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Emergence of the "howling foxes": A semiotic analysis of initial interpretations of the Golden Jackal (*Canis aureus*) in Estonia

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Abstract. The article attempts to bridge semiotics with species conservation and management. Biosemiotic and cultural semiotic methodology is applied in the analysis of a case study – the early occurrence of the golden jackal (*Canis aureus*) in Estonia. Nine semi-structured interviews were carried out with the local inhabitants of the Matsalu region, professional zoologists and environmental officials who were involved in the golden jackals' discourse. The interviews were analyzed for interactions between golden jackals and humans, expected ecological effects of golden jackals, communication between different interest groups and central cultural motifs used to interpret the new species. It is argued that in the development of this discourse, the golden jackals' own activity has played an essential role. At the same time, human cultural models also influence the interpretation of a new species to a considerable degree. Two of such models – the opposition of the own and the alien and the "settler's" narrative – are brought out and analyzed. The effect of the fear of the unknown is also specified. To improve human communication about new or invasive species, it is suggested to raise awareness of the underlying cultural models and to use integrative communication as the developing discourse is dynamical and constantly changing for all interest groups. For a semiotic study of species management, it is suggested to combine methodology from biosemiotics, cultural semiotics and actor-network theory.

Keywords: environmental change; non-native species; invasive species; golden jackal; applied biosemiotics; cultural modeling; the own and the alien

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1. Introduction

An essential characteristic of biosemiotics is that it can study semiosis without creating divides between sign processes in animals, the environment and human culture. In other words, semiotic processes in all three can be treated indiscriminately, as a whole. Semiosis goes on everywhere where life is and can, in principle, connect anything. This gives biosemiotics a specific position for participating in the study of environmental change, species conservation and nature protection; that is, in fields where biological meanings and human cultural meanings interact and where, for the sake of practical applications and problem solving, different types of semiotic activity need to be studied in connection. The spread of species into new areas, the emergence of non-native or invasive species, and the extinction of native species affect both local ecosystems and human culture. The present article applies a combined semiotic methodology for the analysis of a specific case study – the appearance of the golden jackal (*Canis aureus*) in Estonia.

The problematics of human involvement with new or invasive species is an interdisciplinary domain that is mostly studied in environmental communication studies and social studies, but also in geography, anthropology, science studies and other disciplines of the humanities. Semiotics can contribute here with an approach that scrutinizes the hidden causes and factors of communication, which could depart from animal semiosis, pre-linguistic semiosis in humans or general cultural models that shape human understandings (cf. Mäekivi and Maran 2015). The semiosic nature of the present case-study becomes well evident in the process of how the new species was named. The unknown creature, that was spotted by local villagers of the Hanila parish, Estonia three years before its official recognition, was first called a "strange animal" ("imeloom" in Estonian); thereafter, the "howling fox" ("ulguv rebane") and finally after scientific scrutiny it was identified as the "golden jackal". This development from an unawareness to a resemblance-based nomination to a taxonomical determination well illustrates the advancement of the cultural discourse on the golden jackal.

There are some semiotic studies that could be used as a point of departure for a semiotic analysis of non-native or invasive species. Biosemiotic views of biodiversity, invasive species and environmental change have been introduced in Emmeche (2001), Bruni (2001) and Lestel (2013), while different semiotic aspects of environmental communication are described in e.g. Krampen (1989), Posner (2000), Low (2008), Salvador and Clarke (2011), Hiedanpaa and Bromley (2012). A general ecosemiotic basis for studying semiotic interactions of humans and animals is developed by Almo Farina in the concept of "ecofield", which integrates the subjective animal Umwelt and the landscape (Farina and Belgrano 2006, for practical application see Farina et al. 2005) and views landscape as a semiotic medium for the use of resources (Farina 2008, 2012). Kalevi Kull (1998) has developed an understanding of conflicting relations between human culture and the natural environment as taking place through the perception-action cycle (for applications in human-animal relations see Maran and Kull 2014; Maran 2014). Morten Tønnessen (2009; 2014) has developed Uexküll's Umwelt theory towards a research method for analyzing phenomenological and semiotic aspects of changing human-animal relations (e.g. between man and wolf).

An example of applying semiotic research methods in human-animal interactions is provided by Magnus (2014a, 2014b) in the study of communication between guide dogs and their owners.

At the same time, in conservation biology, there appears to be growing interest in semiotic approaches. Several scholars have suggested introducing animal subjective engagement with the environment through concepts like cognition (Greggor et al. 2014), mind (Candland 2005), niche construction (Boogert et al. 2006) or Umwelt (Van Dyck 2012, Manning et al. 2004; Whitney 2014). Mapping how animals make sense of the surrounding environment is considered to be important in conservation biology for understanding animal survival during an environmental change (including a human-introduced change) and success of animal reintroduction programs. Also the understanding of the role of human psychological, cultural and social involvement in species conservation and management appears to be increasing. In regard to invasive species, the public attitudes and participation in management programs have been studied (e.g. Bremner and Park 2007; García-Llorente et al. 2008; Schüttler et al. 2011) and especially good communication between interest groups has been emphasized (Selge et al. 2001; Shine and Doody 2011) as an important aspect for the success of such programs.

2. Methodological considerations

For semiotic methodology, the emergence of a new species is not an easy object to analyze. Approaches based on transmission communication models (following for instance Shannon and Weaver's (1949), Jakobson's (1981) or Sebeok's (1991a) communication models) are not effective as no participant has enough information about the emerging species to fill the position of the sender. Rather, the emergence of a new species should be considered as a dynamical situation, where every participant has its own comprehension about the situation. As the present case study reveals, no participant has a monopoly of knowledge, and much of the information is in the form of anecdotal evidence, with different participants negotiating with each-other over the relations and meaning of the situation. Therefore, methodologically, the analysis could find some support from the Actor-Network-Theory (ANT), which, in the field of sociology of science, has specialized in complex systems such as institutions, scientists, research objects, discourses and their changing interactions. ANT aims to study all types of interrelations, without drawing strict borders between the structures of the text and discursive practices, processes and claims in the "social" realm, and properties and acts of the objects of science (Latour 1993, 1997: 6). The present study can especially rely on works in ANT that include biological agents and conservation issues (Callon 1986; Law 2008; Lynch and Law 1999), and ask, for instance, what the agents and agencies are in the processes of species conservation or management. Jepson and colleagues specify, most helpfully, that:

> actors in conservation are not just people and organizations but also collectives and non-humans such as animals, and categorization and certification devices. A conservation actor might be defined as any entity (human or non-human) having the capacity, intentionally or otherwise, to affect conservation outcomes. (Jepson et al. 2011: 234).

In the case of a new species, the methodological approach needs to be broad enough to include the categorizations and regulations of environmental protection, as, for

instance, the decision of whether or not the new species is listed as a non-native or invasive species influences to a great extent the subsequent actions in species management.

In this context, the cultural semiotic approach can articulate cultural mechanisms and processes that may underlie the emerging discourse of the new species. Semiotics can also develop methodological tools by providing the research methods and specifying the properties and role of the textual material of the study. Biosemiotics can further contribute with the understanding that non-human animals (including individuals of the emerging species, e.g., golden jackals) should be considered as both agents and semiotic subjects (Hoffmeyer 2008; Uexküll 1982) that have their own semiotic activity and species-specific Umwelt and that model their surrounding, make use of environmental resources and establish relations with other living beings in the biosemiosphere. Paying attention to the semiotic activity of the animals involved turns out to be an important aspect of species management discourse. For instance, the biosemiotic approach allows observing how the emerging relations between the new species and the existing biological community influence human attitudes towards the new species. As we see later in this study, the emergence of a new species can be a disrupting factor that challenges existing conceptual categories of nature and communication practices between institutions. In sum, the central methodological principles of the semiotic approach to species management could be mapped as following:

1. Natural processes, nonhuman animals and human social groups are all considered as agents that are able to initiate change and that can be influenced by the change initiated by other parties.

2. All living parties (species, different social groups) are considered to be semiotic subjects. Semiotic subjects seek to understand their environment. In doing this, semiotic subjects have abilities of modeling (that is making sense of surrounding environments, processes and actors on the basis of analogical relations, Lotman 1967: 130–131) and self-modeling (Sebeok 1991b).

3. The process of species management is seen as a dynamical interaction of self-modeling and modeling processes between different human parties and biological species. In this process, different means of communication, translation and persuasion are used (Callon 1986).

The biosemiotic understanding of the emergence of a new species thus pays attention to the encounter of different semiotic subjects, being in concordance with David Low's (2008) semiotic study of environmental communication, which emphasizes dissent and opposition as critical properties of the environmental discourse.

3. Material and Method

The object and material of the present study is the emergence of the golden jackal in Estonia, and its early cultural semiotic and ecological reverberations. The golden jackal belongs taxonomically to the family *Canidae* and its living area covers north and northeastern Africa, southeastern and central Europe, the Middle East, and southeast Asia. The location of the present study, Estonia, is a country in the Baltic region of Northern Europe with a territory of 45.227 km^2. It is situated in the northern part of the temperate climate zone and is rich in forests (around 60 %) and wetlands (around 20%). Estonia has stable populations of larger carnivores, including the

brown bear (*Ursus arctos arctos*), wolf (*Canis lupus*) and lynx (*Lynx lynx*). The golden jackal has never been a native species in the Baltic region. It is common in the Mediterranean area, with the closest large and stable populations living in the Balkans and Hungary (Markov 2012). More recently, golden jackals have also been found in Austria and Slovakia and the geographical range of the species appears to be moving towards the north (Arnold et al. 2012).

Ecologically, the golden jackal can be considered as an opportunistic omnivore who is very adaptable and capable of adjusting its life strategies and diet to local environmental conditions (Lanszki et al. 2010). In Europe, it often prefers wetlands and river deltas as well as heterogeneous agricultural areas, shrubs and herbaceous vegetation as a living habitat (Šálek et al. 2014). The golden jackal can become a human commensal by foraging on trash sites and hunting or cattle farming remains, whereas anthropogenic foods appear to be more relevant in winter (Raichev et al. 2013). As a social species that can hunt in groups, golden jackals could effectively catch larger prey, e.g. cubs of ungulates (Markov 2012: 69), although it mostly appears to feed upon rodents, insects, etc. In regard to other *Canidae* present in the area, the golden jackal may have competition with the red fox (*Vulpes vulpes*) due to an overlap of diet, while the gray wolf (*Canis lupus*) is known to be actively intolerant of golden jackals and to chase them off (Stoyanov 2012: 54–55). The relations between the golden jackal and the raccoon dog *Nyctereutes procyonoides* are not well known, as there is little overlap between the ranges of these two species.

There are a few studies about the perceptual ecology and social behavior of the golden jackal that could be used as a basis for interpreting its relations to humans. Like most other canids, golden jackals are territorial – they establish relatively stable pairs or social groups that mark and defend their territories against species mates (Negi 2013; MacDonald 1979). Scent-marking as well as group vocalizations are described to be important for establishing and maintaining social bonds (Anisko 1976: 285). Golden jackals have diverse social behavior and communication that includes facial displays, play behavior, greeting ceremonies, grooming, group howling and alarm calls (Golani 1973; Negi 2013: 344; Feddersen-Peterson 1991). These communicative and behavioral expressions can be assumed to provide a basis for human perception and interpretation of the golden jackals in the case of immediate encounters.

The first specimen of the golden jackal in Estonia was hunted down at the end of February 2013 in Hanila parish, Western Estonia, near the Matsalu National Park that is a protected wetland of international importance (included in the Ramsar Convention). Anecdotal evidences about encounters with the new species followed from other regions of Estonia. By May 2015, nine specimens of the golden jackal have been shot or found dead (see figure 1). In 2014, the golden jackal was also repeatedly found in Latvia. It has become apparent that golden jackals have formed a small local population.

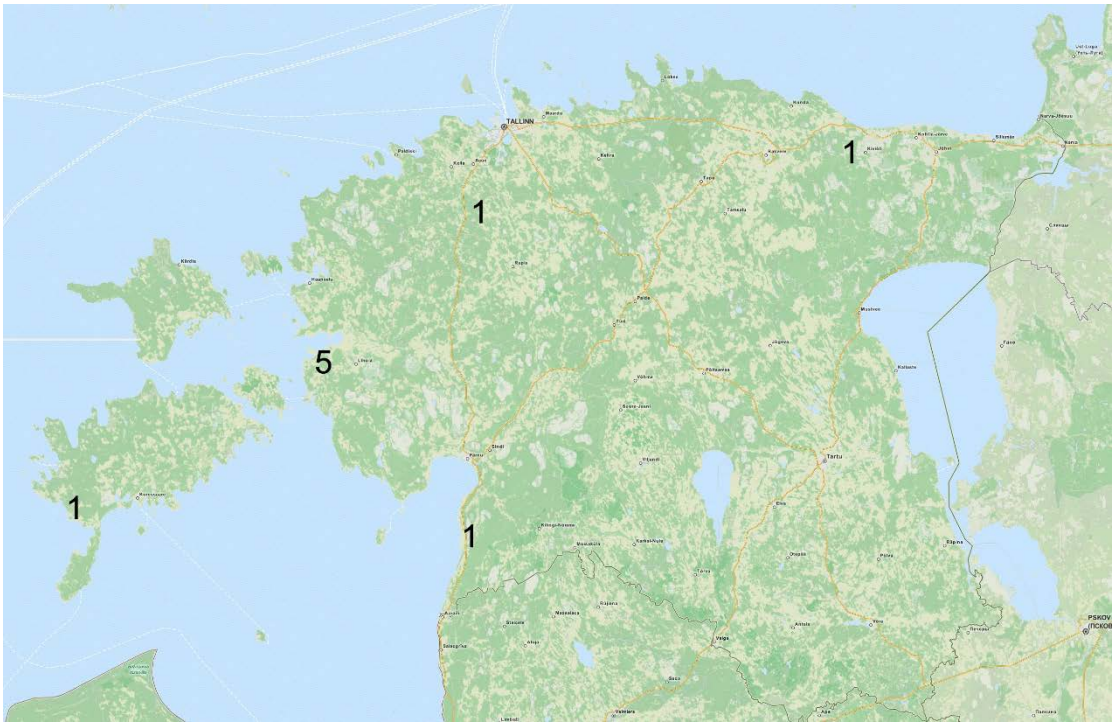

Figure 1. Number and locations of golden jackals shot or found dead in Estonia between 28.2.2013-31.01.2015 (courtesy of Peep Männil, Estonian Environment Agency, Wildlife Monitoring Department, based on Open Street Map). Five individuals were captured from the Hanila parish.

During the year of 2013, the new species, its trajectory of arrival and possible influence on the local environment became a topic of vivid discussion among specialists in zoology, environmental officials, local people of the Hanila parish and the general public. In public discussions, considerable attention was given to the issue of how the golden jackal arrived into Estonia: whether it arrived by natural migration or was brought in by humans and released into wild. The latter option would justify treating the golden jackal as a non-native or invasive species. So far, the exact cause or trajectory of the golden jackals is not scientifically confirmed. In May 2013, the Estonian Ministry of Environment took a position that the golden jackal in Estonia is a non-native species that was followed in September 2013 by a statement from the Environmental Agency (*Keskkonnaamet*, a state office for environmental issues) granting to local hunters' organizations the right to shoot golden jackals for eliminating the species. This decision got mixed responses from different interest groups and was widely disputed in public media.

In this context, a study was conducted with the aim to record and analyze the early cultural reactions to the new species (applying qualitative interview methods suitable for species management research, Newing 2011: 96–118, Torkar et al. 2011; Ryan and Bernard 2000). The individual interviews were chosen as a research method to correspond to the emerging research situation and to be of minimal disturbance to the cultural discourse (Drury et al. 2010). For selecting the respondents, the snowball sampling method was used, where earlier respondents suggested other people that were involved in the topic. Interviews were recorded within the three months from August 2013 to November 2013. Nine respondents were interviewed altogether. The structure of the respondent group was mixed in regard to gender and age and it could

be divided between two groups: local inhabitants of the Hanila region (4) and people with professional involvement (5) with the golden jackal. In the latter group, the people had a different affiliation in environmental agencies and organizations (Ministry of Environment, Environmental Agency, biologists in different research institutions). The conducted interviews were semi-structured (Newing 2011: 101–104) and arranged around the following topics: participants in and the nature of discourse on the golden jackal, the position of the golden jackal in regard to Estonian nature, the concept of non-native species, cultural and ethical issues related to the golden jackal, and personal acquaintance with the golden jackal. The topics varied depending on the specific involvement of the informants, their professional background and their interest in golden jackals. Interviews also included open-ended questions where informants could express their own understanding related to the golden jackals. All interviews were conducted in the environment chosen by the informants, and lasted thirty minutes to one hour and fifteen minutes. The transcripts of these interviews formed the main material of the present study. In addition, biological research articles on the golden jackal, popular articles in public media and internet commentaries were used as sources of supportive information.

Interviews were fully transcribed and coded by keywords. Thereafter, coded entities where organized into thematic groups (Ryan, Bernard 2000: 780–781, including e.g. metaphoric expressions related to golden jackals, general cultural models, the concept of non-native species, ecological relations between species, possibilities to remove the golden jackal from Estonian nature, communication between interest groups). These thematic groups were analyzed to specify the range of views and the dominant understandings. Transcripts were quantitatively analyzed (word counts, Ryan, Bernard 2000: 776–777) in regard to: 1) adjectives (and synonymic expressions) used to characterize the golden jackal, and 2) other species mentioned in relation to the golden jackal and the type of connection. The focus of the study is on qualitative analysis, and quantitative measures provide no bases for statistical generalizations due to the small number of respondents. In addition, the general cultural models or metaphoric models (Holland, Quinn 1987; Schmitt 2005) were sought and analyzed in relation to the respondents' wider understanding of nature. In the latter analysis, popular articles in public media and internet commentaries were also used as supportive material.

In conducting and analyzing the interviews, a few critical aspects were noticed that could influence the results. First, the sample size of the respondents was relatively small. This is due to the fact that the number of people in Estonia that have had a personal or close professional relationship with golden jackals at that time was rather limited. Still, making a qualitative study with people who were personally engaged and well-informed was considered to provide valuable information about the early interpretations of a new species. There was also perceivable overlap between different interviews that could confirm that the sample size was adequate for the type of study. Second, as Estonia is a small society (1.32 million), people both within the professional and local circles know one-another well. This means that the respondents' attitudes and actions could be motivated by long personal histories with one another. This effect was noted in some interviews and the responses with strong personal bearing were excluded from the analysis.

4. Results and Discussion

4.1. Golden jackals as semiotic subjects and agency

Results and analyses of the present study are divided into two sections, the first focusing on the role of activities and behavior of the golden jackals, their influence on the public discourse and people's expectations in regard to golden jackals. The second section observes the cultural models of the discourse. If non-native species have commonly been perceived as problematic objects of environmental discourse, then I will take here an alternative biosemiotic perspective and consider golden jackals as semiotic subjects and agents capable of influencing human environmental discourse. The emerging semiotic and ecological relations of the golden jackals with local ecosystem are an important topic that would deserve further biosemiotic research. At the present moment, given the small number of direct observations, the understanding of the golden jackal's agency will be indirectly derived from the analysis of the interviews.

The most emphasized and dividing issue regarding attitudes toward the golden jackal was the question of origin – whether the species arrived by natural migration or was brought in by humans and released into wild. From the nine respondents, three supported the theory of self-dispersal, three supported the theory of human involvement and three remained neutral or expressed that they did not have enough information to take a position (no correlation between the groups of local inhabitants and professionals was present and the opinions within the professional group varied). The question of the origin of the golden jackal directly relates to the issue of whether it should be considered a native species of the Estonian fauna, as Estonian legislation states that non-native species arrive as a result of human agency: "it is prohibited to introduce live specimens of non-native species in the wild" (Nature Conservation Act, par 57.1).[1] The question of being native or non-native further motivates the understanding of whether the golden jackals should be removed from Estonian nature. Thus it can be seen that the actual trajectory of the golden jackal's arrival influences people's attitudes on the basis of the fixed categories of native–non-native species. Related to the emergence of the golden jackal, respondents expressed an understanding about the artificial nature of the native / non-native species distinction: "this entire concept of non-native species is really difficult to settle" (M, 1959),[2] " it is such a purely anthropocentric concept that .... and well, those borders are so fuzzy." (F, 1972). " With this jackal's case, it is exactly this kind of confusing story that no one can say for sure whether it is one or the other" (F, 1960). On the other hand, in the problematic case where the origin of the golden jackals was unknown, indirect arguments were proposed to fit the golden jackal into existing typological distinctions: "regarding it as a non-native species could be supported in my understanding by [the fact] that you can buy these puppies" (F, 1983), "an analogy exists – a few years ago a permit was requested to bring a dingo to Estonia as a pet animal. Dingo or jackal, I do not see much difference." (F, 1972). These examples explicate how the emergence of the new species with an unknown origin

[1]http://www.legaltext.ee/et/andmebaas/tekst.asp?loc=text&dok=X90008K7&keel=en&pg=1&ptyyp=RT&tyyp=X&query=looduskaitseseadus, retrieved 20.01.2014.

[2] All interview excerpts are translated from Estonian by the author. Respondents are referred to anonymously as (gender [M/F], year of birth).

problematizes the native–non-native species divide and how people make a cognitive effort to keep that conceptual framework.[3]

In addition to the incompatibility with the existing concepts of species management, the golden jackal's own direct semiotic activity seems to influence the discourse as well. Based on the interviews, the local people of the Hanila region had direct and diverse experiences with the golden jackals: "I have here a small field and then they came one evening. I went to the hunting pulpit to watch the wild boars, and then it was in the middle of the field. It watched me and I watched it with binoculars – full eye contact." (M, 1942). "In early spring it starts, this more frequent howling. Dog also likes this. Starts brawling and barking in the house in the middle of the night." (M, 1952). Golden jackals were described as being active and elusive, but not exactly fearful of humans: "One day I looked over the freshly cut meadow and cubs were playing there, five-six of them between the hay rolls. So quick, here and there, that I could not count them. Five surely, perhaps six or seven, and then there was a call, and instantly, all jumped to the juniper bushes and gone they were." (M, 1955). Golden jackals have a certain character, appearance and behavior that appear to appeal local people. Such experiences were reported by the local people of the Hanila parish as important aspects of their interactions with golden jackals. As told by a local informant (M, 1955) "[the Jackal] is very sensitive, very lively. The fox is clever, they say, but the fox is stupid in my mind. But this is something else... [Jackal] is beautiful, slender, alert. [...] still lovely and interesting or so. And sometimes we look each other in the eye." To better understand how people perceive the novel species, adjectives (and synonymic expressions) used to characterize the golden jackal were analyzed. Based on this analysis, four groups of words could be distinguished, expressing exceptionality, appeal, personal attachment and unpleasantness (table 1).

Table 1. Adjectives and synonymic expressions used to describe golden jackals. In square brackets, the original words in Estonian and their absolute number is given (if the respondent mentioned the same word several times during a single answer, it was considered as repetition and counted as one).

Type	**Descriptive adjectives**
Exceptionality	weird [imelik, 6], strange [kummaline, 2], hybrid [hübriid, 2], cross-breed [ristsugutis, 1], of its own kind [omamoodi, 1]
Appeal	hidden [varjatud, 4], alert [väle, 3], active [aktiivne, 2], lively [elav, 2, tragi, 1], beautiful [ilus, 2], clever [kaval, 1], shy [pelglik, 1], less annoying [vähetüütav, 1] sensitive [tundlik, 1], slender [sale, 1]

[3] The issue of native ecosystems is indeed very complex. On one hand, the deterring effect of invasive species to local ecosystems is factually well proven. On the other hand, conceptions of native 'nature' and the „alien" tend to have a counterpart in social processes (cf. Peretti 1998; Coates 2007: 15).

Attachment	interesting [huvitav, 7], cute [nunnu, 4], nice [sümpaatne, 2], dear [armas, 1]
Unpleasantness	ugly [kole 3], nasty [vastik, 3], bastard [ebard, 1, värd 2], carcass eater [raipesööja, 2], bad [paha, 1]

The descriptive adjectives most often used were: interesting (in Estonian "huvitav") 7 times, weird (in Estonian "imelik") 6 times, hidden ("in Estonian "varjatud") 4 times, and cute (in Estonian "nunnu") 4 times. A remarkably high number of adjectives connects jackals with exceptionally, ambiguity and novelty, which expresses that the species is indeed predominantly interpreted in a mode of non-native or novel species. Positive adjectives expressing appeal and attachment appear to outweigh the adjectives expressing disgust and unpleasantness. This result needs to be interpreted carefully, however, as local people tended to have more positive attitudes towards golden jackals compared to professionals, and they also used more descriptive adjectives and synonymic expressions. The direct encounters and personal experiences of local people with the golden jackals probably influenced their more vivid use of language. At the same time, adjectives and synonymic expressions were used by all respondents and their number and diversity is noteworthy, as it indicates the emotional relationship with the new species.

Another aspect in which the golden jackal's own semiotic subjectivity and agency influences people's attitudes and general discourse is their emerging relationship with other species, both wild and domestic. As at present, very little is known about the ecological relations and feeding habits of golden jackals in Estonia, people's opinions on this matter were mostly derived from their literature-based professional knowledge, expectations and fears. The danger of predation of the golden jackal on sheep was expressed several times: "Yeah, he thought that it would be dangerous for the sheep farmer" (M, 1954), "[He] claimed that it was those jackals that had been slaughtering his sheep" (F, 1960), which was magnified by the finding of hair from sheep in the stomach content of the first golden jackal that was shot. At the same time, at least some of these negative expectations appeared to be based on a transfer of meaning from wolves to golden jackals, as there is a lengthy discourse on the influence of wolves to sheep-farming in Estonia. As it was expressed by one respondent (M, 1969): "farmers know the wolf and that it eats sheep and they have their opinion about the wolf, often a negative one. And now it turns out that there's a new fellow with teeth, who may also want to nibble something, and well, of course they do not remain indifferent."

Expected ecological interactions between golden jackals and other species, such as amphibians, water birds, raccoon dogs and wolves, influenced the informants' opinion about the golden jackals. The possible negative effect of golden jackals on water birds and amphibians in Matsalu National Park, in the borders of which the first golden jackal was captured, was one reason for the cautious attitude of environmental officials. In several interviews, the golden jackals were positively interpreted as a possible remedy against the raccoon dog (*Nyctereutes procyonoides*), which is another problematic non-native species brought to Estonia by humans in the 1960's: "it can compete for food with the raccoon dog but these relations we do not know

yet." (M, 1965), "it is a competitor to the raccoon dog here and if there will be a little less of the raccoon dog, then this is a good thing" (M, 1952). Additionally, the golden jackals' relationship to wolves was repeatedly mentioned, the latter of which was expected to act as a natural predator of the golden jackal.

In general, respondents were ready to interpret the golden jackal as part of the existing ecosystem and speculate about the emerging relations with other species (table 2). Most often ground-nesting birds (7) and amphibians (7) were mentioned as prey, the raccoon dog (8) and fox (6) as competitors, and the wolf as a predator (3). Seeing the golden jackal as related to other species would also mean that any scientific information about the golden jackal's ecology could significantly alter the interpretations and attitudes toward jackals. For instance, finding the skin of the wild boar in the jackal's stomach content appeared to rehabilitate jackals to some degree and put the responsibility for its survival on the human actor: "...that it had been eating skin of the wild boar, and this behavior of our hunters that they... – boar hunt takes place in the winter – I checked that over a thousand wild boars have been hunted here in Western Estonia, and all skins are dumped in the woods." (F., 1960).

Table 2. Other species that were expected to have ecological relations with golden jackals. The number of times mentioned is given in square brackets (if the respondent mentioned the same species several times during a single answer, this was considered as repetition and counted as one)

Ecological relation	**Species mentioned**
Predators	wolf [3], lynx [2]
Competitors	racoon dog [8], fox [6], lynx [1]
Prey species	ground-nesting birds [incl. their eggs and nestlings 7], amphibians [7], remains [4], sheep [3], mice and voles [3], hare [2], snails [1], insects [1]

Based on interviews, the golden jackal seems to fit well into existing ecological webs of Estonian nature. It would be interesting, however, to compare the respondents' opinions to existing knowledge of the golden jackal's ecology in Europe. For instance, in regard to prey species, Stoyan Stoyanov (2012: 53) in Bulgaria has found in a study based on stomach content that "golden jackal diet consisted mainly of mammals (occurrence of 87.5%, of which 41,7% was rodents), birds (36,1%), vegetable matter (30,6%, mainly fruits, seeds, acorns and crop), fish (12,5%), insects (9,7%) reptiles (1,4%) and crustaceans (2,8%)". Rather similar results have been gained by A. Radovic and D. Kovacic in Croatia in a scat analysis, that "consisted mostly [of] mammals (50.3%) followed by fruit seeds and vegetables (34.1%), insects (29.5%), birds (including eggs; 24.8%) artificial materials (24%) and branches, leaves and grass (24%)" (Radovic and Kovacic 2006: 219). These and other studies of

jackals' foraging[4] show that its diet varies in relation to local ecological conditions, but that the number of birds and especially amphibians in the golden jackals' diet in Europe is generally smaller than expected by Estonian informants. That may have to do with the concerns specific to Matsalu National Park, which is an important breeding and migration area for waterbirds. Whether the Estonian respondents' expectations and fears of the ecological effects of golden jackals become reality, or are adjusted based on the actual ecological data, remains a question of future study.

Based on the results and analyses given above, golden jackals appear to act as semiotic subjects in this discourse by influencing humans to shape their opinions of and causing problems in existing conceptualizations and dichotomies. After conducting the interviews in autumn 2013, new encounters with the golden jackal in other regions of Southern (Häädemeeste) and Eastern Estonia (Kiviõli), Estonian islands (Saaremaa), and Latvia demand a reinterpretation of the earlier opinions. It may be concluded that the golden jackal's appearance, ability to adapt to new living conditions and developing ecological relations to other species influences to a considerable degree how golden jackals are perceived and interpreted in environmental discourse.

4.2. Cultural bases of modeling

Another central factor of human interpretation of jackals appears to be existing cultural models of thought (that is, general conceptual models that organize cultural understandings). In the case of jackals, a cognitive principle appears to be in force in which novel things are interpreted based on (either similarly or in contrast to) what is already known in culture. As shown in an earlier section, jackals were called "howling foxes" and their potential danger to sheep was interpreted analogously to wolves. The presence of cultural models of thought also becomes perceivable when searching for reasons why the killing of a few individuals of the golden jackal species has become a topic of public discourse. Most arrivals of non-native species to Estonia do not get so much attention.[5] It can be expected that animal species differ in their symbolic or cultural load of meaning and that Canidae tend to have great cultural significance (Nie 2002). But it is also reasonable to propose a hypothesis that in cases of vivid public interest, the events fit well to some general underlying cultural model or paradigm. It is suggested that in the case of jackals in Estonia, two major but contrasting cultural models – opposition of the own and the alien and the settlers' narrative – are stimulated, and that their tension causes a vivid dispute and public interest in this species. Some additional cultural or metaphoric models were deduced from the interview analysis, such as the golden jackal being interpreted as a "vector of

[4] For instance, another scat analysis concludes that "rodents have been found to represent the primary food of the jackal (biomass estimation: 59.3 %, mainly Microtus spp.), and the European brown hare (Lepus europaeus, 20.1 %) and plants (19.7 %, mainly fruits) are secondary foods" (Markov and Lanszki 2011: 44).

[5] In regards to non-native or invasive species, the presence of different interest groups and different perceptions should be expected (García-Llorente et al. 2008). It is also common to have opposition between the general public and professionals in the question of irradiation of the invasive species (Selge et al. 2001).

threat" that could bring along unspecified illnesses or parasites, or metaphors of "pollution" and "outlaw" used to denote the non-native species.[6]

The first general cultural model discerned from the analysis is the opposition of the own and the alien. In the semiotics of Tartu-Moscow school, the opposition of the own and the alien has been treated as a general principle of culture. Cultural self-description or the awareness of one's own culture presumes the opposition to what is considered to be the other (Lotman 1997: 14-15). The opposition can go together with the intention to preserve one's own cultural integrity and the dynamics between the cultural centre and the periphery. As stated by Juri Lotman:

> [I]f (from the point of view of an immanent mechanism) the boundary unites two spheres of semiosis, then from the point of view of semiotic self-knowledge (self-description on a metalevel) in a given semiosphere, it divides them. To realise itself in a cultural-semiotic sense means a realisation of its specific character, in terms of its opposition to other spheres. This serves to accentuate absolutely those features by which a given sphere is outlined. (Lotman 2005: 211–212).

Introducing the distinction of the own and the alien is not to claim that the discourse of "non-native species" is wholly culturally motivated, as there is also a concrete legal definition of that concept in the Estonian Nature Protection Act. Interviewed environmental officials and zoologists used mostly scientific vocabulary and expressed themselves along the lines of scientific or administrative paradigms. At the same time, the "non-native species" appears to be a concept not easy to formalize: "No species is inherently alien, but only with respect to a particular environment at a particular moment. However, precise definitions of such a place and time are problematic" (Warren 2007: 431). There are no clear criteria to determine the relevant scope of human activities (do climate change and other indirect activities count?) and what the spatial and temporal limits of "local" nature are (are these borders of the Estonian state or a wider geographical region, and are, for instance, plant species introduced in the 19th century native or not?).

In such an uncertain context, a formal understanding of the "non-native species" may give room for the underlying cultural opposition of the own and the alien. This may influence the decision-making process, especially when the emergence of a new, large, carnivorous species creates stressful situations for environmental offices and questions their communication routines. Most respondents related to species management expressed their dissatisfaction with how the communication took place between the different participants: "what I really have seen in the case of this jackal, is that information really does not move between different offices" (F, 1983), "You mentioned communication between offices [...] I can say that it does not work very well" (F, 1959)", "[...] There are no explanations whatsoever, one moment just some statement comes that this is a non-native species, and right together with this, that hunters have to be ordered to start hunting. Any reflection on this issue had been skipped." (M, 1969). At the same time, environmental specialists often need to make decisions about non-native species without having sufficient information. This is the case, for instance, when, during the time that good scientific knowledge is being

[6] In some studies, the presence of a specific set of metaphors has been found in invasive species discourse, e.g. military metaphors (Larson et al. 2005). The present study reviewed a few metaphors, but a specific set of metaphors was not identified.

gathered, the new species spreads to a degree where measures against it are no longer effective. Non-native species, when becoming invasive, may put severe stress on local ecosystems, supersede local species, induce human diseases, cause direct economical costs and influence human culture. It is estimated that "up to 40% of extinctions in the past 400 years were the result of introduced species." (Hambler 2004: 79). At the same time, a small number of the introduced or non-native species actually becomes problematic – based on British plant and animal data, M. H. Williamson (1995: 36) has proposed a rule of tens: from 100 introduced species, around 10 become casual and less than 1 becomes a pest. The risk of making a decision based on partial information needs to be calculated against the possible negative ecological effects of the new species.

Another factor that especially indicates the influence of the underlying cultural opposition of the own and the alien is the factor of fear, which was detectible from several interviews and interview situations. This finding is in concordance with some earlier studies of non-native species discourse (Larson 2008). The fear of the alien was expressed in different forms as a suspicion about the new carnivorous species, as a mistrust to act in the ambivalent situation, but also as a bureaucratic concern about making the right decision and not becoming a faulty party:

> "Indeed, people are not afraid of the wolf or lynx anymore, but we now have a much smaller and more innocent animal, and people are afraid of it, there's fear that who knows what it will do. And all that talking, too, of people being scared that there's a jackal now living nearby, what will now happen, can we let our children go outdoors" (M, 1965)
>
> "The hunters were really alarmed by this. They had thought they had done something respectable, had caught some unknown animal, and then suddenly inspectors start prying if they had a permit for this, and then they debated that if the permit was for shooting raccoons and foxes and they had instead caught an animal not listed as a game animal, whether this was legal or not." (F, 1960)
>
> "Especially officials, their fear is from a different source. They are afraid whether they are allowed to make a decision or whether they make the right decision or they are scared of not making any decisions. Things get delayed, someone somewhere will get angry..." (M, 1969).

The cultural opposition of the own and the alien together with the fear of the alien may lead to an attitude towards the jackal that is stigmatizing beyond rational arguments. Mihhail Lotman (2001) has noticed that fear has a capacity to substitute complex semiotic processes with more simple stimulus-response sequences. The fear factor triggers the behaviors aimed to ensure self-preservation, either on the behalf of single individuals or social institutions. For rational decision-making, it could be suggested that the organizations involved in species management acknowledge and take into account the possible effects of this fear on environmental communication.

A contrasting cultural model that appears to be underlying the interpretation of jackals in Estonia is that of "settlers". The story of the possible dispersal of the species, in which a few jackals travelled by river basins and coastline from the Balkans to

Estonia, appeared to be especially appealing for the general public.[7] A historical memory of Estonian culture includes several waves of emigrations, deportations and war refugees and tends to create sympathetic attitudes towards subjects of relocation. "We have an information society and there is a lot of moving around. The world is getting smaller and perhaps it is becoming too small also for the animals." (M, 1952), "There are indications that it is entirely possible that this animal walked here entirely on its own. In such case it would be rather bad and ethically wrong to proclaim that this species that has come to Estonia on its own and widened its range, is a non-native species." (M, 1969). The settlers' narrative was further exemplified by the repeated use of the verbs "came here", "arrived" and "reached at" in interviews. The settlers' narrative is connected to the perception of the animal's agency — it can be operational in the case of larger vertebrates capable of individual translocation and dispersal, but cannot be equally applicable to mass migrations (fish, insects) or passive introduction (plants).

At the same time, the settlers' narrative runs even deeper in cultural memory. The founder stories appear to be parts of the origin myths of many nations, especially of colonial and archipelagic cultures, but also being supported by biblical motifs (e.g. crossing the Red Sea). In Estonian cultural identity, this motif is known as the arrival from the Fenno-Ugric primeval home in the Ural Mountains to the Baltic coasts after the last Ice Age. This motif, although scientifically very questionable, is used in different forms and genres in Estonian cultural texts. This is what was referred to by one of informants, saying: "I think we have to adapt [to this change] as we also reached to this sea once, as once upon a time we ourselves also arrived at this sea and there was nowhere further to go" (M, 1955). Similar descriptions were present in internet forums. As described in an anonymous comment: "Try to put yourselves into the jackals' position. Perhaps they walked here, who knows. Reached here and water stood in front of them. They find nice woods and then comes the man and resettles or just kills them."[8] The "settlers" narrative creates a basis for empathy towards the new species. Due to the motifs of "injustice" and "the promised land", it can give ground to counter-discourses in cases where people perceive that the given species has been an object of unjust decisions and persecution.[9]

A specific feature of these two underlying cultural models is that they place the agency in the system in a contrasting way: in the own/alien distinction, humans are considered to have an active role and it is considered to be their task to control the new species that could endanger the local ecosystem. In the settlers' narrative, golden jackals are considered to be subjects that have their own intentionality and the right to relocate and interact with different environments. The issue of whether the agency was located in the golden jackals or in the humans working in species management appears to be expressed well by the question of whether hunting measures are believed to be effective in eliminating the golden jackal. People's opinions toward this question would show their understanding of whether humans really have the

[7] From an ecological perspective, the river basins in Europe may be considered as a part of the network of ecological corridors for large mammals (e.g. Romanowski 2007).

[8] Anonymous comment made to news portal Ilmajaam.ee made at 19.05.2013, 21:54, retrieved www.ilmajaam.ee on 22.05.2013.

[9] In addition to the settler's narrative also more direct arguments were used to oppose the removal of the golden jackal, e.g. the precaution principle, according to which the possible consequences of action should be analyzed before taking action (cf. Sunstein 2005).

capacity to intervene in such environmental change. From the nine respondents interviewed, three assumed that hunting measures could be effective, three considered them non-effective and three were uncertain or did not expressed their opinion clearly. However, a clear difference between the local respondent group and the professionals was perceived: hunting measures were considered to be ineffective by three local people (one remained uncertain), whereas in the specialist group, three believed in the effectiveness of hunting measures (two remained uncertain). It appeared that local people put more trust in nature's ability to self-regulate and saw the humans' ability to halt the golden jackal's dispersal as quite limited: "You cannot catch them by hunting. Hunters come here every year, every week they sift the area and only now is the first time they have caught one (M, 1955), "My father was also a serious hunter and he used to say that the hunting would not kill the animal so easily, in the way that it will disappear." (M, 1942). "I think that it is too late for this already [...] I can say that it has been three years already that this howling has been heard. And if they have had brood here for three years and supposedly elsewhere as well, then it is too late for this, I think" (M, 1952).

The two cultural models appear to correspond to broader understandings of nature's role and dynamics. The own/alien distinction appears to be supported by the understanding of a passive nature that needs to be actively regulated and protected against harmful influence. As interpreted by one of informants: "alien species are called biological pollution, and I think this is a quite exact definition, that describes quite well the present situation. Pollution will be removed, even if it looks cute." (F, 1972). In the opposite view, nature is considered to be an active and dynamic force and human interventions in nature are considered to be problematic and better off avoided. In the words of a respondent: "If there is this climate warming and soon turtles will also be here, then this is inevitable, we cannot do much about this. We can be rude and it can be good for a while or it can also be catastrophically bad. Time will tell. We just cannot know yet" (F, 1955). Both positions are concerned with the limited knowledge of nature, but the suggestions that they give are opposite: in the first case, it is proposed to react in order to avoid the possible negative developments, while in the second case, it is proposed not to react as the situation could be more complex than humans' current understanding of it. These positions towards environmental change appear to be very wide-ranging and may be supported by general human psychological or cultural types, which is an issue that goes beyond the scope of the present analysis.

5. Conclusions

In this article, semiotic methodology was applied in order to study the early appearance of the golden jackal in Estonia. The main conclusion of the study is that the role of human organizational and communicative activity may be greatly overestimated in the environmental communication process. The discourse of new and invasive species appears to be influenced to a considerable degree by the animal's own semiosis, and by general models of human culture. The case study showed that communicative interactions take place between golden jackals and humans via direct encounters or as mediated by public media. In both cases, the semiotic activity of the golden jackals — its appearance, behavior, and visual depictions in photographs — appears to influence people's attitudes. For biosemiotics, the major conclusion of the present study could be that in the field of conservation, there is no apparent distinction

between the biological and the cultural realm, but that the perception and effect (that is, semiotic causation) easily crosses the lines in both directions. Modeling such objects from a semiotic viewpoint is possible, but in order to do this, it is necessary to combine different methodological approaches, such as those used here from biosemiotics, an ecological approach, cultural semiotics and actor-network-theory.

At the same time, the understandings of golden jackals are also largely dependent on cultural models and metaphors that give presumptions and shape to the discourse of non-native and invasive species. The present study identified two of such general models of thought: the opposition of the own and the alien and the "settlers" narrative. The influence of such organizing cultural models cannot be avoided in environmental communication, but rather their existence should be taken into account in decision-making routines and communication practices. For the environmental officials, it would be beneficial to be aware of the underlying cultural models in the discourse of non-native species. One of such factors, whose presence should be taken into account, is the fear of the unknown and situational change. The present study also implies that using rhetorics in communication that make allusions to an alien character or invasiveness of the new species may be counterproductive, as it as tends to raise connotations of social processes such as migration and minorities (cf. O'Brian 2006).

A specific feature of the discourse of the new or invasive species is that it is in constant development, as a lot of information is in the form of anecdotal evidence and stories, with new developments changing opinions and no participant having a full monopoly of information about the emerging species. In such a situation, the classic sender-receiver communication model is not effective. It would be erroneous to assume that any participant has an independent position above the developing discourse. What could be suggested here for successful environmental communication is to make more use of integrative communication practices and to include different interest groups (field biologists, local inhabitants, etc.) to the decision-making process. In a study of invasive non-native species in Scotland, Selge et al. (2001:182) suggest that in managing invasive species, "local knowledge should be used as a relevant form of information, and vice versa, the public should receive adequately presented information of scientific studies and management scenarios". Given the role of the local communities in successful species management, employing compromises can be seen as way to ensure long-term stable solutions. In developing discourses where every participant has a unique comprehension of the situation, various dissenting voices (cf. Low 2008: 63) are an important part of the discourse and ignoring this can be a source of major communication problems.

For achieving deeper knowledge of how non-native species spread and how human cultural reactions to these develop, it would be very useful to monitor the golden jackal in Estonia as a model species. Such an interdisciplinary research program could provide better management and communication strategies for reacting to emerging non-native or invasive species in the future.

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Compliance with Ethical Standards

The study follows ethical standards of qualitative research in social sciences. The respondents have been informed about the aims of the study, their personal identity has been concealed, and interviews have been conducted with the informed consent of the respondents. The study follows the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The approval of the research ethics committee is not required for this type of qualitative study.

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