid communities the other animals are foremost subjects and only with this consideration can they then be viewed as research objects. In a hybrid environment of the zoological garden, on the other hand, the status of the zoo animal is flexible (see also chapters 1.3.5 and 4.1) and the context that frames the other animal and influences his/her semiosic activity is in the focus.

Managing a zoo is a complex endeavour due to the zoological garden's different functions (see chapters 3.2–3.6), which reveal that in animal husbandry there are conflicting aspects and tensions. One of the priorities of the contemporary zoo is direct species conservation, a part of which is retaining not only biological diversity but also the behavioural competencies of the animals. However, zoos also have high standards of animal welfare, which often creates keeping conditions that are the opposite of what animals' *in situ* conspecifics encounter (see, e.g. article II). The most apparent case of behavioural differences may be seen in predator-prey relationships (cf. article III) and in stereotypic behaviour (see chapter 4.2).

The zoological garden is also meant for people; it is as much a cultural institution as it is a conservational one. This means that animals are presented in a specific manner in this created environment. Enrichment is done not only for the benefit of granting high animal welfare but also so that visitors may enjoy more naturalistic behaviours – the same is true for more 'nature-like' exhibit designs (see chapter 3.7). That is, imitating nature serves the animals, but is also a way to enhance positive visitor experiences through immersion in 'nature'.

1.3.3. The communication of zoo animals

Intra- and interspecies communication[8] of zoo animals is one of the most engaging aspects for ethological zoosemiotics because the influences of a captive environment on the animals enables us to analyse the differences that might arise between *in situ* and *ex situ* animals' semiosic capacities.

Especially in publications I and II, we discuss the possible differences in animal communication that occur due to captivity. We draw on notions such as 'species-specific behaviour' and 'normal-abnormal behaviour' to explicate mainstream (conservation) biologists' views on the behaviour of zoo animals.

[8] Although humans also fall under this category, we discuss human-other animal communication in chapter 1.3.5.

Species-specific or 'normal' is a concept employed to describe the behaviour of animals in *in situ* environments. 'Normal' is juxtaposed with the behaviour of an animal living *ex situ,* and where differences are noted, the label 'abnormal' is used (see article II). We stress the importance of Umwelt analysis in assigning those labels. More specifically, what might be regarded as abnormal behaviour, i.e. behaviour not encountered in *in situ* conspecifics of an animal may not be perceived as making a meaningful difference from the point of view of the zoo animal (e.g. playing with a human-made object or forming close interspecies relationships). We also show how an animal's interpretational activities are often disregarded for other purposes of the zoological garden. We introduce (cf. in paper I) the notions of forced, disrupted and eliminated communication in the social communication of zoo animals. Forced communication describes the circumstances where animals are unable to disengage from a communication situation (e.g. unsuitable social groupings resulting in higher aggression); thus, there is a constant stimulus of an unpleasant meaning-carrier. Disrupted communication describes situations where some meaning-carriers are removed (and sometimes substituted with others) (e.g. offspring are removed from their parents). Finally, eliminated communication describes situations where certain meaning-carriers and functional circles are absent altogether (e.g. predator-prey relations or calving without mating).

1.3.4. Zoo animal-environment relations

The pluralistic view that is based on the concept of Umwelt is vital in not only in analysing other animals' social communication (i.e. communication between animals) but also in animal-environment relations. The concept of Umwelt enables us to analyse the influence of the environment on the zoo animal because the environment is constituted by only what is meaningful for the animal. In all the publications, and especially in papers I and II, we discuss how the communication of zoo animals may be affected by the environment. Depending on the species[9] (e.g. on the complexity of the animals' Umwelten) the environment of the zoo may not affect the animal or lead to perceived differences in the environment. There are also species that perceive distinctions, but these are not relevant (e.g. food that the animals eat in the zoo may not be what their *in situ* conspecifics eat, but the food in captivity is suitable for dietary needs). There are also species for whom the dissimilarities are significant (see also chapter 4.1).

In animal-environment relations, Farina and Belgrano are the leading scholars who, besides Hediger, discuss the possible ways that an animal may interact with his/her surroundings. They employ the concept of 'eco-field', which illustrates how different characteristics of the environment are perceived in accordance with their functions, and thus a cognitive landscape is created. Eco-

[9] For example, some invertebrate species may not experience the zoo environment differently from *in situ* environment.

field is the correspondence of a function and what the environment can provide for that function. "Environmental suitability is the result of the combination of different eco-fields" (Farina, Belgrano 2004: 108), which means that the suitability of the zoological garden's environment for a zoo animal can be evaluated by the presence of different eco-fields that are necessary for the concrete animal.

Since zoos have limited quantitative space, the quality of the space (i.e. the presence of different eco-fields and environmental affordances (see chapter 4.2)) is paramount. In such a hybrid environment, where humans create the living conditions for other species, it is essential to consider all the different ways that animals interact with their environment. Thus, the knowledge of what is pertinent to an animal, and what may be irrelevant to another, requires a good knowledge of animal semiosis.

1.3.5. Human-other animal relations

Interspecies communication, where humans interact with other species, is at the core of many zoo-related discussions and is one of the central themes of this dissertation (cf. articles III and IV). In the hybrid environment of the zoo, human-other animal interactions have many manifestations. Hediger and Sebeok have established, what the human may mean to other animals (see Hediger 1969; Sebeok 1990b) and stress that the right interpretation of other animals' behavioural cues may, in certain circumstances, be vitally important to humans. In chapter 4.3 (and briefly in paper I), we turn our attention more closely to the direct communication between humans and other animals. We also review how the presence of humans, who may be perceived in various ways, influences other animals' intra- and interspecies communication.

This dissertation (cf. article III) also discusses what the animal means for the human or more precisely, the attitudes that people have towards other animals that shape the way humans interact with them. In all the papers we point out that taming animals, i.e. changing the relation towards the human (from negative to positive), together with *ex situ* animal-environment interactions, excludes the zoo animal from being a viable candidate for reintroduction. We also pay particular attention to animal valuation and attitudes towards other species (cf. articles III and IV) to explicate how human perceptions manifest themselves in managing other animals and thus, heavily influencing their semiosic activities. We argue that human (mammalian) Umwelt plays a role in regarding some species as having more 'exhibition value' than others. These species are referred to as flagship species, i.e. popular and charismatic animals that are employed as symbols evoking public interest (Smith, Sutton 2008). However, we also show that different attitudes towards the same species may be held simultaneously by different interest groups. These attitudes may be influenced by the zoo (to a certain degree), and some of the attitudes (e.g. welfaristic and conservational) may be incompatible to a certain extent and yet be simultaneously present in animal management.

2. HISTORY OF THE ZOOLOGICAL GARDEN

> [I]f there were no zoo, someone would invent one. And many have done so over the past 5,000 years, in various ways. (Kisling 2001b: 1)

Traces of the history of the zoological garden are still visible today, especially in the public's perception of what the institution of the zoological garden is for. Thus, it is important to show where the zoo originated from and where it stands today. We have indicated the importance of the history of the zoo (cf. paper I), but we have not reviewed the evolution of the zoological garden in detail. This chapter describes how antique and private animal collections evolved into contemporary and public institutions, which have committed themselves to species conservation, scientific endeavours, and education.

This background information about the history of keeping wild animals in captivity serves the purpose of framing the possible plurality of perceptions and attitudes that different interest groups have of other animals, and the functions of the zoological garden. The history of the zoo is also essential to show the different forms of manifestations that the given institution has exhibited. Additionally, a historical account enables us to describe human attitudes towards wild animals in captivity, and how these attitudes can also exist simultaneously – independent of the era.

Usually, the zoological garden is considered as an institution that has grown out of antique animal collections; only in rare cases is the zoo described as the successor of curiosity cabinets. This view of the zoological garden as a descendant of animal collections emphasises the human tradition of keeping wild animals in captivity, without considering the reasons behind this practice (Mehos 2006: 13). Indeed, sources that deal with the history of zoos do not discriminate between whether the antecedents of zoological gardens were animal collections kept for prestige, religious reasons, as diplomatic gifts, for personal pleasure, recreation, or for a more profound scientific interest behind the activity. It is quite complicated to retrospectively discriminate between these compatible reasons for keeping animals in captivity in the past; especially when considering that there may have been many simultaneous reasons for forming collections. What matters for the development of the zoological gardens is that wild animals were collected and collections with different (often foreign and exotic) species emerged.

Animal collections of the past have not been studied in depth – there exists enough information to give an extensive overview, but there is little profound understanding about these collections and their development (see, e.g. Kisling 2001c; Kohlstedt 1996: 6). There is also no single comprehensive source to refer to for a complete overview of the history of the zoological garden.

In contemporary debate, there is some disagreement about the first animal collection. However, the renowned French historian of the zoological garden, Gustave Loisel, asserted that the first recordings of keeping wild animals can be

attributed to the ancient Egyptians (Mullan, Marvin 1987: 89, Rees 2011: 32). Thus, the historical indications of the first attempts to keep local wild animals are dated approximately 10,000–3000 B.C. (see, e.g. Kisling 2001c, Bostock 1993). Some of the species kept were not purposively domesticated, and those could have been the antecedents of wild animal collections.[10]

2.1. Antique animal collections

The first societies where animal collections could be found in were thus Egypt, but also China and Mesopotamia (from approximately 3000 B.C.). Keeping wild animal collections was the privilege of the royal and wealthy (Kisling 2001c: vii). The existence of animal collections in Egypt is supported by pictures and hieroglyphs, which depict Egyptians keeping different species of antelopes, hyenas, cheetahs, and other animals. Some of the animals were considered as holy and thus, protected (e.g. lions, crocodiles), and some of them were used in religious ceremonies (Hoage, Roskell, Mansour 1996: 9; Bostock 1993: 7). Parks were built for animals recovered through expeditions, and some of the animals were embalmed after death (Croke 1997: 129). Animals were trained for hunting (Bostock 1993: 8) and tamed as pets, e.g. pharaoh Ramses II had a giraffe and a pet lion who accompanied him to battles (Hosey *et al.* 2009: 18; Bostock 1993: 8). In wealthier households, it was common to find rooms with wall murals depicting plants, animals, and birds. In these rooms, caged birds were also held, and in some cases, the murals extended into a garden (Kisling 2001b: 14). It is interesting that even nowadays many contemporary zoos have murals in their indoor (especially bird) exhibits, which imitate landscapes and are clearly meant for the aesthetic satisfaction of humans, and not for other animals (see also paper I) (i.e. murals serve no function in the Umwelten of most of the species).

There are writings about Mesopotamia that refer to royals managing lions, apes, and elephants. Also, the roots of the first collection presented as an ecosystem can be seen in Mesopotamia, where Sennacherib, the king of Assyria, exhibited human created wetlands that held plants and animals (Hosey *et al.* 2009: 18). The nobility also had ponds and cages with exotic fish and birds (Kisling 2001b: 10). Some of the exhibit design principles employed in this era are very common nowadays (but were not so at the beginning of the 19th century), e.g. multispecies and habitat-based exhibits, where animals adapted to a particular habitat share an enclosure (see, e.g. Hancocks 2001: 113–114).

In China, parks were the most prevalent places for keeping wild animals. Around 1100 B.C., King Wen had an animal collection that was called the *Intelligence Park* (eliciting some connotations to the educational function of the contemporary zoological garden (see chapter 3.4)); however, not much is

[10] For a discussion about wild and domesticated animals in the context of the zoo, see chapter 4.1.

known about it (Rees 2011: 32; Patrick, Dale Tunnicliffe 2013: 6). This and other parks had high walls, and behind those barriers bears, tigers, and elephants were maintained. Managing these animal reserves required separate staff to take care of the collections. In these parks, animals were kept to be used for religious rituals, food, hunting, and recreation. Further, fighting spectacles were common, in which both or one of the parties was a wild animal (the other party may also have been an unarmed man) (Kisling 2001b: 16–17).

In approximately 1000 A.D. intensive animal collecting moved from Mesopotamia, Egypt, and China to Greco-Roman and Arab regions, although active collecting was still carried out in Asian countries. Large collections could also be found in Central-America (Aztec collections) and South-America (Incan collections) (Kisling 2001c: vii).

Significantly larger number of notes exist about ancient Roman and Greek animal collections than Egyptian, Mesopotamian, and Chinese collections. The Greeks were interested in science and thus treated animals with scientific curiosity (Bostock 1993: 10), and their research was based on much more than what one could observe by merely looking at the animals. The Greeks also showed concern for the treatment of animals, e.g. the first recorded statement against neglecting and abusing other animals was made by Plutarch in the first century A.D. (Hancocks 2001: 8).[11] Although generally there was not enough wealth to establish extensive collections, by 400 B.C., animal collections could be found in most cities (Croke 1997: 131). Entertaining shows were put on with tamed animals, and in these shows, bears and lions were common (they could be found in and around Greece), and tigers were relatively rare. The exotic nature of these animals depended on where the animals were from, e.g. a specific animal from another country was exotic, and it did not matter whether the species also existed in Greece (Kisling 2001b: 17–18).

The first known zoological encyclopaedia was also created in Ancient Greece. Aristotle, who according to some sources owned a personal animal collection (see, e.g. Hancocks 2001: 8), wrote (350 B.C.) pioneering work on descriptive zoology – *Historia Animalium*.

During the Roman Republic, two simultaneous but different directions in wild animal keeping can be distinguished: private zoos and aviaries resembling the ones in Ancient Greece, and the keeping of animals for (bloody) spectacles (Fisher 1967: 32). The main reason for keeping wild animals was nevertheless entertainment – massive fights were held in the arena of Colossus between other animals and humans and between other animals themselves (Bostock 1993: 12). Written sources refer to a show funded by general Pompeii, where 20 elephants and 500–600 lions took part (Hosey *et al.* 2009: 19). Entertainment events that size led to a lot of wild species becoming rare or locally extinct, and this was likely exasperated by further arenas that were quickly established in other regions and countries (see Fisher 1967: 40). Those events carried the leading role in extinguishing hippopotamuses in the area of Nubia (today part of Egypt),

[11] The issue of animal welfare is a very prevalent concern nowadays (see cf. articles II and III).

the disappearing of lions from Mesopotamia, and the extinction of tigers from the area today known as Iran (Hosey *et al.* 2009: 19). It is paradoxical that the main reason for keeping wild animal collections in Rome was responsible for species extinction – preventing species extinction is the very reason for the existence of the zoological garden today (see chapter 3.3).

From the above description of ancient animal collections, we can see that they evolved independently in every corner of the world. In addition, the practice of animal keeping indicates that during these periods the first attempts to acclimatise animals brought from exotic places were made – this management issue is still relevant in today's zoos (such as creating necessary environmental conditions and proper diets). The issue of the displacement of animals into different geographical regions and climatic conditions, from nature to human-created environments, is something that accompanies the discussions about the zoological garden and zoo animals (see, e.g. chapter 4). We can also recognise the different attitudes that people had towards other species. In general, it can be argued that Egyptians considered themselves rather, as members belonging to the family of animals, but in Greco-Roman culture, humans were perceived as superior to other animals (Hancocks 2001: 7). Even more, there are traces of different attitudes within the same cultures, e.g. Roman violence and brutality towards other animals was not considered as entertaining spectacles by all – Cicero, for instance, condemned the poor treatment of other animals (see, e.g. Bostock 1993: 12).

Additionally, in ancient animal collections, we may see rudimentary manifestations of different functions that the contemporary zoo holds. For example, there are indications of scientific curiosity, which is compatible with education and the general knowledge about the diversity of lifeforms. Clearly, these functions have taken a different form, but the roots of these objectives can be found in ancient history. There is, however, one exception: in the described past, there are no visible traces of species conservation. Paradoxically, the entertainment, amusement or even spectacle facet, as a significant reason for the existence of ancient animal collections, is something that most contemporary zoos are trying to distance themselves from. The remainder of this function, however, is still clearly present (see chapter 3.5). We can say with certainty that the contemporary accredited zoological garden does not keep animals for religious reasons. However, in the recent past, there have been some private animal collections[12] that have not followed the goals of the modern zoo and have kept animals for prestige – another remnant of the ancient times.

[12] Perhaps the most notorious contemporary animal collections were Michael Jackson's animal park (see, e.g. Fletcher 2010) and Pablo Escobar's *menagerie* (see, e.g. Jaramillo 2017).

2.2. The *menagerie*

Information about animal collections after the Roman empire up until the 15th century is scarce because the fall of the empire brought about a long-lasting decline of animal collections in Europe (Hosey *et al.* 2009: 20; Fisher 1967: 40). This is not to say that there were no animal collections in other parts of the world, but there is little scientific knowledge about them. There is, however, some documentation, e.g. there exist records of an enormous aviary in the Aztec Empire during the 16th century, where over 300 people were needed to take care of the birds (Mullan, Marvin 1987: 104; Fisher 1967: 43). Further, in 15th-century China, there existed collections of African animals (Hoage *et al.* 1996: 12). Also, Turks and Arabs had flourishing collections in the 16th century (Mullan, Marvin 1987: 104), and at the end of the 17th century, exotic animals were showcased in (public) tea houses in Japan (Kawata 2001: 295).

According to some approaches, animal collections evolved into *menagerie*s during the Renaissance era or possibly later (from the 15th to the 19th century) (see, e.g. Kisling 2001b). Today, even earlier animal collections may be called *menageries*, because this concept is often attributed to any kind of animal collection. Thus, some authors refer to ancient animal collections as *menageries* (see, e.g. Bostock 1993; Patrick, Dale Tunnicliffe 2013; Hosey *et al.* 2009; Mullan, Marvin 1987). What is even more peculiar is that there are authors who refer to ancient animal collections as zoos (see, e.g. Fisher 1967, Garrett 2014), thus disregarding the transformations that have taken place over thousands of years.

It is difficult to pinpoint the beginning of the *menagerie*; however, there exist some noticeable changes that support the separation of the *menagerie* from ancient animal collections. The most notable development is that the collections changed, in large part, from private to public. Since possession transferred from wealthy individuals or families to the government or public, the *menagerie* became a cultural institution. We can, however, notice some trends, which demonstrate the parallel existence of the ancient animal collections and the *menagerie*. For example, by the 16th century almost all European kings and princes owned a personal animal collection that offered entertainment to the court (Hosey *et al.* 2009: 20), but at the same time 16th century *menagerie*s started to appear in the centres of large European and North African cities (e.g. Prague, Siena, Cairo, Constantinople) (Hoage *et al.* 1996: 14).

The emergence of the *menagerie* is closely connected to the growth of knowledge about wild animals, which enabled the improvement of keeping conditions in *menagerie*s (Kisling 2001c: vii). Besides turning into public institutions, we can also notice some additional features that are specific to *menagerie*s: exhibiting as many different species as possible, displaying captive animals in taxonomical arrangements, keeping animals in barred cages, limited educational and scientific programs, and placing recreation as a primary goal (Kisling 2001c: vii; Robinson 1996: x). Thus, we see a contrast with the contemporary zoo in its functions and exhibiting principles (see chapter 3). Regardless of the fact, that there is no consensus on what precise criteria these

changes should be estimated against, the noticeable alterations themselves are enough to denote the transition from ancient animal collections to the *menagerie*.

After the middle ages, and despite the emergence of the *menagerie*, many of the European animal collections still belonged to bishops, popes, rulers, and wealthy aristocrats, so that the access to collections was restricted to a selected party. In addition to these permanent collections, travelling circuses had significant importance. Often, their main attraction was a rhino, an elephant, or a bear, and consequently, some exotic animals reached a wide audience. Moreover, sometimes the travelling circuses became stationary, especially, if the collections had too many animals to continue travelling (Strehlow 2001: 80).

The turning of private collections into public collections in massive numbers took place quite late, i.e. at the end of the 18th century and the beginning of the 19th century. Some authors, thus, consider precisely this period to be the birth of the *menagerie* (see, e.g. Rabb 1994). The transition from private to public collections was part of a more substantial cultural change that went together with the growth of civil society and democracy. The *menagerie* became a compulsory part of every major city in the West (Lee 2005: 89). Thus, the responsibility to financially support *menagerie*s moved from higher classes to the institution's visitors (Kisling 2001b: 37). Prices of tickets were low so that people from industrial cities could rest in a natural environment (Lee 2005: 87). Thus, the *menagerie* was not merely a place that exhibited exotic animals but was also a park that enabled people from urban areas to stroll in a green environment. We can see, that this idea has been carried over to the contemporary zoo, where the public sees the zoological garden as a place to spend leisure time in a park-like setting (see chapter 3.5). Likewise, Hediger (1969: 67, 72) has referred to zoos as 'emergency exits to nature' that offer the visitor an opportunity to spend time in a natural environment (see chapter 3.7 for a discussion on the naturalness of the zoo).

There are some chronological overlaps between the last era of the *menagerie* and the emergence of the zoological garden. The transformation was a time-consuming process that took place at different times in various countries without much dramatic change, and it is thus difficult to pinpoint the exact time of transition (Kisling 2001c: x; Kohlstedt 1996: 4). There are, however, some characteristics that describe the transition from the *menagerie* to the zoological garden, e.g. the changed functions and goals. Still, there are plenty of animal collections that do not operate according to the standards of international umbrella institutions and are thus despairingly called *menagerie*s – without consideration for whether their aims are similar to those of accredited zoos (Graetz 1995).

We can see that the *menagerie* is a clear predecessor of the contemporary zoological garden as a public institution that needs to account for people's perceptions. As we discuss in this dissertation, the public's perceptions and attitudes are a significant factor in the semiotic analysis of the zoo and its changed functions. The remnant features of the *menagerie* still create difficulties for the institution of the zoo today, which only increases the complexity of this research object.

2.3. The development of the contemporary zoological garden

The birth of the contemporary zoological garden is often marked by the establishment of animal collections that had the aim to develop science and conserve species. However, collections that were established in the 19th century started calling themselves zoological gardens or simply zoos[13]. In some cases, this was done merely to be fashionable, because zoos were considered, as opposed to the *menagerie*, professional institutions – regardless of whether they actually were professionally inclined or not (Kisling 2001b: 38).

Some authors mark the birth of a modern zoo with the establishing of the *Tiergarten Schönbrunn* in Vienna (1752) (see, e.g. Hochadel 2005, Fisher 1967). Others claim that *Jardin des Plantes* in Paris (1793) (see, e.g. Hosey *et al.* 2009) or *Tierpark Hagenbeck* in Hamburg (1863) (see, e.g. Graetz 1995) was the first. However, many authors dealing with the history of the zoological garden, mark the beginning of the zoo in 1828, when London Zoo was established (see, e.g. Strehlow 2001; Hochadel 2005; Hosey *et al.* 2009). In any case, it can be seen that the first (modern) zoo(s) was/were established in Europe. Moreover, it is likely that the European zoological gardens were considered as examples to be followed by American zoos (the first zoological garden there opened in 1874 in Philadelphia (see Hanson 2004: 3)).

To avoid becoming preoccupied with the issue of pinpointing the first contemporary zoological garden, we can once again turn our attention to the characteristics that enable us to describe the transition from the *menagerie* to the contemporary accredited zoo, that has taken on the responsibility of adhering to specific standards and goals. The exhibits in contemporary zoos are more naturalistic as compared to the era of *menagerie*s, e.g. "[b]y the early twentieth century, a return to the parklike setting of a hundred years earlier […], signalled a new stage in zoo development, at once new and old – innovative yet with a clear tradition" (Kohlstedt 1996: 6). Instead of taxonomic ordering, ecological[14] or zoogeographic[15] arrangement of animals is often used; continuous search for knowledge (ecological, biological, dietary, etc.) about animals is prevalent; educational, scientific, and nature protection programs are continually being developed; and animal welfare is an integral part of the everyday management of zoo animals.

Although the zoos established in the 19th century received much support from nature associations (e.g. the associations of nature lovers), most of the zoological gardens were still established and supported by scientific institutions

[13] The term zoo was coined in 1869 by British music-hall artist Albert Vance in his song *Walking in the Zoo* (Rothfels 2002: 38).

[14] Animals who belong to different species but have adapted to the same ecological region are kept near each other or even in the same enclosure (Mullan, Marvin 1987: 69).

[15] Animal enclosures are arranged in the order adhering to the origin of species (Mullan, Marvin 1987: 69).

(Hochadel 2005: 38). During that time, an interest in natural history was rising, which also meant that natural history museums and zoological gardens became more relevant (Hosey *et al.* 2009: 21). Thus, the zoo had taken on the responsibility to develop science and offer direct access to exotic animals. However, in reality, most of biologists preferred deceased animals for carrying out morphological research. Scientifically orientated zoos established in the 19th century could not fulfil the goal of being science centres, because breeding and acclimating animals was difficult due to little knowledge. Additionally, ethological observations remained as isolated cases (Hochadel 2005: 39).

Therefore, the zoological gardens had to abandon or redefine their goals and ask for support from elsewhere to remain open and functioning (see, e.g. Mullan, Marvin 1987: 109–110). For example, the London Zoo was initially accessible only to members of the Zoological Society of London but became open to the public in the middle of the century (Hochadel 2005: 38–40). Due to the stated difficulties, the zoo once again became a recreational institution, although, for scientific purposes, efforts were made to tie the recreational facet with the educational function.

Even though many zoos were not able to flourish as scientific establishments, there were a lot of outstanding people, who aided the development of the zoological garden in the 19th and 20th century. One of these individuals was Frédéric Cuvier who looked after the animals in the zoo of *Jardin des Plantes* for over 30 years in the middle of the 19th century. Cuvier's contribution came from his profound interest in what is nowadays known as animal welfare and enrichment. In his first handbook on zoological gardens, he expressed concerns that so much remained to be done, and nearly nothing had been written (Hosey *et al.* 2009: 22). Another influential person in reforming the zoos was Carl Hagenbeck who is known for designing and building natural-looking areas – his vision was a zoological garden with free-roaming animals, a place where the public is separated from the animals by a natural barrier (e.g. moat) not iron bars. In the 1890s Germany, he developed panorama expositions, where animals from different species but the same ecological regions were exhibited together. Different landscapes were recreated, and arrangements of plants were added (Strehlow 2001: 103) (see also chapter 3.7). It is noteworthy that Hackenbeck also delivered indigenous people from all over the world to be presented to European visitors and scientific societies (Rothfels 2002: 9).

The onset of World War II stopped the evolution of the zoo, mainly due to economic reasons, or even took the zoological garden to a pre-war state due to the war's demolishment and destruction of gathered information. Thus, the systemic scientific work in zoos started to be carried out only in the 20th century when the difficult period, following the war was overcome (Strehlow 2001: 106–108). These events are the reason why the second half of the 20th century can be referred to as the new era of the zoological garden. Animal rights movements also began gaining more attention, with such thinkers as Peter Singer (e.g. 1975), Mary Midgley (e.g. 1978), and Tom Regan (e.g. 1983). Also, the public started expressing concern about the keeping conditions of animals

(Hosey *et al.* 2009: 33) and animal welfare in general (see also article III). In the 1990s zoo animals were included in many countries' legislation on animal welfare (e.g. Kohn 1994). However, the first act to concentrate specifically on wild animals in captivity was the Zoo Licensing Act[16] (1981) enacted in the United Kingdom. Also, in the second half of the last century, professional skills developed in keeping animals in zoological gardens, and animal keeping standards were issued by the zoo associations (e.g. the guidelines for keeping mammals published by AZA (1997)).

Even broader was the impact of Hediger, who, according to some sources, was the leading figure in studying animal agency and subjectivity (see, e.g. Churlew 2011; Maple, Perdue 2013). He addressed the issue of wellbeing by including the subjective experiences of an animal. However, there is evidence of scientists researching such issues from earlier times, as was the case with Cuvier in France. Also, zoologist Robert Garner spent time in the Congo wilderness to learn about great apes and wrote (in 1896) about the conditions necessary for keeping them in captivity (Hancocks 2001: 59–61). In addition, Hediger (1964[1950]) refers to Clarence Carpenter and Robert Yerkes as dealing with social issues of captive primates. Hediger himself dealt with animal psychology, personality issues, and the subjectivity of not only great apes and primates in general, but, we could argue, as something pertaining to any animal that found him- or herself in the zoo.

Due to the necessity of engaging the public, zoological gardens had to make additional changes, because, in the second half of the 20th century, people had more opportunities to spend their free time in other institutions besides the zoo (e.g. theme parks, amusement parks, grand sports events, etc.), and this offered zoological gardens serious competition (Strehlow 2001: 110). The revenue raised through visitor attendance was and is crucial for zoos to continue functioning. The zoological gardens belonging to the private sector rely on income earned from ticket sales, renting available spaces, and special events like animals' birthdays, keeper-talks, excursions, etc. (Kawata 2013: 11; see also chapter 3.5). To offer exciting experiences, new or already existing zoos of the 20th century transformed into bioparks, and establishments that concentrated on ecosystems with immersion exhibits (Hosey *et al.* 2009: 36–37; see also chapter 3.7).

Since the 1970s, the number of associations[17], which assisted and still assist in coordinating the species conservation activities of zoological gardens, grew. The number of species that were threatened or going extinct increased concern for other animals and encouraged to take actions in conserving biodiversity. For this reason, the goals of accredited zoos became nature and species conservation,

[16] URL: www.legislation.gov.uk/ukpga/1981/37/pdfs/ukpga_19810037_en.pdf.

[17] Naming just some: 1975 *Convention on International Trade in Endangered Species of Wild Fauna and Flora* — CITES, 1981 *Species Survival Plan* — SSP; 1992 European Association of Zoos and Aquaria; 1993 *World Zoo Conservation Strategy* — WZCS; 1994 *European Endangered Species Program* — EEP.

which also meant that the activities of zoos reached beyond their physical barriers and location, because next to *ex situ* species conservation, *in situ* species conservation also became relevant (see chapter 3.3).

The most significant functions of the 21st century accredited zoo is (direct) species conservation and sustaining biological diversity (see, e.g. Zimmermann *et al*. 2007; chapter 3.3). The diversity of zoos is now higher than ever, indicating that it is complicated to make generalisations (Hosey *et al.* 2009: 42), but it has to be acknowledged that the general characteristics brought out before, which stress the changed functions of the zoo, serve as a self-representation of any accredited zoo. However, even in contemporary accredited zoos, there may be evidence of different eras. In zoological gardens that are still going through the transition, there can exist exhibits based on several different displaying principles. Still, for zoos themselves, there are changes taking place, and the fact that zoological gardens have common goals that principally distinguish the contemporary zoo from its more traditional form should be considered. On the other hand, there is the question of how efficiently zoological gardens have been able to communicate their changed functions to the public, because different perceptions of what constitutes a zoo or what kind of organisation it is, is evidently affected by the history of keeping other animals in captivity. The evolution of the zoological garden reflects the broader cultural history of the meaning that other animals and nature have held in our society.

The changes of the zoological garden, especially during the last century, are undeniably evident. Zoo advocates often emphasise the clear break between historical practices of keeping wild animals in captivity and the reasons for the existence of the contemporary zoo (Kemmerer 2010: 37). The increase of public awareness of environmental decline, the need for nature conservation, accompanied by advances in legislation regarding the function of the zoo, and animal welfare (see, e.g. European Commission 2015), have given zoological gardens a new direction in their missions. However, the roles or functions of zoos are being debated and critically revised (see chapter 3). Zoos have been under public pressure to become ethically acceptable institutions.

Many of the different layers that have fulfilled a specific role in the history of the zoo can still be perceived to exist simultaneously in the zoological garden as we know it today. For example, the perception of exercising dominion over other animals for utilitarian purposes, keeping animals for their aesthetic purposes, experiencing zoos as recreational facilities, and discerning scientific, educational, and conservational facets – the concurrence of all these aspects forms a very complex phenomenon. The zoo is saturated with often incompatible historically gathered facets, which form the basis for opposing views. As we have discussed (in article IV), there are many co-existing perceptions and attitudes towards animals that can be simultaneously held by different interest groups. The same is true for perceiving zoos in general, with recreation being the most deeply rooted facet for the visiting public (see chapter 3.5), which might impede the zoo's educational and, more widely, conservational endeavours.

3. MULTIPLE FUNCTIONS AND NATURES OF THE CONTEMPORARY ZOOLOGICAL GARDEN

> The purpose of keeping any collection of wild animals in confinement should be threefold; first, to conduct as complete as possible a biological study of every species, […] second, to aid severely endangered species by setting up, under ideal conditions, protected breeding groups and, eventually, a reintroduction programme, so helping to ensure their future survival; thirdly, by the display and explanation of this work to the public, to persuade people of the vital necessity and urgency for the overall conservation of nature. (Durrell 1976: 108)

Despite the evolution of the zoological garden, there is still much debate over whether the goals of the zoo are being achieved or not. This chapter analyses the favourable and unfavourable arguments pertaining to the accomplishment of the contemporary zoological garden's missions; to reveal how and to what extent the changed functions of zoos are implemented in practical endeavours. We shall also discuss the challenge for the contemporary zoo to find a balance in its activities. As an interconnected topic, in chapter 3.7, we will explore the multiple natures of the zoological garden, i.e. how the zoo environment itself serves as a message for the public. Also, we will give an overview of interpreting the environment in the context of the zoological garden.

3.1. The changed concept and meaning

As discussed in paper I, there is no commonly agreed upon definition of the zoological garden, and thus there might be discordances between various parties as to what is denoted by the given term. Due to the burden of the past, it has become necessary to employ new concepts and alter already existing concepts to change the perception of the zoo. There exist official definitions, which refer to standards that exist in accredited zoological gardens, e.g. the Association of Zoos and Aquariums (AZA) defines a zoo as:

> [A] permanent institution which owns and maintains wildlife, under the direction of a professional staff, provides its animals with appropriate care and exhibits them in an aesthetic manner to the public on a regular basis. The institution, division, or section shall further be defined as having as their primary mission the exhibition, conservation, and preservation of the earth's fauna in an educational and scientific manner. (AZA 2018: 14)

A similar definition, to the above quote, states that the zoo is a "[…] professionally managed zoological institution […] having a collection of live animals used for conservation, scientific studies, public education, and public

display" (Regan 1995: 38). Together with the development of the zoo, there is an aspiration to modify the denotative content of the term 'zoological garden', to avoid the unwanted connotations that accompany this expression.

Another possibility in the attempt to change the meaning of the concept of the zoo is represented by cases where expressions are used, which contain the term zoo but modify it in a way to oppose the general perception of the zoo as a place that merely exhibits wild animals. Some examples of these terms are 'unzoo' and 'nooz'. 'Unzoo' presents a vision of a zoo without cages or enclosures, it is a "[…] place where the public learns about wild animals, plants and ecosystems through interaction with and immersion in original or recreated natural habitats" (Coe, Mendez 2005: 1). 'Nooz' represents a composition of the words 'new' and 'zoo', which indicates a non-exploitative and safe environment for the animals (Kemmerer 2010: 37).

As a third opportunity, the meaning of the term 'zoo' itself is not modified, but is substituted with some other expression. A quite widely used concept is 'ark', which is derived from Noah's Ark and is meant to emphasise the human dependence on nature: "[w]e are all in the same boat! Noah's Ark was the lifesaver for animal biodiversity after human behaviour doomed the whole world" (Fa, Funk, O'Connell 2011: 113). The concept of the ark thus indicates that captivity (and eventual reintroduction) is a valuable tool in conserving wildlife. The ark carries a strong symbolic meaning and is employed in an array of zoo-related expressions, such as in the names of zoos (e.g. Noah's Ark, Zoo Farm), in the titles of zoo themed books (e.g. *Ethics on the Ark: Zoos, Animal Welfare and Wildlife Conservation* (Norton *et al.* 1995), *After the Ark? Environmental Policy-Making and the Zoo* (Mazur 2001), *The Stationary Ark* (Durrell 1976)), and in the names of conservation programs (e.g. Frozen Ark, Amphibian Ark).[18] The ark concept has been criticised for conveying the wrong message in the zoo discourse (see, e.g. Fa *et al.* 2011), i.e. captivity is not a short-term solution and zoos do not have two animals of every species. In addition, zoological gardens are engaged with breeding animals and not merely retaining the individuals they already have under their care.

When it comes to naming zoos as contemporary institutions, many opt for equivalents not related to religious origins. Several institutions formerly known as zoos are now called 'bioparks' or 'conservation parks'. Some zoological gardens have also added expressions such as 'botanical garden' to their names, emphasising the importance of landscape and plants next to the animals (Maple 1995: 25).

Terminology associated with the zoo, as it exists nowadays, came into use during the 18th and 19th century. It is noteworthy that a lot of the zoological garden's terminological base is analogous to that of the natural history museum and botanical garden (Kisling 2001b: 1). Even in modern times, one can find observations that compare the zoo to a 'living museum', e.g. "[z]oos, like

[18] A similar trend, although on a smaller scale, can be seen about the concept of 'Eden' (see paper I).

museums, are designed to present animals in ways that allow humans to see and understand them in particular ways" (Adams 2004: 3). However, there are also comparisons that stress the differences between zoological gardens and museums, precisely because the former deal with live animals while museums do not (see, e.g. Lee 2005: 32). Concepts like the collection, exhibit, exposition (also the organising principles of exhibits and information signs) refer to the zoo's close association with the museum. These museum-originated concepts are still widely used by zoological gardens themselves. In the second half of the last century, some authors argued that the cultural status of the museum and the zoo was different, stating that zoos were representatives of 'low culture', whereas museums were more sophisticated and embodied higher culture (Mullan, Marvin 1987: 122–126).

Similarly to the concept of the zoo, other expressions bear negative connotations and thus have acquired more acceptable alternatives. For example, excess animals are called 'surplus' animals. These are the individuals who are, for various reasons, unwanted by the zoo. If there are no other acceptable zoological gardens to give the animals away, then they are killed, or, according to zoo terminology, 'culled'. One of the most important expressions that has been substituted is 'cage', which is often renamed as an 'enclosure', because:

> In the zoo world, 'cage' is a dirty word. Zoo animals are no longer allowed to live in cages, as it projects a feeling of sterile, cold, insensitive living conditions. It is also a reminder of what zoos are no longer supposed to be. Instead, terms like 'captive environment', 'zoo habitat', and other more politically cosy designations are being substituted for the 'C' word. (Robinson 2004: 72)

If some of the substitutions (e.g. surplus animals, culling) may be in use due to the acceptability considerations of the public, then such words as 'zoo' or 'cage' may have also been changed due to the physical transformations of the institution itself.

The original definition of zoological gardens is derived from the general concept of the garden "[…] a garden is an artificial and controlled reconstruction of elements from the natural world which have been chosen and then ordered for presentation in an alien context" (Mullan, Marvin 1987: 68). In the context of the zoo, the elements are animals. Described in such a manner, the challenge for the zoological garden lies in relating the animals with the artificial (designed environment) and thus has the intention to present the natural in some form (see chapter 3.7). In attempts to avoid connotations where the presented animals are there to be looked at, attention is diverted by stressing that "[…] while the exhibition is [its] most visible facet, education, conservation, and research are fundamental commitments" (Beardsworth, Bryman 2001: 93).

3.2. Scientific research

Much of the scientific work carried out in zoological gardens concerns the animals inhabiting the institution (see also chapter 1.1), which is understandable considering that the research is grounded on the necessity to improve and maintain the health of animals (in the 1960s the aim of the research was to deliver more offspring (Conway 1969)). Thus, the issue of animal welfare in the zoo's everyday activities is essential (cf. paper I and III). However, focusing on primarily the effects of captivity on wild animals has been criticised, because studying the complications arising in captivity (e.g. dietary, behavioural, and reproductive problems) do not contribute to *in situ* conservation:

> The zoo community is currently preoccupied with environmental enrichment, which, while often conferring some welfare benefit on zoo animals, often has little to do with conservation. Unless zoos can demonstrate a clear and substantial role in reintroduction programmes, much zoo research on reproductive biology is only likely to be of importance in helping zoos to maintain their supply of replacement animals. (Rees 2011: 338)

Favouring research topics on behaviour and welfare over genetics, ecology, or conservation (see, e.g. Semple 2002) can be deemed as a severe problem. Another significant (and perhaps the most provocative) problem of the zoo's scientific endeavours pertains to species bias, i.e. most of the research carried out with relevance to animals, is concerned mainly with mammals (especially primates, large cats, bears, and elephants). Welfare studies that concentrate on fish, reptiles, amphibians, and invertebrates constitute less than 2% of all the research published from 1985–2004 (Melfi 2009). Described bias may be related to the complexity of animal Umwelten (cf. paper I), indicating that the zoo environment may affect species differently. It is more difficult to grant animals with rich Umwelten the necessary qualitative space than for other species, whose Umwelten are not as rich in perceptual and effector cues. The more complex the animal's Umwelt, the more complicated it becomes to create the necessary keeping conditions, and thus arises the need for researching the behaviour of these animals.

Research carried out in zoos is less expensive than *in situ* field work, but in interpreting the results of *ex situ* findings, the unnatural conditions that these studies have been conducted in are often referred to (Rees 2011: 339). To cite an instance, for decades the wolf pack was brought as an example in cases where social relations and statuses (e.g. alpha, omega) were discussed, but in captivity wolf packs are often composed of non-related (and often also same-sex) animals who do not express the natural social relations of wolves; the natural social composition being a pair of wolves with offspring of several years (Mech 1999). Thus, the so-called alphas, in a typical social grouping, are simply parents guiding their offspring. This example indicates the necessity for considering animals' Umwelten in social communication. It should be

determined, which (social) meaning-carriers are absent, present, and excessive and how these affect the semiosic activity of an animal. There is a need to analyse how the given social structure (e.g. naturally or artificially composed wolf pack) itself influences animal communication; and, in turn, how the communication influences the animal's Umwelt. Thus, careful consideration is in order when extrapolating the results of information gathered in a zoological garden setting to animals' *in situ* conspecifics.

Another point of critique is the small number of animals that are involved in the studies (Hosey *et al.* 2009: 250). Although small samples are explained by the fact that the animals are either rare or they are too big to keep in large numbers, sampling size still affects the credibility of the research results. Whether there are possibilities to draw conclusions from research on zoo animals that could be applied to *in situ* conspecifics, depends to a certain degree, on whether the animals in zoological gardens are considered wild or domesticated (see also chapter 4.1). If, for example, the results of zoonotic disease or reproductive physiology studies are more easily extrapolated beyond the barriers of the zoo, then more opposition may be encountered, as discussed above, when interpreting the results of behavioural research as species-specific or relevant to both, *in situ* and *ex situ* animals. In addition, part of scientific studies pertaining to species conservation is directed at granting the animals who are being reintroduced with necessary capabilities to survive in their natural habitat outside of the zoological garden (see, e.g. Rees 2011: 350–354). This endeavour presupposes thorough knowledge of animals living *in situ*. We have analysed the complications that arise in creating the necessary conditions for the animals who are meant to be reintroduced, and argued that these difficulties emerge partly due to welfare requirements and people's perceptions (see articles II and III). Animal managing principles often lead to differences in *ex situ* and *in situ* environments and these differences may prove to be critical regarding the survival of the animal upon reintroduction. For example, this may be the case with large predatory species who lack hunting (also prey locating) skills and are not accustomed to other large carnivores competing for the same resources (see, e.g. Scheepers, Venzke 1995). In such instances, the zoo animal cannot perform all the species-specific functional circles, not all of the species-specific eco-fields are present, or the animal is not able (or not allowed) to make use of all the eco-fields (i.e. predatory behaviour and avoiding other predators).

In addition to communicative capacities, the genetical material of animals should be conserved. The Frozen Ark project aims to achieve latter – it has collected the genetic material from over 200 endangered species. However, from the gathered material 15% is of species that can no longer be found *in situ* (Clarke 2009).

Although there are certain tendencies in many of the studies carried out in zoological gardens, it can also be argued that there are research topics that have a broader influence (Hutchins, Thompson 2008; Rees 2011; see also Hediger 1964[1950], 1969). For example, much importance is put on sociological research, which enables, by tracking and questioning visitors, to gain feedback

on zoos' educational practices and visitor experiences (see, e.g. Ebenhöh 1992, Patrick, Dale Tunnicliffe 2013). It has also been proposed that zoological gardens have the potential to be involved in urban planning as advocates for nature within cultural landscape, to emphasise the need for nature in human lives (Wharton 2007). We also propose that our semiotic analysis, as a scientific endeavour pertaining to the zoo (although not carried out by the institution of the zoological garden), serves as part of a more comprehensive study, helping to conceive the inner tensions of the zoological garden as a functioning institution. This is done by bringing forth the different facets and their interconnectedness in the zoo as a communication and communicative environment.

3.3. Species conservation

Conservation activities in the contemporary zoological garden can be either direct (e.g. providing animals for reintroductions, assisting in translocations, breeding for sustaining genetic diversity, etc.) or indirect (such as research projects, visitor education, general conservation advocacy).[19] It has been argued that advancing nature education (see chapter 3.4) is one of the leading conservation activities of the zoo (Zimmermann, Wilkinson 2007). However, zoological gardens are also engaged in the direct protection of species, by saving them from extinction, and relocating and reintroducing the animals to their *in situ* environment (Rabb 1994). The International Union for Conservation of Nature (IUCN) has formed guidelines for conserving *ex situ* populations and states that *ex situ* conservation should be viewed as an alternative to *in situ* species conservation only in extreme cases, and, where possible, *in situ* and *ex situ* measures should be combined (IUCN 2014). Taking on the responsibility of species conservation does not only imply retaining the zoo animal's species-specific communicative capabilities, social relations, and Umwelt, but zoological gardens must also convince the public about their success with conservation activities. It is equally important that zoos' contributions would be measurable.

It has been argued that zoological gardens are deviating from their function of species conservation because analysis shows that these institutions often emphasise their involvement in specific and well-known exemplary projects of reintroduction (e.g. the Arabian oryx (*Oryx leucoryx*), California condor (*Gymnogyps californianus*), or black-footed ferret (*Mustela nigripes*)). However, in reality, zoos are neither the primary providers of animals nor the managers of most reintroduction programs (Fa *et al.* 2011: 197). Some authors even state that zoo-bred animals are rarely used in these programs (Rees 2011: 339). Thus, the value of zoo-based breeding programs becomes problematic. These

[19] They can also be local (e.g. reintroducing local animals in local regions or collecting funds for this local reintroduction) or international (e.g. supporting conservation activities in another region).

concerns are troublesome, considering that there is a conviction that direct *in situ* conservation should constitute a considerable reason for the existence of the contemporary zoological garden (Zimmermann, Wilkinson 2007).

There are additional controversial aspects pertaining to direct species conservation, such as species bias that was already encountered in relation to scientific research. However, in animal welfare, the reason for bias might stem from the complexity of animal Umwelten, but in species conservation, this species bias exists primarily because of the need for public support. In other words, it can be argued that to communicate a species conservation message and to achieve a set goal, charismatic species are employed. These animals exhibit a high potential to engage people's emotions and trigger actions necessary for conservation (e.g. petitioning, fundraising, and sustainable behaviour). We have discussed in article IV that to develop visitors' awareness of conservation issues, the zoological garden seems to operate with a two-stage strategy of animal personification and de-personification. The problem is, as we have shown, that different attitudes and perceptions are often contradictory and create public debate about the zoo's conservation activities.

Even if animal welfare is compromised due to species protection activities, the results of reintroductions are not always satisfactory. By the year 2002, of all the projects that were aimed at ensuring self-sustainable populations, only 10% succeed (there were a little under 200 projects) (Stanley Price, Fa 2007). Newer evidence suggests that the outcome of reintroductions[20], although increased, remains quite low, and tend not to exceed a 23% success rate (Seddon *et al.* 2014). The failure of many reintroduction projects indicates that even nowadays it is difficult to consider all of the necessary factors in the lives of other animals for ensuring their *in situ* survival. This realisation raises doubt about the capabilities of zoological gardens to breed animals for reintroductions, may discredit the value of scientific studies carried out for conserving species (see chapter 3.2), and undermine the reasons for keeping animals in captivity (see papers I and III).

We should recognize that zoos have the potential to contribute to species conservation in other ways than through reintroduction or providing animals for reintroductions. It has been argued that zoological gardens are vital in aiding reintroductions by employing their other resources (such as knowledge, facilities, and funds) (Fa *et al.* 2011: 198–199). This claim is also echoed in the WAZA (2015) conservation strategy. Zoos' financial aid has proven to be crucial in supporting *in situ* conservation projects if the latter want to be viable (Rees 2011: 357). The funds, however, are mostly the result of the general public supporting the conservation activities, which indicates that educating people on the issues of conservation is paramount.

[20] In this study, translocations are also taken into account, meaning that besides *in situ* to *ex situ* reintroductions, animals moved from one *in situ* location to another are included.

3.4. Nature education

Zoological gardens state that they have an important educational function to fulfil. In addition, the European Commission (2015: 29–33) has made the educational role of zoos compulsory for EU member states. The educational function of zoological gardens can be considered threefold: directed at formal education (i.e. as connected to school programs); fulfilling the duty of non-formal education (i.e. directed towards visitors and a broader public of all ages); and informal learning that stems from people's personal interests, but also includes unintentional learning (Kellert, Dunlap 1989; Falk, Dierking 2002). The totality of the educational activities that the institution of the zoological garden can offer is called the 'zoo education' (Zareva-Simeonova *et al.* 2009).[21]

Already at the end of the 1960s, there were observations, which stated that the educational functions and methods of zoological gardens are different from teaching carried out in classrooms (see, e.g. Conway 1969). In addition, the zoo's learning environment is described by short contact with the learning material; exposure to a lot of competing stimuli, which leads to dispersion of attention; social relations being usually at the centre of attention; and no sanctions if the visitor does not employ the material at his/her disposal (Bitgood 2002). Zoos possess a vast potential to impart educational messages (e.g. through exhibits, signage, excursions, keeper-talks, etc. (see also chapter 3.7)), which should have a positive impact on visitors' knowledge about nature protection and conservation, and should have an influence on the behaviour of visitors in the context of conservation (Rabb 1994). However, there is no agreement in the relevant literature, whether zoos achieve their educational potential (Rees 2011: 314).

There are supporting and confuting claims about the capability of zoological gardens to be involved in nature education advancement. Some authors express opinions that zoological gardens only confirm pre-existing knowledge and attitudes (Lindemann-Matthies, Kamer 2005) and that visitors of zoos are already more educated in the matters that concern nature conservation than people who do not visit zoos (see Mason 2010). Alternatively, some authors claim that there exists a significant inconsistency between the awareness and comprehension of different conservation concepts by visitors, and what the zoological garden is imparting regarding conservation (Fa *et al.* 2011: 248). This discrepancy further increases the challenge to educate visitors. What the message is, when animals are exhibited in captive settings, is another problem. Zoos aim to display wild animals behaving naturally in a natural surrounding; however, as stated in article I, people visiting zoological gardens expect the

[21] Also, zoos themselves can be considered as important educators for training *in situ* and *ex situ* conservationists in a variety of disciplines, such as veterinary medicine, researchers, field biologists, educators, animal handlers (Fa *et al.* 2011: 72).

most unnatural behaviour of many wild animals[22], i.e. for them to show themselves to and interact with humans. In addition:

> Some zoos exhibit animals in inappropriate social groups (e.g. pairs of coatis) or in inappropriate mixed-species groups (e.g. wallabies and blackbuck) that send a questionable educational message. If a normally solitary animal is kept with others of the same species, or species from different habitats (or even different continents) are housed together, visitors are likely to learn little about normal animal behaviour or ecology. (Rees 2011: 316)

Still, some studies claim that zoos raise people's awareness about matters and questions pertaining to nature, and also guide people to certain behaviours (Smith, Broad, Weiler 2008). However, long-term research is scarce, and the results are once again non-conclusive, or supportive arguments can be found for either case (see, e.g. Falk *et al.* 2007). Thus, it is difficult for zoos themselves to assess whether they are successful in their educational endeavours (see, e.g. Mason 2010). Some authors insist that those promoting the educational role of the zoological garden are often biased by having a direct interest in advocating zoological gardens (see, e.g. Rees 2011: 316).

Another focal point in the zoo education is the discussion about the means of conducting nature education. For example, some studies claim that visitors read the signs of the enclosures and can recall what they have read; also, that the readability of the signs grows when the signs are knowingly designed and placed (Plaatsman 1996). However, some studies have found that the information conveyed by signage is dry, passive and does not fit into the primarily non-formal and informal learning environment, because signs are unable to compete with other stimuli (Lindemann-Matthies, Kamer 2005). In paper I, we state that the analysis of signage can reveal what zoological gardens consider as relevant information, and what kind of discourse and rhetoric is used, i.e. what kind of attitude does the zoo itself have towards animals and towards nature more generally (see chapter 3.7). So, the measure of the educational impact of the zoological garden's signage should not be limited to finding out whether people read the signs, but rather how do people interpret the totality of messages conveyed by a sign.[23]

There is a general disagreement regarding the educational value of informative signs, but there is a common consensus on the matter that human contact (e.g. with guides, animal trainers, and keepers) has a positive effect on the goals of nature education (see Moss, Esson, Bazley 2010; Hodak 2008). Storytelling and narrative structures that encourage people to engage with animals in an affective manner create moving and exciting experiences (see, e.g. Moyer-Gusé

[22] See chapter 4.1. for the discussion of whether the zoo animals are wild or not.

[23] For example, does a sign next to an exhibit reinforce the feeling of animals being on display for humans? Does the sign provide information similar to museum exhibits? Is it made out of recyclable materials? Is it interactive (i.e. what other senses can one use when perceiving the sign?).

2008). It is quite commonly understood that zoos' educational activities "[…] often aim to 'inspire' and create a 'sense of wonder' and tapping into visitors' emotional response to animals may enhance the power of this messaging" (Fa *et al.* 2011: 242–243). It has been noted that humans have a strong internal tendency and biological need for emotional affiliation to other living beings, also known as the biophilia hypothesis (see, e.g. Wilson 1984).

It is becoming more evident that learning is not a linear process, i.e. "[…] increasing knowledge through education, whether related to health, safety, or conservation, does not lead to a change in behaviour" (Schultz 2011: 1080). We are not arguing that there is no connection between attaining knowledge and behavioural change, but we believe that a more in-depth approach is necessary. The way that the contemporary zoological garden presents itself and communicates its message of species conservation through its exhibits will be discussed in chapter 3.7. However, we must admit that zoo signage, keeper-talks, guided tours, animal shows, etc. have not received much attention in this dissertation, despite them constituting undoubtedly a relevant part in zoo semiotics (see chapter 1.2). The study of the means for communicating a conservational message, in the semiotic framework, is more firmly grounded in edusemiotic research (e.g. Semetsky 2010, 2017; Stables, Semetsky 2015) than in zoosemiotic inquiry. To provide a thorough analysis of the educational means of the zoological garden, we should develop further the connections between edusemiotics, conservation psychology (Clayton 2012; Bitgood 2002), ecopsychology (Roszak, Gomes, Kanner 1995; Conesa-Sevilla 2006; Vakoch, Castrillón 2014), deep ecology (Næss 1989; Drengson, Inoue 1995), and other relative fields as they are manifested in the context of the zoo. We believe this to be a viable research area for future studies because nature education in the zoological garden needs a much more detailed consideration where edusemiotic theories, that are applicable not only in formal education but also in non-formal education and in informal learning environments, are more thoroughly developed. This endeavour falls beyond the scope of this dissertation, which offers a more general framework in investigating the different facets of the zoological garden.

Despite the educational goal of the zoo, there is plenty of research that claims that people's main aim for visiting zoos is to spend their recreational time with their family and friends (Puan, Zakaria 2007).

3.5. Recreation

The recreational function is notably underrepresented in scientific literature as compared to other functions of the contemporary zoological garden. A reasonable explanation for this may be seen in the fact that zoos are hoping to distance themselves from the historical burden of exploiting animals for human pleasure and the entertainment of families (see chapter 2). Another possible explanation lies in the self-evidence of the recreational facet, which makes

emphasising it seem obsolete, i.e. "[w]hen posing the question of why visitors spend their leisure time coming to zoos, one rather obvious answer is that they want to have fun and enjoy themselves"[24] (Sickler, Fraser 2009: 313). Recreational setting draws people to the zoological garden, but once the visitors are already there, then the zoo can also undertake conservation education activities. We can recognise that the zoo needs to be attractive and compete with (other) entertainment-oriented facilities.

Mostly, the recreational or entertainment aim of the zoological garden is discussed regarding visitor studies, i.e. when researching the reasons for visiting the zoo or when the zoo's functions are arranged in a prioritising manner (see, e.g. Falk *et al.* 2007, Turley 1999, Patrick *et al.* 2007). Overall, in the relevant literature, the recreation facet of the zoological garden receives only brief mentions next to other missions (e.g. Carr, Cohen 2011; Carr 2015). Recreation is acknowledged as a primary reason for attendance and as a mean to earn revenue. Sometimes it is referred to as an inhibiting factor for the educational role of the zoo (see, e.g. Clayton, Fraser, Saunders 2009) or as an accompanying role of education (e.g. entertaining education) (e.g. Patrick, Dale Tunnicliffe 2013). Recreation on its own, compared to other functions, serves as a mere footnote for authors who are inclined to support the zoo's more ethically acceptable activities. However, many zoological gardens themselves still often mention recreation in their mission statements (Patrick *et al.* 2007). In addition, the images that zoos present on their websites strongly emphasise entertainment (Carr, Cohen 2011), thus creating tension with the statements issued by associations that they belong to because these associations do not explicitly include recreation in their functions or goals (e.g. EAZA 2013; Barongi *et al.* 2015).

This tension is further echoed in relevant literature about visitor experiences, i.e. some authors claim that if recreational motivation drives people to visit a zoo, then it can be argued that the actual experience is also framed by the expectations of enjoyment that people hold (Falk *et al.* 2007). However, there are also findings, which claim that despite the recreational aim for a visit, visitors perceive the zoological garden's educational, scientific, and conservational roles to be more important, and the conservational aim of zoos serves as an ethical justification for people to spend time in zoological gardens (Turley 1999). Some authors take the middle ground and emphasise that adults are aware of the zoo's educational mission and significance, but see the educational aim as directed towards children, so the adults encourage their children to learn without the intention of gaining new knowledge themselves (Patrick, Dale Tunnicliffe 2013). The indicated attitudes only accentuate the difficulties that zoos face in educating people on conservation matters. There are also concerns that visitors might not welcome a strong emphasis on the educational aspect. For example:

[24] Either by engaging with their family, friends, animals or a combination of these.

> While there is a need to develop/maintain credibility on the basis of their role in the World Conservation Strategy, there is a danger of overemphasising the more serious side of the work of zoos to the potential visiting public whose orientation is fundamentally recreational. (Turley 1999: 7)

In any case, it is essential that zoos earn revenue and gain moral support. Thus, underemphasising the recreational aspect in scientific literature does not abolish the importance of this ethically less acceptable but historically rooted function of the contemporary zoological garden.

3.6. Balancing the goals

As we have discussed, there are many controversial opinions about whether zoos achieve or are even capable of attaining their goals of direct and indirect species conservation. We have also introduced some aspects on how the demands of the public have an influence on the endeavours of zoological gardens, e.g. with the invitation of species bias, where there are signs of struggle in sustaining a collection with "[…] an appropriate mix of popular animals and the desire to maintain appropriate numbers of breeding groups for effective conservation breeding" (Turley 1999: 10). Thus, it is widely recognised that:

> The need to attract visitors is a concern for zoos and their conservation, research, and education efforts when set alongside the traditional image of zoos as sites of entertainment for members of the public in a manner more akin to traditional animal circuses than places of learning and science. (Carr, Cohen 2011: 178)

Simultaneous fulfilment of all the goals is a significant challenge, because equal and maximum achievement in scientific research, nature education, and species conservation is further complicated by the everyday management of zoological gardens that aim for visitor satisfaction and high animal welfare standards. It is evident that zoos must strive to carefully balance their goals, which indicates that there is a need for compromise and prioritisation:

> [M]aintaining a satisfactory balance between running the zoo as a recreation-orientated business and a conservation organisation; generating sufficient finance and funding; effectively communicating their roles in order to attract an optimum number of visitors; managing the demands of both the resident and visiting species, and those *in situ*; and attaining cultural status on the basis of their conservation work. (Turley 1999: 11)

There are some authors who consider finding a solution to the philosophical and practical challenges of a contemporary zoo to be paramount, e.g. "[a]s we see it, the process of resolving the competing ideas, beliefs, and perceptions about the appropriateness and feasibility of zoos' goals and operations is far more central than defending zoo performance" (Mazur, Clark 2001: 185).

We shall further draw on some examples to emphasise the inherent contradictions between daily management of the zoological garden and the achievement of its conservation goals. Fulfilling the roles that the zoo has taken on are to a certain extent often competing and not complementary; even though the latter may be the general assumption.

It is worth mentioning that when ethical questions and recreational function are stressed as arguments against zoological gardens, zoo advocates, as a response, may overemphasise the zoological garden's actual influence on conservation or education. Also, zoo professionals may respond by distinguishing between the multitude of institutions that are called 'zoos', dividing them into 'proper' zoos and the 'bad' ones that are not changing in the light of changed functions (see Fa *et al.* 2011: 252). It is evident that different stakeholders may have different (and often incompatible) perceptions of zoological gardens' activities and their prioritisations, which creates tensions. If we add the needs of other animals next to the demands of the public and conservation endeavours, the matter is further complicated. We argue that the main discrepancies arise precisely because of the difficulty in resolving conflicting perceptions and beliefs about which roles are a priority and how zoos should carry out their roles while reconciling various different aspects.

One of the severe problems in the zoological garden's roles is noticeable in the processes of species conservation and achieving educational goals. For zoo animals to carry an educational role in a collection, they must attain a level of attraction and holding power (Moss *et al.* 2010). These animals, as discussed (cf. in articles III and IV) belong mainly to the order of mammals. Taking advantage of people's emotional ties may work against conservation activities of the zoological garden, as discussed in article IV. Educational and conservational functions of the zoo employ different perceptions of animals, i.e. for the educational purpose welfaristic or conservational attitudes are often encouraged, and for species conservation often utilitarian (or even mechanistic) perceptions and attitudes are employed. These perceptions and attitudes, which fall under extreme and opposite cases, may be completely incompatible and lead to serious conflicts between different stakeholders, thus discrediting zoos in the eyes of the public. Already at the beginning of the 1990s, there was a discussion about possible contradictions in the endeavours of the zoo, e.g. "[i]n some cases, the right course for conservation programs may run counter to what zoogoers want and expect to see in their local zoo" (Cohn 1992: 654).

Another major issue that stresses the incompatibility of the zoological garden's daily management and its conservation role is discussed in detail in article II, where we analyse the controversy between animal welfare requirements and direct species conservation endeavours of the zoological garden. We discover significant discrepancies between granting high welfare and preparing individual animals for successful reintroduction. Since the public expects high welfare standards, this sometimes leads the conservation role to be jeopardised. In addition, incompatibilities between different demands of welfare are emphasised in article III. Since zoos have an obligation to care for the animals

under their supervision, many compromises between providing opportunities for natural behaviours, health, and safety must be made. An issue we have discussed in article IV is the recognition that "[c]onservation goals of zoos may conflict with animal welfare concerns, as in the case of surplus animals" (Cohn 1992: 654). There is an urgent need for zoos "[t]o balance their welfare obligations to the animals they keep while maintaining a conservation role" (Rees 2011: 12).

Zoological gardens have to find viable solutions to the contradictions in their activities. Hediger stated that reconciliation is necessary between the needs of other animals and wants of people (Hediger 1969: 4). Finding a balance between roles and functions proves to be challenging because even in the zoo community, there seems to be disagreement about the priorities of different goals. For example, some authors state that education (i.e. indirect conservation activity) is the most essential function of the contemporary zoo (see e.g. Patrick, Dale Tunnicliffe 2013); and some find that direct conservation is the prime motivator behind the zoo's endeavours (see e.g. Stanley Price, Fa 2007). The first step towards resolving these conflicts, tensions, and contradictions implies that zoological gardens must, first of all, acknowledge the existing and opposing sets of values within the zoo's endeavours. Only then, reassessing their own functions can ensue, and compromises leading toward coherent activities, can be made. We believe that semiotic inquiry enables us to pinpoint the most complex issues of the zoological garden as a hybrid environment and direct our attention towards the significant issues that are at the core of the undertakings that surround animals in zoos. We draw out the factors that are relevant when analysing the zoo environment in general (cf. paper I), human perceptions of other animals (cf. article IV); how these perceptions have potential and real outcomes on the lives of other species (cf. article III); and animal intra- and interspecies communication in the zoo (cf. article II). This dissertation provides the starting point for laying out the intricate web that zoological gardens need to navigate to gain a balance between competing interests and factors. Moreover, viable operational models based on semiotic studies of different interconnected cultural, biological, and social aspects are necessary. We may only hope that future zoo semiotic elaborations in this field can have the potential to aid zoological gardens in finding a balance in their functions and everyday management decisions. In addition, it is crucial that contemporary zoos clarify their current aims and limitations, and work out wherever possible, the means to measure their input to indirect and direct species conservation.

3.7. Interpretation and the multiple natures of the zoological garden

In this chapter, we will concentrate on the zoo environment as a particular representation of nature, and how this environment is not only a place where communication takes place, but also how the zoological garden itself is communicative. Thus, we analyse the self-image of the zoo and how it is communicated through the environment. The zoological garden has been designed to communicate the message of nature conservation through its exhibits and accompanying interpretations of what is presented (such as signage, keeper-talks, and animal shows). This kind of information offered by the zoo may be non-synchronous, i.e. the sender and receiver can be different interest groups, and the environment and its elements are part of the message. As mentioned in chapter 3.4 we will not go into a detailed content analysis of the environment and educational material provided by the zoo, but we will offer a more general and overarching approach to how the zoo environment is interpreted by the visitors.

It is widely acknowledged that experiencing any institution starts before the visit, e.g. with the image that, in the given case, surrounds the zoo, the information distributed in leaflets, the web, the ease that the zoo is found, and all the other myriad and extramural information surrounding the zoological garden. The impression of the institution builds the expectations that drive the visit and, as we have seen, this impression for the zoo visitors, is primarily of a recreational setting[25] (for school-children also an educational setting). However, what interests us here is the immediate self-(re)presentation of the zoo, i.e. what is the message that the zoological garden is aiming to impart with its environment. The approach we take here is to concentrate on the environment of the zoological garden in its entirety instead of solely focusing on human perceptions of other species. Thus, the zoo environment is what (with all its elements) constitutes the source of meaning, because the experience is influenced by many different factors, e.g. social interactions, the physical environment, animal subjects within that environment, weather, information provided, and other relevant elements. Lindahl Elliot (2005, 2006) has covered in detail the different mediums that the zoo employs in conveying a message, such as iconic-naturalism (e.g. exhibits imitating nature), symbolic-scientific (e.g. signage that encourages abstract approach to animals by enabling the visitor to compare zoo animals with their *in situ* conspecifics, etc.), and indexical-multisensual (e.g. by encouraging activities that require visitors to use all of their senses) (see also paper I). These mediums represent the ways that physical manifestations are perceived and interpreted.

[25] People who do not visit zoos, often have moral reasons to object to keeping animals in captivity. They mainly oppose people exercising their power over other species and create negative (jail-like) images of zoos (e.g. Malamud 1998). In extreme cases, the ways that animals are displayed in zoos have even been compared to pornography (e.g. Acampora 2005).

If we turn our attention to how the zoological garden is conveying its message of conservation, we can distinguish two main domains: the environment (such as the design and placing of the exhibits, visitor paths, resting areas, and various zoo facilities) and the additional interpretation provided by the zoo. Generally, 'interpretation' in the zoological garden context refers to the style of the delivery of the education or conservation message:

> Interpretation is more than simply dispensing facts and figures, it is an interactive style of delivery which aims to involve and engage the audience through active participation and the use of techniques such as storytelling, use of artefacts and demonstrations. (Fa *et al.* 2011: 227)

Thus, people coming to the zoo are supposed to have an experience that is a combination of the two named domains. Later in this chapter, we will discuss the fact that the design of the environment is also already an interpretation (of nature) offered by the zoological garden, but currently, we shall analyse the interpretation offered by the zoo through other means than its exhibits and the general zoo design.

It is interesting that generally in the context of a zoological garden (or a museum), the term 'interpretation' has somewhat different meaning than in semiotics. In the semiotic approach, the perceiver is the one who interprets, and interpretation is a semiotic process of this perceiver. In the context of the zoo, however, the interpreter is a person who facilitates learning, i.e. he/she is a facilitator of understanding. The provided interpretation is thus the information (e.g. talks, tours, animal-feedings, and shows) as mediated by the interpreter. Also, the interpretation is the additional information that the zoological garden provides (e.g. signage, pictures, audio and video materials, artefacts, and other simulated environmental interactions). However, the way that the term 'interpretation' is applied seems to indicate that there is a sort of direct connection between offering the interpretation and receiving the interpretation. Figure 2 depicts the given situation, where the visitor is expected to interpret the environment and also obtain the interpretation of the environment (and its elements) as offered by the zoo.

The semiotic approach enables us to show that the actual situation is much more complicated, i.e. there is no direct connection between the interpretation provided by the zoo and the obtainment of that information – on the contrary, there are many levels of interpretative actions. More specifically, the interpretation provided by the zoo is additionally interpreted by the visitor (see Figure 3). We shall also argue that the zoo environment is an interpretation of nature and the visitor, thus, interprets the interpretation of nature.

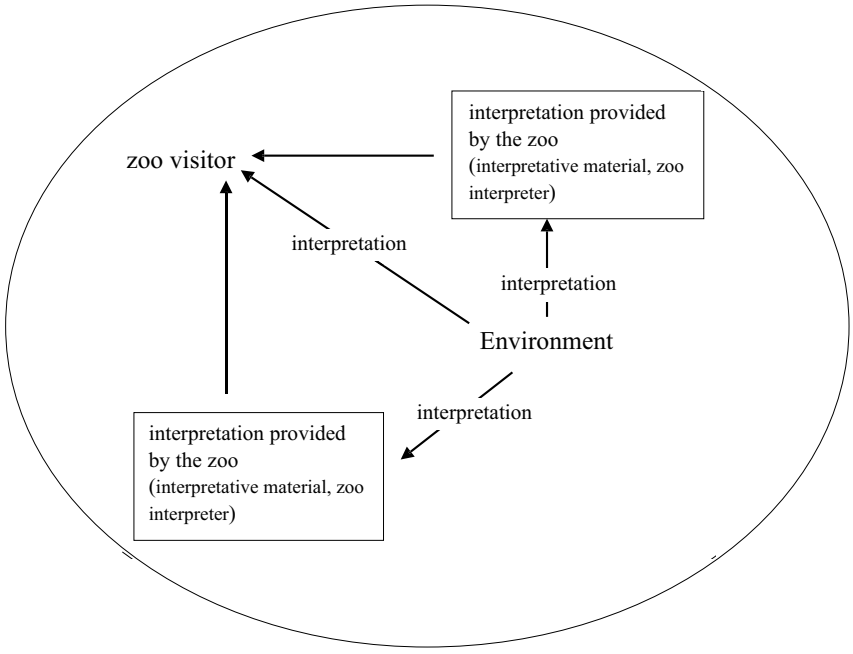

Figure 2. The zoo environment is interpreted by the visitor, the zoo interpreter, and interpretive material. Interpretation provided by the zoo is depicted as having a direct connection to the attainment of this information by the visitor.

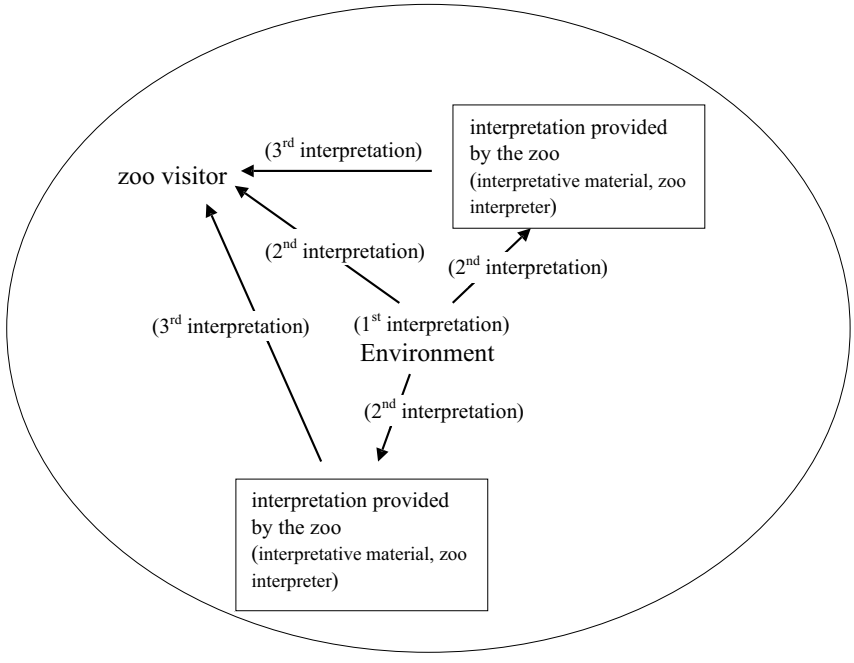

Figure 3. The zoo interprets what it presents (i.e. the interpreted nature in the form of the zoo environment) and the people (knowingly or unknowingly) interpret what is presented and what is interpreted by the zoological garden.

Since the time of the *menagerie*, it is evident that zoos have become more nature-like (see chapter 2.2). Already in the 1960s city-zoos were called the 'lungs of the city' (Hediger 1969: 67). It is also very common to depict zoological gardens as places that connect people to nature (Bruni, Fraser, Schultz 2008). In addition, when visitors pinpoint what they like about zoos, the natural setting is relatively highly valued (e.g. Reade, Waran 1996). However, it is obvious that zoological gardens are also very unnatural places with created landscapes and ecosystems, with animals in displaced climatic zones and in unusual density and proximity to each other. There seems to be a contradiction, where, on the one hand, people need to be brought closer to nature (indicating that they are separate), and, on the other hand, the zoo is to a certain extent relatively unnatural, i.e. artificially built environment. This conundrum can be further explained by employing the concept of 'multiple natures' (Kull 1998).

According to Kalevi Kull, zero nature is the uninterpreted wilderness; first nature is the seen and described nature (it is a translation of zero nature); second nature is materially changed or produced nature; and third nature is theoretical or artistic nature (as in art or science), i.e. it is a "[…] non-natural nature-like nature" (Kull 1998: 355). When we think about the environment of the zoological garden and the multiple natures it embeds, it becomes evident that the zoological garden is a perfect example of a space containing all the natures (from zero to three) within its setting. Often it is challenging to distinguish these natures from one another. Consequently, it is difficult, if not impossible, to disclose anything about the true zero nature of zoos, but we can assume that there exist elements of it unattainable to our Umwelt. However, there definitely exist aspects of nature that go unnoticed by those visiting the zoo (e.g. the climatic conditions of outdoor exhibits and some of the terrain and local (e.g. bird, insect) species staying at or living in the zoological garden). For visitors, first nature may be the elements that they (rightly or wrongly) identify and distinguish as nature, i.e. what the visitors consider to be natural.[26] First nature as recognised by the visitor is also the perception that the zoo aims to influence. Specifically, the zoo tries to manipulate or have a considerable impact on the perception of the naturalness of the zoological garden environment. For example:

> [V]isiting one of the premier zoological gardens of today, we quickly find ourselves immersed in environments designed to mask the fundamentally and overwhelmingly human nature of the place; instead of seeing animals in the ornate buildings of the late-nineteenth-century zoological garden, we now see them – if often only with difficulty – in deeply wooded 'forests' and 'jungles' or at a distance as they move slowly across a stretching 'veldt'. (Rothfels 2002: 7)

[26] At this point it is not essential that what the visitor perceives or describes as nature to be truly unmodified by the zoological garden.

However, much of what the visitor perceives as nature is essentially second nature. In the zoo, it is everything shaped and created by people. This second nature in the zoological garden constitutes altering nature through human activities, e.g. creating the habitats that people believe to be the representations of an animal's 'natural habitat'. Second nature transforms what we accept as 'true' nature and imposes this transformation on to zero and first nature (e.g. created landscapes and enclosures). Third nature is the interpretative material offered by the zoo[27], also, murals, and other depictions used by the zoological garden.

What is truly unique, is that people are presented with an impression of first (and maybe even to some degree zero) nature when it comes to the designs of enclosures. Nowadays a very common exhibit style is habitat immersion, i.e. "[a]n immersion exhibit is an enclosure design in which the visitor feels they are a part of the enclosure […] giving the visitor an impression of the animal's *real* habitat" (Patrick, Dale Tunnicliffe 2013: 10; emphasis ours). The immersion design is also meant to be a shift from a homocentric to a biocentric view because the primary aim of immersing visitors is for them to perceive the interdependence of animals, plants, and habitats (Hancocks 2001: 118). Immersion implies that people are immersed into the natural habitat of an animal (zero and first nature), although most of it is human-made (second nature) on the basis of what we believe the animal's wilderness to look and feel like (first nature). The created environment is accompanied by theoretical information, such as biological and ecological facts, drawings of animals' physiology, and maps (third nature).

In addition, there were and still are cases, where zoos do not imitate nature, but other zoological gardens:

> Rather than studying natural habitats and examining geological formations to understand what caused their particular shapes and colours, other zoos merely attempted to mimic what Hagenbeck and Eggenschwyler had created and they, in turn, were copied by other zoos. […] This problem persists in many zoos, especially in Europe; many designers still prefer to copy ideas from other zoos than to seek inspiration from studying natural habitats. (Hancocks 2001: 67)

In these cases, second nature is additionally interpreted and presented as the nature-like habitat of the zoo animal.

We must also remember that the environment of the zoological garden affects the way that zoo animals are perceived, e.g. immersion exhibits advocate for a holistic view of nature. Alternatively, there are also people who dislike more nature-like environments, "[…] complaining that the animals can hide from view, take no interest in the observer, and are difficult to see among 'all

[27] Until the 19th century there was no interpretative material that accompanied the zoo animals (i.e. the animals were there simply to be experienced) (Rees 2011: 314).

those plants'" (Hancocks 1980: 176). This described instance indicates that the perceived purpose of the zoo animals, in the given case, is to be there for people to look at and enjoy. So, what kind of message is imparted about animals, and what are our relations with them, are two highly relevant issues to discuss. An anecdotal story (Embury 1992) recounts a survey carried out at the end of the 1980s, where people who experienced gorillas in barren concrete enclosures used words like 'boring', 'stupid', 'ugly' to describe the animals. However, after the animals were moved to a more naturalistic enclosure imitating a rainforest, words like 'powerful', 'peaceful', 'fascinating' were used. Thus, the animals were described in relation to their environment, indicating the importance of such relations in forming visitor perception of zoo animals.

We must admit that the changed environment does not only affect the way that people perceive other animals, but it may also affect the behaviour of the animals themselves, i.e. if the exhibits genuinely imitate the natural setting of an animal, then it may lead to expressing more natural behaviours (see, e.g. Clubb, Mason 2003). Nevertheless, the multiple natures of the zoo also raise the question of the 'naturalness' or 'wildness' of animals in zoological gardens. If zoo animals are not in their natural environment (i.e. 'wilderness'), but in the zoo, can they still be considered as wild animals? We shall further discuss this issue from the perspectives of cultural perceptions and animal communication.

4. ZOO ANIMALS AND SOME ASPECTS OF THEIR COMMUNICATION

> We classify animals by pre-established categories, which hinders our understanding of the composition of hybrid communities, for example when we oppose wild and domestic animals. In so doing, we oversimplify a space of possibles and we obliterate the great diversity of the situations encountered (taming, habituation, familiarity, commensalism, etc.). (Lestel 2002: 57)

This chapter inquires about the wildness of zoo animals. In addition, we shall provide an Umwelt analysis of stereotypic behaviour and an overview of interspecies communication between humans and other animals.

4.1. The status of zoo animals – wild or not

It is evident that people's cultural perceptions directly influence the keeping conditions of animals (e.g. following the welfare requirements) (see cf. article III), which in turn possibly influence animal behaviour and reintroduction success. Changes in animal Umwelt consequently follow (see, e.g. paper I). It is thus reasonable to argue that different aspects contributing to the condition of the zoo animal are relevantly interconnected. We will tackle the conservation, cultural, and Umwelt issues to emphasise several facets that, together with the zoological garden environment, shape the status of the zoo animal.

Wild animal keeping is at the core of every zoo – wild animals are the ones who need protection, they are the basis for educating the visitors and conducting research, and the ones that people come to meet. Animal collections can be said to be the most valuable asset of any zoological garden. However, in the relevant literature, it is still debated whether animals in the zoo are wild or domesticated.

In the context of the zoological garden, 'wild' is not meant as a synonym for 'brute', 'savage' nor even to an 'exotic animal' with whom people's encounters are rare.[28] Thus, wildness does not reflect cultural perceptions of the character of the animal nor his/her *in situ* habitat. Being wild is regarded as the opposite of being domesticated. A domesticated animal has adapted to human and *ex situ* living conditions through genetic changes that have taken place through many generations (Clubb, Mason 2002). A more extreme description states the domesticated animal to be the "[…] one that has been bred in captivity for the purposes of economic profit to a human community that maintains total control over its breeding, organisation of territory, and food supply" (Clutton-Brock 1999: 32). Domestication is accordingly defined as the "[…] process by which a

[28] Although *in situ* habitats of many zoo animals are jungles, deserts, mountains, and other regions not considered as typical human habitats.

population of animals becomes adapted to man and the captive environment by some combination of genetic changes occurring over generations and environmentally induced developmental events recurring during each generation" (Price 2002: 11). However, there are differences in opinion on whether domestication should refer to the whole species, a specific population, or even a single animal (see Price 2002). Further, since taming is a prerequisite to domestication, the concept of domestication can be fuzzy. The opposing views on zoo animals being wild seem to stem from whether their domestication is equated with tameness or not, i.e. whether these concepts are considered as synonyms (see, e.g. Lee 2005, Hediger 1969). Some authors do not make a distinction between tame and domesticated and thus, limit their opinion to stating that zoological gardens cannot justify their existence because they are not keeping wild animals (see, e.g. Lee 2005, Bostock 1993).

Zoos themselves claim their animals to be wild (see paper II). However, most of the animals, especially large mammals, are tame, because it eases their handling, transporting, veterinary treatments, and cleaning their enclosures (see Hediger 1964[1950]: 154–156 for further discussion on taming animals in the zoo). Having some species, e.g. elephants, in zoological gardens without taming them is impossible when considering the safety of keepers (Bonner 2006). For animals undergoing the process of taming and domestication means profound changes in their Umwelten. The enemy, i.e. human, from whom the other species usually flee, transforms into a different kind of meaning-carrier. Morten Tønnessen (2011: 44–46) discusses how, with domestication, we may consider the way that the human in general changes its meaning (in the phenomenal field) on the level of the species (e.g. with wolves becoming dogs). This transition from an enemy to a social partner also has many intermediate steps. If we consider the Umwelt of a specific animal, the issue gets further complicated. Transforming the position of *human in general* from an enemy to a partner, although sought for, may have several outcomes depending on the species, age, personal life history, etc. of the animal and also, on the concrete human. For example, a specific human may be considered as a social partner, while another may be regarded as an enemy. More specifically, although taming is defined as reducing animal's flight distance to zero (Hediger 1964[1950]: 156), it is reasonable to imagine cases where an animal does not flee from person A (e.g. familiar keeper) but will not allow person B (e.g. a new veterinarian) to approach (for more elaborate discussion on human-other animal communication see chapter 4.3).

Relevant literature that supports zoo animals being domesticated emphasises that the domestication process starts with taming the animals and selectively breeding them (see, e.g. Carr 2015). Breeding animals (with genetic diversity in mind) is also prevalent in the conservation endeavours of the zoological garden.

Zoo professionals agree that the animals under their care are indeed tame due to necessities arising from keeping conditions. Alternatively, zoological garden representatives still claim that their animals are wild because zoo animals are not managed with the *intent* to be domesticated. Accredited zoos try

to avoid bringing forward or suppressing certain species-specific traits.[29] However, artificial selective pressures are still intense in zoological gardens, because specific behavioural characteristics of individuals are sought for, e.g. good responsiveness to taming and low aggression towards conspecifics (Fa *et al.* 2011: 89). For the implementation of species conservation, different zoos share their data through Species360 (formerly known as International Species Information System), which gathers information that enables zoological gardens to decide when to exchange animals and which specific animals are essential for maintaining genetic diversity. Employing this sort of control mechanism makes the wildness of a lot of zoo animals questionable. The breeding programs of zoological gardens are generally designed to maintain 90% of the genetic diversity of a species for the next 100–200 years (Lees, Wilcken 2009: 7; Penfold 2013: 200). If such a program is started with very few individuals, then severe human intervention is inevitable – people are bound to carefully select the animals that are allowed to mate and have offspring. So, to avoid inbreeding and retain genetic diversity, the choice to pick a partner is not always presented to the animals. For example, after WWI, there were only 56 European bison (*Bison bonasus*) left in European zoos (Strehlow 2001) and today, out of those 56 individuals, there are around 6000 of them (Raczyński 2016: 8). It can be argued that in this case, the subjectivity of these animals was unaccounted for. It seems that this kind of conservation activity reflects a utilitarian attitude, which consequently indicates that little or no attention is paid to animals' own preferences (for a more detailed discussion see article IV). For animals themselves, this kind of marginalisation may have dire consequences for their subjective experiences and, paradoxically, inhibit species conservation. For example, a study carried out with the giant panda (*Ailuropoda melanoleuca*), found that when animals could choose their mating partner, then there was a higher probability of having an offspring and providing maternal care (Martin-Wintle *et al.* 2015). The given example indicates the importance of the animal's Umwelt and agency. We have discussed (in paper I) that animal management can have different effects on an animal's social communication. In the case of imposed communication, which may happen if an animal's personal preferences are not accounted for (i.e. mating partners are chosen *for*, and not *by* the animals), the outcome, as indicated by maternal behaviour, is more successful. Human activity in choosing mating partners can thus be said to exclude sexual selection in a Darwinian sense, because the choice criteria for the animals themselves may be much more detailed and hardly related to criteria used by people in charge of the lives of zoo animals.

When we have a species that for some periods of time could not be found in their *in situ* habitat, the issue of their wildness becomes even more complicated.

[29] There are however some zoos that deliberately breed animals in a way to bring forward the traits that are popular among visitors. For example, in the Cincinnati zoo, white tigers are bred (see URL: http://cincinnatizoo.org/blog/animals/white-tiger/). They are not a subspecies but are heavily inbred and suffer from genetic defects (Cohn 1992).

There exist some species that for a duration have lived only in captive conditions. One of these species is Père David's deer (*Elaphurus davidianus*) who, according to different sources, was seen in the wild about 1500 or more years ago, and was raised in the gardens of Chinese emperors until the 20th century. After that, the deer was kept in zoological gardens. By the end of the 19th century there were only 18 individuals left, and 70 years later their population had grown to 500 (Conway 1969). Nowadays, the Père David's deer have been reintroduced to Chinese nature conservation areas, but there is no consensus on whether this species, which for 1500 years has not existed in its natural environment, can be called 'wild'. There are other species that have for some time existed only in captivity, e.g. the European bison (*Bison bonasus*), the Przewalski horse (*Equus ferus przewalskii*), and the bearded vulture (*Gypaetus barbatus*) (EAZA 2013: 78). In these instances, it is evident that zoological gardens are involved in species conservation, but the question is rather whether the animals that are being reintroduced are part of a wild, domesticated or some other form of species, e.g. "[b]reeding animals in captivity is in some sense breeding the wild out of the animal. Those traits that make it likely that the animal will thrive in captivity are usually precisely the opposite of the traits needed to make it in the wild" (Loftin 1995: 169). In the aforementioned cases, it is impossible to make behavioural comparisons between the zoo animal and the animal's wild conspecifics[30], because the criteria used by ethologists and zoologists to describe the 'normality' of the behaviour of a specific zoo animal, is to compare it with species-specific[31] behaviour, i.e. the behaviour that is expressed similarly in almost all members of a species *in situ* (Haraway, Maples 1998: 191; see also chapter 1.3.3 and article II).

However, if there exist *in situ* conspecifics, the question remains how the animals in zoos genetically or behaviourally differ from their conspecifics. If the animals are bred to be behaviourally suited to live in captive environments, then there is a relatively high probability for behavioural changes, that, in turn, may hinder the success of reintroduction.[32] Also, we should consider how in recent decades, in biology, more emphasis has been put on studying epigenetic changes (e.g. how does diet, the presence of other animals, stress, etc. influence which genes are expressed in the offspring). This topic is understudied

[30] At the same time, it can be argued that the animal species *in situ* have also changed over the course of time.

[31] In paper I we discuss that the concept 'species-specific' is also somewhat arbitrary due to e.g. sex and age differences of individuals and due to *in situ* environmental differences that must be accounted for.

[32] In the EU Zoos Directive (European Commission 2015: 38) there is an example of how captivity may affect the behavioural competence of animals: in the 1990s the planned reintroduction of golden lion tamarins (*Leontopithecus rosalia*) was delayed because the animals could not handle the moving branches – these tamarins were used to static branches in their enclosures. Upon the initial reintroduction they kept falling off the trees, so modifications had to be made to the branches in their enclosures. Final release could be done only once they had learned to climb on moving branches.

regarding the zoological garden environment but may provide useful information if undertaken in future research.

The issue of how captivity influences animal Umwelt is one of the central topics of this dissertation, and this subject has been covered in detail in papers I, II and III. Concrete ways that zoo animals' Umwelten are affected are discussed in detail, cf. in papers I and II, where we indeed try to offer an emic perspective on the subject matter.

To avoid falling into discussions over the relationship between 'wild' and 'domesticated', it is not uncommon to meet the term 'zoo animal' in relevant literature (see, e.g. Mullan, Marvin 1987, Garrett 2014). This indicates that there exist wild animals, domesticated animals, and zoo animals. The zoo animals are not fully wild nor domesticated, but rather something in between. Obviously, the usage of the term 'zoo animal' may create confusion, because the associations of zoos claim their members to be managing wild animals. On the other hand, the usage of this concept is understandable considering the amount of control that humans have over the breeding of the animals in zoological gardens, and, considering the possible behavioural differences that might arise in *ex situ* animals because of their keeping conditions or because of other typical features of the contemporary zoo (see, e.g. paper I).

The question of the status of animals, whether they are domesticated, wild or something in between, matters the most in practical endeavours of a zoological garden. Thus, to grant the diversity in nature via a diversity of species it is essential that next to genetic material, species-specific communication with other animals and the environment must also be maintained. Otherwise, it becomes impossible to successfully undertake species conservation in practice (e.g. through reintroduction). It seems that for contemporary zoological gardens to achieve their set goals it is necessary for animals under their care to be wild, i.e. the environment created for them must be rich enough to grant their normal behaviour (see cf. articles II and IV).

4.2. Umwelt analysis of stereotypic behaviour

In paper I we discuss how the zoo animal's communication may differ from his/her wild conspecifics. In addition, some indications are made to the relevance of the functional circles and eco-fields. It is proposed that assessing the suitability of a zoo environment for a specific animal should encompass consideration for the presence of different meaning-carriers necessary for the actuation of different functional circles. Also, the operation of functional circles (whether they are complete or incomplete) is crucial, and assessments should be made about the availability of different eco-fields that are needed to fulfil the activities of an animal. In addition, we discuss the ways that human perception and attitudes affect animal communication (see the model in article II).

In this chapter, we will further analyse the effect that the zoological garden environment has on zoo animals. While stressing, that not all species are

affected by the zoo environment, the species with complex Umwelten seem to struggle in captivity, which often results in stereotypic behaviours because it is difficult to reproduce their natural habitats, both, regarding quantity and quality (see papers I and II), and species-specific social groupings. We shall discuss the behavioural peculiarities called stereotypies by employing the concepts and reasoning provided by Uexküll (1982) and, to some extent, James Gibson (2015[1979]).

We have discussed the importance of the concepts of Umwelt and functional circle elsewhere (e.g. Maran *et al.* 2016: 14–15), and it suffices if we reemphasise that each animal has a subjective world in which he/she interacts only with meaningful objects (and subjects). If an animal interacts with any object, it will attain meaning and become a meaning-carrier (Uexküll 1982: 28). If we consider a functional circle together with perceptual and effector cues, then we get a model, which illustrates how an animal interacts with specific objects in his/her environment. Uexküll (1982: 31) states that "[b]ecause the effector cue that is assigned to the meaning-carrier extinguishes in every case the perceptual cue that caused the operation, each behaviour is ended". However, with stereotypic behaviour it is evident that the relation between perception and action is unsatisfactory, i.e. the perceptual cues are not always (to a full extent) extinguished by the effector cues. This may occur because of three reasons:

- The anticipation or the perception of the cue re-emerges *immediately* after the operation, indicating that the chosen action is insufficient for completely extinguishing the perceptual cue (although it may do so momentarily);
- The relation between the perceptual cue and operation needed to extinguish it is unidentified or misinterpreted and thus, no meaningful action that could end the functional circle follows, and perceptual cue remains unextinguished, i.e. it persists;
- The animal is unable to carry out the necessary operation for extinguishing the perceptual cue, and thus the perceptual cue persists, motivating the animal to find alternative behaviours to reduce the influence of the perceptual cue.

This proposed approach indicates that the animal keeps conducting a particular activity, e.g. a stereotypy, to extinguish the perceptual cue(s), but without success. Stereotypies may be caused by lack of behavioural opportunities or environmental affordances[33], e.g. self-caressing or self-clasping may form into stereotypy in the permanent absence of social affordances. Caressing oneself might be interpreted as an insufficient action for completely extinguishing the perceptual cue (pt. 1) or an alternative (or displacement) activity that reduces

[33] The term 'environmental affordance' is borrowed from Gibson (2015[1979]) and we are employing it as describing *animal-relative* properties of the environment, i.e. properties attain meaning through relations that the animal has with the environment and its objects. Affordances are thus what the environment affords or provides for the animal through interaction.

but does not extinguish the perceptual cue (pt. 2).[34] If the animal is under stress or very fearful (e.g. when translocated to a new zoo), the stereotypic behaviour may evolve or deepen. In this case, it is possible that the animal is unable to identify the correct action to relieve his/her stress (pt. 2), but it is also possible that the cue is re-emergent (pt. 1) or (to a full extent) inextinguishable (pt. 3). It is reasonable to assume that enriching the environment in a way as to create more environmental properties that, through interaction, could transform into environmental affordances, would have a positive effect on the zoo animal's behaviour. However, there are cases where enlarging the enclosure of Arctic foxes (*Vulpes lagopus*) or giving minks (*Mustela vison*) extra items to play with had an opposite effect, i.e. stereotypic behaviour deepened (Mason, Latham 2004). We believe that the proposed errors in the functional circle of an animal may offer an explanation. Modifying the physical environment of an animal may not provide the basis for necessary affordances, and thus the animal is still unable to extinguish the perceptual cue with the necessary effector cure. Even more, the deepening of a stereotypy indicates that the perceptual cue has instead been amplified, while before the environmental modifications the zoo animal was better able to numb the perceptual cue, either faster or with more efficiency.

It has also been shown that there is a direct link between the home range of an animal and the tendency to pace, as is the case with polar bears (*Ursus maritimus*) (Clubb, Vickery 2006). Pacing is the most common stereotypy in large carnivores (amounting up to 97% of all reported stereotypies) (Clubb, Mason 2003). With Umwelt analysis, it is challenging to pinpoint the exact perceptual cues that are extinguished by covering vast distances. However, considering that most relevant functional circles fall in the categories of physical medium, food, enemy, and sex (Uexküll 1982: 67), we can deduce a cluster of perceptual cues that may lead to walking, which is the activity undertaken to extinguish them all. In the case of pacing let us assume that walking in polar bears is an activity meant to extinguish the perceptual cues for feeding. Let us also assume that there are several perceptual cues and behaviours at play, e.g. locating the prey, catching, killing, and eating it. It is then reasonable to argue that *all* of these perceptual cues and corresponding actions may be necessary for the animal in his/her Umwelt. Polar bears living in zoological gardens do not locate nor kill their prey, and eating alone may be insufficient to extinguish all the other cues in the given cluster, i.e. the totality of actions that precede feeding. Not being able to extinguish all of the cues results in pacing behaviour, which can also be regarded as a coping mechanism. There are plenty of studies that support the argument that performing specific

[34] We are hesitant to propose that the perceptual and effector cue are unidentified or misinterpreted in the case of social deprivation, because there are many primate species that develop this kind of stereotypy (e.g. macaques, chimpanzee), indicating that there may be some link between social deprivation and self-directed movements (e.g. the physical contact with another being bears some resemblance to physical contact with oneself).

activities are at least as necessary as the end result. For example, small cats and other mammals prefer to work for their food, even when it is readily available (e.g. Shepherdson *et al.* 1993; McPhee, Carlstead 2010).

Since we are discussing stereotypies, we should make a few notes on how stereotypic behaviour as something abnormal relates to fixed action patterns (see, e.g. Lorenz 1981: 107–112), which are also often referred to as stereotypies (see e.g. Gadbois *et al.* 2015). Fixed action patterns can be considered inflexible functional circles, where the connection between the perceptual cue and effector cue is very rigid. What distinguishes stereotypic behaviour, as we have discussed above, from fixed action patterns is that the latter are seen as species-specific, i.e. exhibited by most (if not all[35]) members of the species (under certain conditions). This makes species-specific stereotypies natural behavioural sequences (e.g. some mating behaviours with relatively invariant action patterns (e.g. Wiley 1973)). We can conclude that although described abnormal and normal stereotypies may both be regarded as repetitive and relatively inflexible, their inner working mechanisms are different. That is, fixed action patterns have a clear and reliable connection between the perceptual cue and the following action (indicating the potential completeness of the functional circle), however stereotypic abnormal behaviour can be considered as a failure to (fully) complete a functional circle.

4.3. Interspecies communication between humans and zoo animals

As discussed in all four papers, one of the characteristics of the zoological garden is close contact between humans and other species, which composes a large part of communication taking place in the zoo. As referred to in papers I and II, the potential influence a human can have on other animals is also dependent on the Umwelt of the species and personal peculiarities of the animal under consideration.

The topic of human-other animal interactions in zoos is gaining popularity, and relevant publication numbers have risen significantly over the last decade (see cf. Hosey, Melfi 2014), with several literature overview articles. The issues most commonly discussed are visitor effect on zoo animals' behaviour and secondly, interactions between keepers and the zoo animals. Visitor effect studies concentrate on visitor noise (e.g. Quadros *et al.* 2014; Fernandez *et al.* 2009; Hosey *et al.* 2009: 488–489), numbers (e.g. Sherwen *et al.* 2015; Fernandez *et al.* 2009), proximity to the zoo animals (Morgan, Tromborg 2007), etc. These studies mainly discuss the negative impact that visitors have on animal welfare. Research on zoo animal interactions and relations with keepers

[35] We take into consideration that not all behaviours are relevant to all members of a species when e.g. age, sex, health etc. are accounted for.

are more varied as related to animal welfare (see, e.g. Martin, Melfi 2016; Hosey, Melfi 2010, 2015).

As we have stated, people in zoological gardens can very broadly be divided into the zoo staff (mainly animal keepers) and visitors. Visitors are characterised as people who are usually (except in the children's zoos) outside of the territory, i.e. enclosures of animals; do not come into physical contact[36] with the zoo animals, which is an integral part of communication in social animals; and are strangers to the animals, i.e. the animals do not have any personal relations with the humans. Zoological garden staff or, more precisely, animal keepers, are the people that can often be found in or very close to the enclosures of the zoo animals (e.g. bringing them food, cleaning the enclosures or training the animals). The zoo staff may also have quite a lot of physical contact with the animals (e.g. while training them or taking care of young offspring), and keepers are usually well known by the zoo animals. These are the people who commonly constitute one of the parties in the human-other animal relationship (HAR), which indicates a history of interactions enabling to anticipate the future actions of the other party (Hosey 2013). These relationships may be either enriching or sources of stress for the animal.

A lot of human-other animal interactions also fall in between the described two categories, e.g. there are a lot of regular visitors[37] whom some of the animals recognise, but these people, nevertheless, are not permitted to have physical contact with the animals under question. There are also veterinarians or 'keepers for the day', who may, in some cases, be quite unfamiliar to the animals, but who are still permitted to enter the territories and come into physical contact with the zoo animals. Many animals (e.g. primate species and large cats) also have intermediate categories in recognising specific humans (see, e.g. Hosey 2013), indicating that categories such as 'visitor' and 'keeper' may sometimes prove to be too general for analysing zoo animal communication with humans. For example, it has been noted that the stress levels[38] of clouded leopards (*Neofelis nebulosa*) are proportionally lower when they get to spend time with a certain keeper. Because of these positive relationships, the leopards are also more successful in having offspring. In instances where there are more keepers who look after the leopards, the stress level of the animals rises, and fertility drops; even though these leopards get to spend the same amount of time, or even more time, with keepers than when only one keeper is involved (Carlstead 2009). Thus, it may be inferred that leopards do not consider all keepers equal. However, it has also been proposed that many zoo animals are indeed prone to generalise their existing relationships (or interaction

[36] Physical contact, if allowed, can be, depending on the animal species, age, tameness, and the zoo's policy, protected or direct.

[37] This category also includes much of the zoo staff who are not keepers, but who still spend a lot of time in the close vicinity of animals (e.g. gardeners, souvenir sellers, guides, security personnel, etc.).

[38] In addition to behavioural indications, the level of stress is also measured by cortisol levels in the animal's urine or faeces (see e.g. Hosey 2008, Carlstead 2009).

patterns) with various humans who are similarly categorised (Hosey 2008). The described situation indicates that the meaning-carrier of humans may be similar, depending on certain properties (e.g. 'known' – keeper; 'unknown' – visitor). It is also possible that all humans may carry a similar meaning to a certain extent. For example, a relatively recent study (Hosey 2013) reviewed close to 50 articles dedicated to investigating human-other animal interactions in zoological gardens and concluded that the premise that animals have a natural fear of humans is mostly correct. However, the degree of fear (or caution) differs across species and in individual animals of the same species (Stoinski, Jaicks, Drayton 2011). Fear of humans is not constant, and over time it may increase or decrease (Hosey 2013).[39]

Another possibility is thus, to divide the interactions, that the *ex situ* animals may have with humans, as positive, neutral[40] or negative (Hosey 2008; Hosey, Melfi 2012; Hediger 1969: 913a–92). This division is a general consideration that might be difficult to measure due to ambiguity in defining stress indicators that correlate with reduced welfare (Davey 2007). For the observer, it might not be easy to always correctly assess, whether the communication is supportive of the animal's physical and mental well-being or not (see cf. article III). It is even more complicated to assess whether the animal himself/herself prefers the interaction (see paper II). Still, research carried out in zoological gardens that concentrates on human-other animal communication and focuses on the behaviour of other species, is set out to examine which factors, and in what way, influence animal welfare (Carlsetad 2009).

Hediger considered what a human means to other animals, and one situation he pointed out is the case where an animal considers the human to be an inanimate object (Hediger 1969: 81–83). This corresponds with the instance where the human has a neutral effect on the zoo animal on the level of social interaction. The human is not recognised as a potential communication partner, i.e. the human does not constitute a social meaning-carrier. Also, neutrality can constitute the indifference to the presence of humans, i.e. human may be recognised as a potential communication partner, but the desire or the need to actuate that potentiality in specific instances is absent.

It is important to note that we should not consider interactions as one-sided, i.e. the zoo animal being the only one that is affected. Recent studies have also explored the effects that human-other animal interactions have on keepers and have concluded that good HARs are formed into strong bonds that promote the well-being of both parties (Hosey *et al.* 2018; Hosey, Melfi 2010). If the

[39] Fear may increase through constant unavoidable contact with humans (e.g. in children zoo (see Anderson *et al.* 2002)). This kind of contact can also be called forced communication, i.e. a social situation that is unavoidable for the animal. It is believed that the higher mortality rate of animals in children's zoo, as compared to animals in other sections of the zoological garden, is precisely because these animals have little choice over having contact with visitors in the opening hours of the zoo (see e.g. Robinson 2004).

[40] The measure for neutrality is the animal's indifference and unaltering level of stress, when humans are present.

human-other animal relationship is rated as weak, then the well-being of the human is also perceived lower (Hosey, Melfi 2015, 2010). If we consider the visitors and the mainly discussed negative impact they have on zoo animals, then the situation changes. The zoo as a facility that invites people to be closer to nature (see chapter 3.7) and other animals, has reportedly mostly positive effects on visitors (Bruni *et al.* 2008; Reade, Waran 1996). Thus, the experiences for zoo animals and visitors are not in correlation. However, we would not categorically claim that visitors have no enriching impact on zoo animals. Visitors may also have a positive effect because zoo animals have the need for impressions, which is the significance of different cues and the surroundings according to the Umwelten of the animals. The need for impressions is, in other words, natural curiosity (Turovski 2000: 383). Curiosity has been noticed in cases when there are fewer visitors than usual, e.g. during winter (Hosey 2008). In this case, the presence of visitors may be beneficial for the zoo animals.

As a conclusion we would like to stress again that human-other animal communication is dynamic, i.e. human actions can influence the perceptions that the other animal has of said human (or humans on some more general level). Human-other animal encounters also influence the intraspecies communication of that animal. Positive and negative interactions with a specific animal in a zoological garden may alter our attitudes towards that species or animal. In many species' Umwelten the human as a meaning-carrier is open to alterations as are humans' perceptions and attitudes towards other animals.

CONCLUSIONS

This review and additional chapters of this dissertation have been written with the intention to provide a framework for the publications included in the dissertation. Although in large part referential, it provides the necessary background information to support the analysis that contributes to the (zoo)semiotic research. We hope that this dissertation in its entirety explicates the importance that humanities and, more specifically, semiotics have in understanding hybrid environments. The semiotic approach has enabled us to navigate in the intricate web of the communication of humans and other animals and explicate some of the core issues as seen not only on a philosophical level but also in practice, as outlined in the setting of the zoological garden.

The most relevant findings of this dissertation are:

- Species neutrality, as proved by employing a semiotic viewpoint, hardly ever exists in conservation biology, animal welfare studies, and species management. The same is true for the perception of the general public.
  - We have proved that people's attitudes are, among other things, strongly dependent on human Umwelt and cultural connotations.
  - The zoological garden is an excellent example of how people's dispositions are employed in the ways that other animals are displayed to influence visitors' attitudes. Zoo animals are personified and depersonified, resulting in shifting perceptions on the dynamic scales of welfaristic, conservational, dominionistic, and utilitarian approaches. We have provided a model to illustrate the possible changes in attitudes towards zoo animals.
  - Human attitudes towards and perceptions of zoo animals are further influenced by the long and complicated history of the zoological garden and the contemporary goals of species conservation, nature education, scientific work, and recreation, which, as revealed, may not be fully compatible with each other and thus not sufficiently attainable.
  - We have also argued that the physically created environment of the zoo and additional interpretation offered may not adequately consider the complexity of actual interpretation by the visitor.
- Human perceptions and attitudes influence the management and keeping conditions of wild animals in captivity.
  - The 'Five Freedoms' is the general guideline to be followed. However, we have explicated that in certain circumstances the importance ascribed to freedoms differ and they are approached hierarchically. The causes for this situation can be found in our own Umwelt and indicate species bias in our value system.
  - The management of zoo animals often favours animal welfare over the goal of conservation (via reintroduction), explicating a strong opposition between the ecologistic attitude and humanistic, and moralistic attitudes towards other animals.

- We have proposed a case-based approach to welfare that is considerate of animal's Umwelt and relations to the environment, people's attitudes, and the zoological garden's institutional goals regarding that concrete animal. Thus, incorporating semiotic analysis into welfare would allow for the addressing of the issue by combining the sign processes in human culture, animals (including human biocommunication), and the environment.
- We have presented a model that can be used as an analytical tool in future studies to indicate the dissociation between what is considered species-specific communication and what is considered as consistent with good welfare. We have concluded that deviations in *ex situ* animals' communication are unavoidable according to current management practices.

- *If* the zoo environment differs for the animals from their *in situ* environments, their Umwelten are influenced.
  - We have determined that there may exist different meaning-carriers and eco-fields. The meaning-carriers might be, depending on their importance and similarity, easy or difficult to substitute. The animal may also not be allowed or able to use all the relevant eco-fields, as is proven to be the case with predator-prey interaction.
  - We have proposed a list of questions that take a more emic approach that is inclusive of animal communication and Umwelt, and which has the potential to aid zoological gardens in zoo animal behaviour studies, enclosure design principles and reintroduction efforts.
  - We have also proposed that social communication that differs for *in situ* animals may be categorised coerced or forced, which is indicated by the constant stimuli of an unpleasant meaning-carrier; disrupted, which is indicated by the removal of some meaning-carriers; or eliminated, which is indicated by the absence of certain meaning-carriers and functional circles.
  - We have offered a semiotic analysis to explicate the possible relations between perceptual cue and effector cue in cases of stereotypic behaviour, i.e. the inability for the operation to (fully) extinguish the effector cue.
  - We have analysed the interactions between humans and other animals in zoological gardens and shown that in the animals' Umwelten the meaning-carriers associated with humans may be open to alterations.

The issues mapped out in this dissertation can also pave the way for further studies of other hybrid environments where people (knowingly or not) have an impact on the lives of other species. Human habitats are continually expanding and human influence on wildlife, in general, is growing – there is little if any places untouched by human activity. It is evident that in this age of Anthropocene the research dealing with topics of species conservation, nature education, and human-wildlife conflict management is on the rise. Semiotic framework inclusive of ecological, biological, zoological, human cultural, and other relevant factors is crucial in understanding these issues, as we have shown in the case study of the zoological garden.

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KOKKUVÕTE

Loomaaed kui hübriidne keskkond – (zoo)semiootiline analüüs

Doktoritöö eesmärgiks on uurida loomaaeda kui paljutahulist semiootilist keskkonda, mida iseloomustab inimeste ja teiste loomade tihe lävimine. Vaatamata loomaaedade (kasvavale) populaarsusele, on loomaaiale kui uurimisobjektile semiootikas võrdlemisi vähe tähelepanu osutatud. Antud töös näitame semiootilise lähenemise olulisust selle keerulise uurimisobjekti mõtestamisel ehk analüüsime loomaaeda kui kultuurilist nähtust, selle praktilisi ettevõtmisi liigikaitses, teadustöös ja loodushariduses, ning keskendume loomaaias elavatele loomadele kui omailma omavatele subjektidele.

Loomaaia keskkond, semiootilised nähtused ja kommunikatsioon, mis leiab aset antud keskkonnas ja keskkonnaga, sõltuvad paljudest eripalgelistest teguritest, nt loomaaia ajaloolisest taustast, kujundatud füüsilisest keskkonnast, loomaaia eesmärkidest ja funktsioonidest, enesekuvandist jm. Kõik need tegurid aitavad kujundada konteksti, milles toimub nii liigisisene kui liikide vaheline (inimese ja teiste loomade) kommunikatsioon. Lisaks on loomaaia keskkond tajutud, kujundatud ja ümberkujundatud lähtuvalt inimeste eetilistest tõekspidamistest ja arusaamadest selle kohta, mida peetakse vastuvõetavaks viisiks teiste loomade esitlemisel. Inimeste tajud ja hoiakud mõjutavad vältimatult loomade vahetuid pidamistingimusi ja seega ka nende kommunikatiivseid võimeid.

Doktoritöö koosneb kolmest avaldatud artiklist, raamatu peatükist ja neid raamistavast sissejuhatavast osast. Pakkudes semiootilist terviklikku analüüsi, toob see töö esile loomaaia keskkonna keerulise võrgustiku, näidates erinevate tahkude vastastikust sõltuvust.

Peamised uurimusküsimused, millele publikatsioonides ja tööd raamistavas osas vastused anname, on järgnevad:

- Millistel viisidel tajutakse ja tõlgendatakse teisi loomi loomaaedades (nt kuidas meie enda omailm mõjutab teiste loomade tajumist; millist rolli mängivad teiste loomade kommunikatiivsed pädevused; kuidas mõjutab keskkonnakujundus teiste loomade tajumist, jm)?
- Kuidas inimeste taju, hoiakud ja arusaamad mõjutavad loomaaialoomade pidamistingimusi?
- Kuidas mõjutavad pidamistingimused loomade omailmu (nt millised on põhilised aspektid, mis mõjutavad loomade kommunikatsiooni tehiskeskkonnas)?

Doktoritöösse kaasatud raamatu peatükis (Mäekivi 2016a) analüüsime loomaaeda kui kommunikatsioonikeskkonda nii inimese kui ka teiste loomade seisukohast. Lisaks toome esile loomaaia kui tehiskeskkonna peamisi omadusi ja käsitleme nende mõju teiste loomade liigisisesele ja liikide vahelisele lävimisele. Teiste loomade kommunikatsiooni süvaanalüüsiga jätkates (Mäekivi 2016b) esitame üldise mudeli, mis kujutab põhjusi, miks loomaaialoomade kommunikatsioon võib erineda nende *in situ* elavate liigikaaslaste lävimisest. Järgmises

artiklis (Mäekivi 2018) keskendume nn „viie vabaduse“ ettekirjutustele loomade heaolu tagamiseks ja arutleme nende sobivuse üle loomaaia kontekstis. Tõstame esile vabaduste vahelisi vastuolusid, mis teatud juhtudel esineda võivad. Analüüsime ka inimeste hoiakuid teiste loomade suhtes ning visandame, kuidas erinevate suhtumiste vahel esinevad pinged, kuna hoiakud ei pruugi olla ühitatavad (Mäekivi, Maran 2016).

Publikatsioone raamistavas osas pakume ülevaate loomaaia varasemast uuritusest ning esimeses peatükis selgitame üldist metodoloogilist lähenemist ja põhimõisteid, mida selles doktoritöös rakendame. Teises peatükis kirjeldame loomaaia kui institutsiooni kujunemislugu, et tõsta esile selle asutuse olulised ajaloolised muutused. Kolmandas peatükis anname ülevaate kaasaegse loomaaia funktsioonidest ja vajadusest leida eesmärkide täitmise vahel tasakaal. Samas peatükis analüüsime ka loomaaia looduse erinevaid tasandeid. Viimases peatükis käsitleme loomaaialoomade staatuse küsimust, analüüsime stereotüüpset käitumist lähtuvalt omailmast ja vaatleme inimese ja teiste loomade vahetut kommunikatsiooni.

Doktoritöö tähtsaimad järeldused on järgnevad:

- Liigikaitsebioloogias ja loomade heaolu-uuringutes ei ole kõik liigid võrdsed, st enam tähelepanu saavad karismaatilised ja keerukate omailmadega liigid (nt suured imetajad). Inimeste hoiakuid teistesse loomadesse mõjutavad inimese omailm ja kultuurikontekst (vt Mäekivi, Maran 2016).
- Inimeste hoiakud on (teatud ulatuses) muudetavad ja sama loomaliigi suhtes võivad erinevatel huvigruppidel olla erinevad hoiakud. Loomaaias on tavapärane praktika loomade isikustamine (tähelepanu juhtimine indiviidile suurema afektiivse sideme loomiseks) ja seejärel vastupidise protsessi rakendamine (tähelepanu viimine üksikloomalt tema liigile või mõnele muule taksonoomilisele üksusele). Oleme kujundanud mudeli, mis illustreerib hoiakute võimalikku muutust loomaaia kontekstis (vt Mäekivi, Maran 2016).
- Inimeste tajud ja hoiakud mõjutavad loomaaialoomade hooldamist ja nende pidamistingimusi. Viis vabadust, kui heaolu tagamise põhiline ettekirjutus, ei ole siiski sobiv kõikide loomade kõrge heaolu kindlustamiseks, kuna meie analüüsi tulemusena nähtub, et eri vabadustele määratud olulisus on varieeruv ja neid seatakse sageli hierarhiasse (vt Mäekivi 2018). Selle põhjused peituvad meie omailmas ja viitavad liigiliste eelistuste kallutatusele meie väärtussüsteemis.
- Loomaaia praktilised ettevõtmised hindavad sageli loomade heaolu tagamist olulisemaks kui liigikaitselist eesmärki (läbi loomade taasasustamise), mis väljendab selget vastuolu ökoloogilise ning humanistliku hoiaku vahel loomadesse. Oleme välja pakkunud juhtumipõhise lähenemise heaolule (vt Mäekivi 2018), mis arvestab looma omailma, looma suhestumist keskkonda, inimeste hoiakuid ja loomaaia eesmärke seoses konkreetse loomaga. Semiootilise analüüsi kaasamine heaolu-uuringutesse võimaldab meil kombineerida inimkultuuris, loomades (ka inimestes) ja keskkonnas toimuvaid märgiprotsesse.

- Oleme visandanud mudeli (vt Mäekivi 2016b), mida saab rakendada analüütilise vahendina selgitamaks, et kaasaegsete loomade pidamispraktikate juures ei ole kõikidel juhtudel võimalik tagada paralleelselt loomaaialooma liigiomast kommunikatsiooni ja kõrget heaolu.
- Kui loomaaialooma jaoks on loomaaia keskkond erinev tema *in situ* keskkonnast, on tema omailm mõjutatud. Looma jaoks võivad tema keskkonnas esineda erinevad tähenduskandjad ja ökoväljad, mis võivad osutuda kergesti või raskesti asendatavateks. Kui erinevad tähenduskandjad ja ökoväljad on loomale olulised, kuid raskesti asendatavad, võivad tekkida raskused *in situ* elutingimustega kohanemisel (vt Mäekivi 2018).
- Oleme välja pakkunud kindlad küsimused, mis lähtuvad loomast kui subjektist ja millel on potentsiaal aidata loomaaedu loomade käitumisuuringute, aedikute kujundamise põhimõtete ja taastutvustamise püüetes (vt Mäekivi 2016a). Analüüsi tulemusena oleme leidnud, et loomaaialooma (kelle omailm on mõjutatud tehiskeskkonnast) sotsiaalse kommunikatsiooni erinevusi *in situ* liigikaaslastest saab kategoriseerida lähtuvalt sotsiaalse olukorra sunnitusest, katkestatusest või elimineeritusest.
- Oleme esitanud stereotüüpse käitumise analüüsi, mis põhineb funktsiooniringi mõju- ja tajumärgi vahelise suhte iseloomustamisel. Järeldame, et stereotüüpse käitumise peamiseks põhjuseks on asjaolu, et mõjumärk ei ole suuteline tajumärki (täielikult) kustutama.
- Oleme analüüsinud inimeste ja teiste loomade vahetut lävimist loomaaias ja järeldame, et teiste loomade omailmades esineb võimalusi inimese tähenduskandja muutmiseks.

Usume, et antud doktoritöös kaardistatud probleemid ja võimalikud lahenduskäigud on rakendatavad ka teiste hübriidsete keskkondade semiootilises analüüsis. Inimasulate ja üldise inimmõju pidev kasv soosib teadustöid, mis tegelevad liigikaitse, loodushariduse, inimese ja muu looduse vaheliste konfliktide jmt. uurimisega ning samalaadsed uurimused võimaldavad pakkuda lahendusi, mis arvestaks erinevate osapoolte vajadusi ja kaasatud tegurite paljusust.

PUBLICATIONS

CURRICULUM VITAE

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Education

2015–2016	Tartu Vocational Education Centre Car painter, EQF level 4
2011–2017	University of Tartu doctoral studies in Semiotics and Theory of Culture
2010–2013	Tartu Vocational Education Centre Car Technician I, EQF level 4
2009–2011	University of Tartu MA, Semiotics and Theory of Culture
2005–2009	University of Tartu BA, Semiotics and Theory of Culture

Career

01/2018–11/2018	University of Tartu, Department of Semiotics; adjunct instructor
10/2017–12/2018	Kopli Vocational School of Tallinn; guest lecturer of continuing education course "Zookeeper short course I"
01/2017–08/2018	Tallinn Zoological Gardens; development plan manager
09/2011–08/2016	Tartu Vocational Education Centre, senior teacher in automotive studies

Fields of research

Zoosemiotics, ecosemiotics, zoo biology

Major publications

Mäekivi, Nelly 2018. Freedom in captivity: Managing zoo animals according to the 'Five Freedoms'. *Biosemiotics* 11(1): 7–25. DOI: https://doi.org/10.1007/s12304-018-9311-5.

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Haridus

2015–2016	Tartu Kutsehariduskeskus Automaaler, EQF tase 4
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2010–2013	Tartu Kutsehariduskeskus Autotehnik I, EQF tase 4
2009–2011	Tartu Ülikool MA, semiootika ja kultuuriteooria
2005–2009	Tartu Ülikool BA, semiootika ja kultuuriteooria

Teenistuskäik

01/2018–11/2018	Tartu Ülikool, semiootika osakond; õppeülesande täitja
10/2017–12/2018	Tallinna Kopli Ametikool; täiendusõppe kursuse „Loomaaia talitaja lühikursus I“ külalislektor
01/2017–08/2018	Tallinna Loomaaed; loomaaia arengukava projektijuht
09/2011–08/2016	Tartu Kutsehariduskeskus; autoerialade kutseõpetaja (vanemõpetaja)

Uurimisvaldkonnad

Zoosemiootika (nii etoloogiline kui ka antropoloogiline), ökosemiootika, loomaaiabioloogia.

Peamised publikatsioonid

Mäekivi, Nelly 2018. Freedom in captivity: Managing zoo animals according to the ‘Five Freedoms’. *Biosemiotics* 11(1): 7–25. DOI: https://doi.org/10.1007/s12304-018-9311-5.

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