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Iconicity in the Semantic Domain of Animals in the Emerging Family Sign Language of Berbey (Mali)

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Cover image: BERBEY in Berbey Sign Language (taken from Berbey Sign Language corpus).

Abstract

Cross-linguistic studies have shown that despite variations across languages, universal patterns are found within semantic domains. In sign language linguistics, cross-linguistic studies of the iconic patterns per semantic domain have received major attention in recent years. This study investigates iconicity in the semantic domain of animals in Berbey Sign Language – an emerging family sign language in Mali – and compares it to 10 other sign languages. The results of the analysis of the iconic strategy and iconic image in 10 animal signs reveal notable patterns. An overview of the universal tendencies found in the semantic domain of animals is included in the study as well.

Contents

1 Introduction

This study aims at investigating the patterns found in the semantic field of animals signs in Berbey Sign Language, an emerging family sign language of Mali. It was not until recently that emerging and rural sign languages became included in the sign language research (see de Vos & Nyst, 2018 for an overview of the attested languages), and they have been the subject of many current studies in the field (cf. de Vos, 2011; de Vos & Pfau, 2015; Sandler, Aronoff, Padden & Meir, 2014; Hou, 2016, 2018). Moreover, studies on universal patterns and tendencies found across languages predominantly focus on spoken languages (see Evans & Levinson, 2009 for criticism) and there is a need for more cross-modal studies that include sign languages as well (Evans & Levinson, 2009; de Vos & Pfau, 2015). In particular, there have been no studies of classification and nomenclature of the natural world (plants and animals) in sign languages.

This dissertation is in 6 chapters. The first (current) chapter is the introductory chapter. Chapter 2 (Literature Review) provides an overview of the studies of linguistic universals in two semantic domains: colour terms and fauna and flora terms. The domain of colour terms is one of the most extensively studied semantic domains; since the universals in this domain have been studied in a number of sign languages as well, an overview of universals in this domain can illustrate challenges faced when applying models for spoken languages to sign languages. The second domain is the domain of animals and plant terms (with a focus on animal terms), which provides the theoretical background for the current study. Chapter 3 (Methodology) presents the methodology of this study. In chapter 4 (Results) the findings of the study are presented. Chapter 5 (Discussion) discusses the findings of the study. Finally, chapter 6 (Conclusion) concludes the study.

This chapter first presents an overview of emerging sign languages (section 1.1), then goes on to introduce Berbey Sign Language (1.1), and finally briefly explains two key concepts

in sign language linguistics that are referred to throughout this dissertation, namely, sign language phonology (1.3.1) and iconicity (1.3.2).

1.1 Emerging Sign Languages

Perhaps one of the most fundamental questions in linguistics is how language started (Meir et al., 2010). Studying how a new language is born could shed light on the origin of human language. However, the only new spoken languages known to linguists are pidgins and creoles[1]. Although these languages are new, they never start from scratch; they are based on one or more existing spoken languages. If we shift our focus from spoken languages to sign languages, however, we realise that there are communities whose members have no prior knowledge of any language and a new language is spontaneously born among them (cf. Meir et al., 2010). A community of deaf people with no previous exposure to any spoken or sign language is where a new sign language emerges seemingly out of nothing due to the need for communication (Meir et al., 2010). Emerging languages provide a unique opportunity to study the emergence of linguistic structure ate every level and the evolution of a language from its early days (cf. de Vos & Pfau, 2015; Meir et al., 2010; Sandler, Aronoff, Padden & Meir, 2014; Sandler, 2017).

New sign languages may emerge in a variety of social circumstances, for example in a community comprised of families with high incidence of deafness or a community of school children brought together in an educational institute[2]. The terms *village sign language*, *rural sign language*, *indigenous sign language* or *shared sign language*[3] refer to a sign language that

[1] When speakers of two (or more) mutually unintelligible languages are brought together, their need for communication results in creation of a new language or a pidgin. When the children of pidgin speaking adults acquire the new language as their native language, the language is referred to as a creole. (Meir et al., 2010)

[2] Since the majority of deaf children are born into hearing families it is common for an isolated deaf child (or a few deaf siblings) to invent a basic communication to interact with their hearing family members. However, this communication system, referred to as *home sign*, is usually not considered a language because it is not shared by a user community and is not transmitted across generations (Meir et al., 2010; Nyst, Sylla & Magassouba, 2012).

[3] Since in small scale communities with high incidence of deafness the sign language is used both by deaf members as well as hearing members of the community (with hearing signers often outnumbering the deaf signers) the term 'shared sign language' is used (Nyst, 2012; de Vos & Pfau, 2015).

arises in a small scale community and is transferred within and between families; often (but not always) these communities have a high incidence of deafness (higher than the 0.01% incidence found in developed countries) (Meir, Sandler, Padden & Aronoff, 2010; de Vos & Nyst, 2018; Nyst, 2012; de Vos & Pfau, 2015; Hou, 2016). Kata Kolok Sign Language in Bali (cf. de Vos, 2011) and Adamorobe Sign Language in Ghana (cf. Nyst, 2007) are examples of a rural sign language in a village with high incidence of deafness. San Juan Quiahije Chatino Sign Language in Mexico (cf. Hou, 2016), in contrast, is a sign language that has emerged in a rural area with only a very few deaf individuals. Languages such as San Juan Quiahije Chatino Sign Language that emerge among a number of the families but have yet not spread to the entire village, can be referred to as a *family sign language* (Hou, 2016; Nyst et al., 2012).

On the other hand, the terms *urban sign language* or *community sign language* refer to a sign language that arises when deaf individuals with different backgrounds are brought together in a national deaf community (Meir et al., 2010; de Vos & Nyst, 2018). Nicaraguan Sign Language is an example of an urban sign language that emerged among Nicaraguan deaf children in the 1980s as a result of opening of the first school for the deaf in Nicaragua (Senghas, Kita & Ozyurek, 2004).

Compared to spoken languages, all known sign languages are young (Sandler, 2017). There is debate about how long after its emergence a sign language can still be considered an *emerging* sign language (de Vos & Nyst, 2018). For example, Kata Kolok Sign Language emerged about 150 years ago and is currently in its sixth generation; however, a notable degree of lexical and/or sub-lexical variation is found in Kata Kolok Sig Language (de Vos, 2011; de Vos & Nyst, 2018). More research is needed to determine whether the characteristics observed in rural sign languages are due to their emerging status or they are characteristics of rural sign languages (de Vos & Nyst, 2018; Hou, 2016). De Vos (2011) suggests that rural sign languages may allow for a greater degree of lexical variation than urban sign languages because the

signers to are aware of the idiosyncratic variation within the community due to the relatively small size of the community and understand each other's signing despite variation.

1.2 Berbey Sign Language

Mali is a multilingual West African country with several spoken and sign languages (Nyst, Sylla & Magassouba, 2012). Although French is the official language of Mali, most Malians use one or more of the local languages in their homes (Nyst, 2015). Malian Sign Language (Langue des Signes Malienne, LaSiMa) is a sign language which emerged in Bamako, the capital of Mali (Nyst et al., 2012; Nyst, 2015). None of the many sign languages in Mali are officially recognised by the constitution (for more information on sign languages in Mali see Nyst, 2015). There is no official statistics on the number of sign language users or the exact rate of deafness in Mali. However, Mali is estimated to have a significantly high incidence of deafness mainly caused by meningitis (Nyst et al., 2012; Nyst, 2015). Due to lack of access to adequate health care meningitis leads to deafness.

Berbey is a small village in the vicinity of Mount Hombori in the Dogon area of Mali (Figure 1). The local spoken language in Berbey is Humburi Senni, which is a variety of Songhay (cf. Heath, 2014). Berbey Sign Language (henceforth Berbey SL) is a sign language that has emerged in the Berbey village. Like most rural areas of Mali, access to deaf education is not available in Berbey and its surrounding areas (Nyst et al., 2012) Between 2010 and 2011 Nyst and colleagues documented Berbey SL as part of a larger Dogon Sign Language Corpus project (Nyst et al., 2012). More information about the corpus will be given in the Methodology chapter.

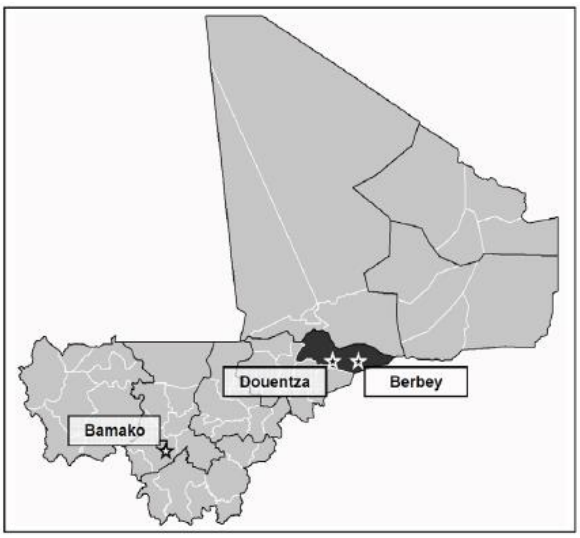


Figure 1. Geographical map of Mali and the relative location of the Berbey village. (Nyst et al., 2012, p 252).

As reported by Nyst, Sylla and Magassouba (2012) the Berbey signing community consists of the families of two brothers living close to each other. The two families have 5 deaf family members among them. One of the brothers (who was 50 years old at the time of Nyst et al.'s report) is deaf and married to a hearing wife; together they have two children one of whom is deaf. The other brother is hearing and married to a hearing wife; they have four children, three of whom are deaf. The two families, especially the children, spend a lot of time together and both the hearing as well as deaf children are competent signers. One generation before, i.e. the generation of the two brothers' late father, all the signers in Berbey were deaf (Nyst et al., 2012). If the all-deaf signers were the first generation of Berbey SL signers, then Berbey SL is currently in its third generation and is considered an emerging sign language according to the criterion mentioned in the previous section.

Although the distribution of deafness among the two Berbey families is hereditary, it has not spread to other Berbey families yet (Nyst et al., 2012). Thus, Berbey SL is different from rural sign languages that have been spread due to the high incidence of deafness (Nyst et al., 2012). At its current stage, Berbey SL may be referred to as a 'family sign language' (Nyst et al., 2012). Additionally, Nyst et al. (2012) reported that Berbey signers showed the highest

level of fluency in the groups of sign languages they documented in their Dogon Sign Language Corpus project. Nyst et al. suggest this might be because Berbey signers comprise of several deaf members of the same age group interacting frequently with one another which contribute to the expansion of the language.

1.3 Sign Language Linguistics

Sign language linguistics is still in its infancy. The beginning of the field dates back to the 1960s and the ground breaking study of William Stokoe and his colleagues on the phonology of American Sign Language (Sandler, 2017; Kristoffersen & Troelsgard, 2012; Zwitserlood, Kristoffersen & Troelsgard, 2013; Johnston & Schembri, 2007). Today linguists appreciate that sign languages are natural languages that have all levels of the linguistic structure including phonology, morphology, and syntax.

1.3.1 **Phonology.**

At first glance, it might seem paradoxical to speak about phonology in the context of sign languages since traditionally it is associated with speech sounds. However, as natural languages, sign languages have duality of patterning: meaningful levels (morphological level and above) and a meaningless level (phonological level) (Sandler & Lillo-Martin, 2006; Sandler, 2017). In any given sign language, the signs are comprised of three formational parameters: *handshape, location* and *movement* (Sandler, 2017; Schembri et al., 2009). Changing any of these formational parameters can potentially lead to the creation of signs with different meanings (i.e. minimal pairs). Figure 2 shows examples of minimal pairs in American Sign Language (ASL).

BIRD

DUCK

a) Signs differing in the handshape parameter.

CUTE

FUNNY

b) Signs differing in the location parameter.

MOTHER

GRANDMOTHER

c) Signs differing in the movement parameter.

Figure 2. Examples of minimal pairs in ASL (Images from Tennant & Brown, 1999).

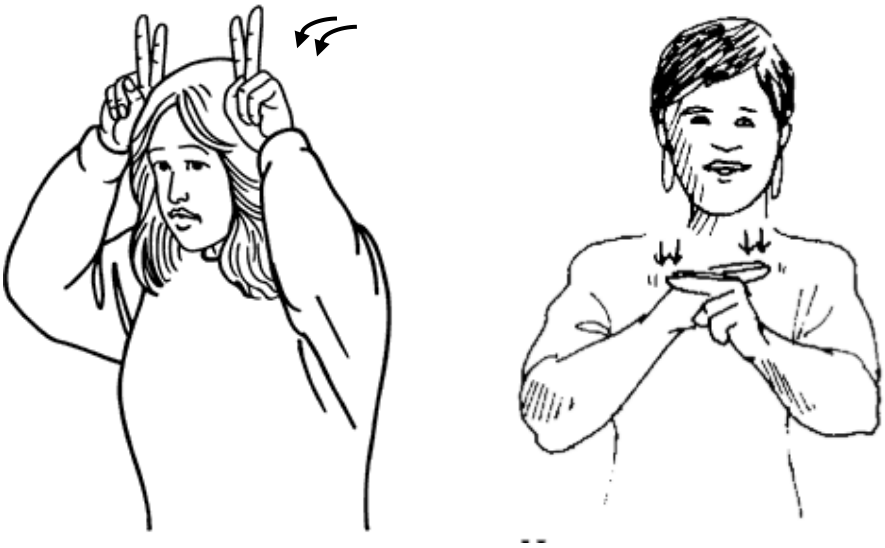
The handshape parameter indicates 'which fingers are … selected … and whether they are straight, bent, flat, or curved' (Pfau, Steinbach & Woll, 2012, p. 24). The location parameter of a sign specifies the place in the space or on the body of the signer where the hand is located (Johnston & Schembri, 2007). Finally, the movement parameter refers to the 'path that the manual articulators traverse to produce the sign' (Meier, Cormier & Quinto-Pozos, 2004, p. 28). Each formational parameter has a set of possible realisations in a given sign language (Meier et al., 2004). Additional elements, such as palm orientation, or non-manual features such as head movement, mouthing or facial expressions, have also been proposed as formational parameters of (cf. Battison, 1978; Sandler & Lillo-Martin, 2006). However, the relevance of these additional elements to minimal pairs is still debatable (Schembri, 2009).

1.3.2 **Iconicity.**

Iconicity in language refers to a direct or apparent relation between linguistic form and meaning' (Sandler & Lillo-Martin, 2006; Perniss, Thompson & Vigliocco, 2010). Onomatopoeia (e.g. 'buzz' or 'meow' in English) and ideophone (e.g. 'ngaa-ngaangaangaa', the sound of a baby's cry in Akan) are some examples of iconicity in spoken languages (Sandler & Lillo-Martin, 2006; Pernis et al., 2010; Edward, 2015). Since sign languages use the visual modality they can employ iconicity more readily than spoken languages (Sandler & Lillo-Martin, 2006). Ironically, the noticeably high degree of iconicity in sign languages was one of the reasons that for a long time sign languages were not considered a 'language'. Given the dominant views (generally associated with the Saussurean linguistics) that the relationship between form and meaning in language is arbitrary, in the early days of sign language research the role of iconicity was often disregarded or minimised by sign language linguists in order to show that sign languages were 'real' (natural) languages like spoken languages (Lillo-Martin & Sander, 2006; Perniss et al., 2010).

As early as 1979 Klima and Bellugi (as cited in Sandler & Lillo-Martin, 2006) observed that even when signs are iconically motivated, there is diversity among them in terms of what

aspect of the referent they depict (iconic image) and how the formational features combine to depict the sign. To illustrate this point Figure 3 shows the signs for RABBIT in New Zealand Sign Language (NZSL) and ASL. Both signs are iconic, and the iconic image in both is the rabbit's long ears. However, the formational parameters of the signs (location and handshape) are different in these two signs. Furthermore, although the aspect of the referent that is selected (iconic image) in both signs is the same, it is not the only possible choice; for example, in a different sign language, the rabbit's teeth or the way it jumps may be selected instead of its ears. It has been suggested that younger sign languages may have a higher degree of iconicity in their lexicon; over time as the signs undergo processes such as phonological assimilation they may become less iconic (cf. Frishberg, 1975; Kendon, 1980).



(a) (b)

Figure 3. The sign for RABBIT in (a) NZSL and (b) ASL. (Images from McKee et al., (2011) and Tennant & Brown (1999), respectively.)

Perniss et al. (2010) suggest that iconicity, alongside with arbitrariness, is a property of human language in general – both in spoken languages and sign languages. In a study on sound symbolism in the basic vocabulary of spoken languages, Wichmann, Holman and Brown (2010) found when the words referring to the same concepts are compared across languages similarities arise in their sound shape (e.g. height and frontedness of vowels). The sample of

the study contained 170 languages and according to the authors was a representative sample of the world's linguistic diversity (Wichmann, Holman & Brown, 2010). Wichmann, Holman and Brown argue that these similarities are due to sound symbolism – i.e. association of properties of speech sounds with properties of the referent. In other words, although there is variation in the lexicon of world languages, general patterns exist such as a preference to use sounds of low acoustic frequency for large or slow-moving entities (for an overview of studies on sound symbolism see Berlin, 2006; de Carolis, Marsico and Coupe, 2017).

Wichmann et al. (2010) suggest that in language sound symbolism is involved in linguistic encoding from the very beginning. Berlin (2006) also suggests that sound symbolism may have had a significant role in the development of lexicon and evolution of language in general. De Carolis et al. (2017) even go one step further to suggest linguistic encoding starts based on associations between the form of the linguistic code and properties of the referent. In sum, as Wichmann et al. point out, cross-linguistic research of sound symbolism 'is of key importance for the understanding of language evolution' (Wichmann et al., 2010, p. 844). Taking this conclusion further, it seems reasonable to propose that cross-modal studies of iconicity – i.e. both in spoken languages as well as sign language – would shed more light on some mysteries of human language and its evolution.

> . . . trying to figure out things like why a really small dog isn't a cat. . . . All the dogs I knew were pretty big, and I used to sort them by size. . . . Finally I realized that the dachshund had the same kind of nose my golden retriever did, and I got it. Dogs have dog noses.
>
> —Temple Grandin, *Animals in Translation, 2005*

2 Literature Review

Studies on spoken languages have shown that although there is a noticeable amount of variation among world languages, there seem to be certain properties that are commonly found in all human languages. Such common regularities – or linguistic universals – are found in all levels of linguistic structure. At the level of lexicon, many cross-language studies have been concerned with identifying universal patterns found in lexicalisation of terms within specific domains. S*emantic field* or *semantic domain* refers to a set of lexical items that have conceptually related meanings (Grose, 2012), and *lexicalisation* refers to the realisation or encoding of meaning via lexical items in language (cf. Filipovic, 2007). Linguists have observed that '[l]anguages never provide unique labels for every discriminable variation within a [semantic] domain' (Malt & Majid, 2013, p. 583). Moreover, studies on the semantic typology of the lexicon, suggest languages follow a hierarchical order when lexicalising words of a particular semantic domain. Universal patterns in lexicalisation have been identified in several different semantic domains such as colour terms, kinship terms, numeral systems, time, spatial relation terms, and modals.

It goes without saying that in order for a proposed universal to be considered a true language universal it should hold independent of language modality (vocal-auditory modality in spoken languages vs visual-gestural modality in sign languages). However, this apparent point has generally been widely neglected in most linguistic studies. In recent years sign language linguists have tried to explore some of these universals in various sign languages but

still much more research is needed. This thesis is concerned with patterns found the semantic domain of animal terms; animal terms together with plant terms form what is known as 'folk biology'. In what follows I first provide an overview of one of the most extensively studied semantic fields, i.e. the domain of colour terms, as an example of study of universal patterns found in spoken languages extended to sign languages; then I will review the literature on folk biology, with a focus on animal terms whenever possible.

2.1 Colour Terms

2.1.1 Colour terms in spoken languages.

In 1969 anthropologist Brent Berlin and linguist Paul Kay published a study of colour terms in spoken languages that identified eleven colours as 'basic colours' across languages. They offered four primary and four secondary criteria for determining basic colour terms, and terms referring to colours BLACK, WHITE, RED, YELLOW, GREEN, BLUE, BROWN, PURPLE, ORANGE, GREY and PINK were found to be the most basic colour terms (cf. Kay, 2015; Schuit, 2014). Moreover, Berlin and Kay found that these eleven basic colours are lexicalised in the 'history of a given language in a partially fixed order' (Berlin & Kay, 1991, p. 5). Based on these findings they propose a universal colour hierarchy.

According to the Berlin & Kay's colour hierarchy, a language lexicalises its basic colour terms as follows (Berlin & Kay, 1969 as cited in Grose, 2012):

- Stage I: The language has two colour terms – BLACK and WHITE
- Stage II: The language lexicalises a third colour term – RED
- Stage III: The language lexicalises a fourth colour term – either GREEN or YELLOW
- Stage IV: The language has five lexicalised colour terms – both GREEN and YELLOW
- Stage V: The language lexicalises a sixth colour term – BLUE

- Stage VI: The language lexicalises a seventh colour term – BROWN
- Stage VII: The language lexicalises additional basic colour terms – PURPLE, ORANGE, GREY and PINK

Figure 4 Shows Berlin & Kay's universal colour hierarchy. The colours on the left are higher on the hierarchy, meaning that they get lexicalised before the colours that follow them on the right. The implication of the colour hierarchy is that if a language has a lexicalised term for, say, RED, it certainly has a lexicalised term for the colours BLACK and WHITE as well.

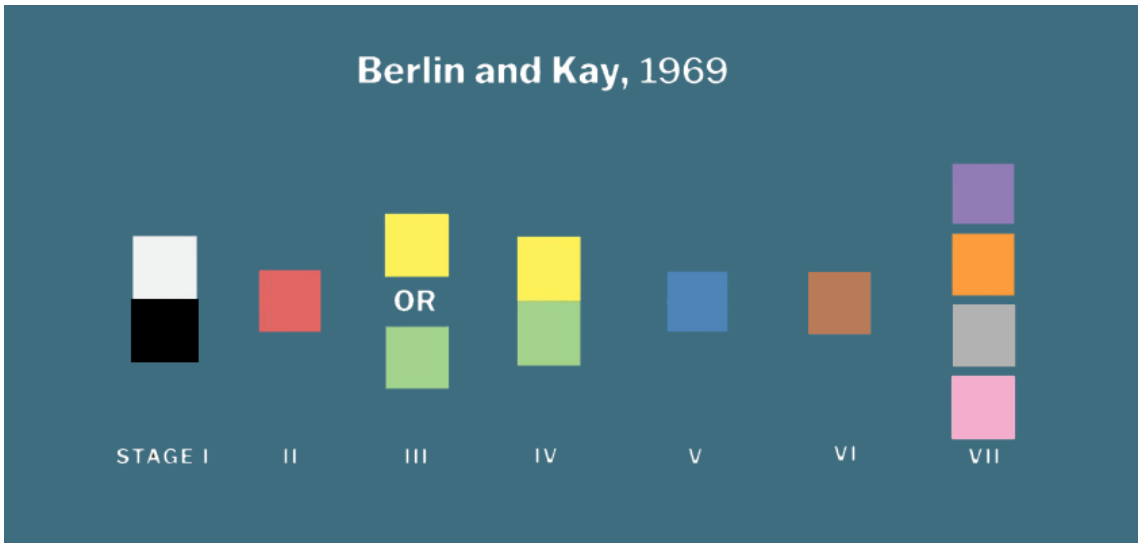


Figure 4. Berlin & Kay's 1969 basic colour terms hierarchy. (Image adapted from: Haubursin, 2017)

The colour hierarchy has not been without criticism (see Kay, 2015 for an overview of major criticisms and his response to them) and several revisions have been proposed for it either by Berlin, Kay or other scholars. In one of the revisions by Kay (1975, as cited in Woodward, 1989 and Schuit, 2014), in Stage III of lexicalisation GREEN has been replaced by GRUE (a term that covers both GREEN and BLUE); thus a language at Stage III will have a term for either YELLOW or GRUE. Moreover, GREY may get lexicalised at any stage (Kay, 1975 as cited in Schuit, 2014).

2.1.2 **Colour terms in sign languages.**

Sign linguists have also been exploring the colour hierarchy across several sign languages. In 1989 Woodward (as cited in Grose, 2012), studied colour terms in 10 unrelated sign languages, and found that they follow Berlin & Kay's colour hierarchy. However, as Nyst

(2007) observes that studying colour terms in sign languages is far from straight forward due to the challenges of defining basic colour terms in sign languages. According to Nyst, sign languages use various strategies[4] to refer to colours, and most of these strategies do not meet the meet Berlin & Kay's criteria for basic colour terms.

In a Kata Kolok Sign Language (which is an emerging rural sign language), for example, de Vos (2011), found that in order to refer to a specific colour, there are two strategies commonly used by signers: they either name an item that has the intended colour (for example, they sign BANANA to refer to colour YELLOW), or they point at an object in the environment that has the intended colour.

Nyst proposes that the definition of basic colour terms must be revised for sign languages (Nyst, 2007). Interestingly, however, Nyst observes that if colour terms in sign languages are grouped together based on the signing strategy they use, the colour terms that are adjacent to each other in the colour hierarchy tend to use the same strategy (Nyst, 2007). This interesting observation could suggest that categorisation of signs based on the similar 'strategies' they use is more relevant for sign languages than the criteria proposed for spoken languages.

Additionally, in a more recent study on Inuit Sign Language (IUR), an indigenous sign language in the Canadian Arctic, Schuit (2014) found that this language only has two colour terms. Quite surprisingly, these two colour terms are BLACK and RED; IUR has no lexicalised term for WHITE, and thus violates the colour hierarchy: according to the hierarchy, the first two colour terms in a language are BLACK and WHITE. This compelling finding leaves little room for doubt about the urgency of carrying out more sign langue studies in order to better understand the nature of human language and arrive at cross-modal language universals.

[4] Nyst (2007) lists five strategies for referring to colour terms in sign languages: derivation, pointing, mouthing, initialisation, and arbitrary signs.

2.2 Folk Biology

2.2.1 Folk biology in spoken languages.

Classification and naming of animals and plants have been the subject of many ethnobiological studies in anthropology and psychology as well as linguistics. *Folk biology* (also referred to as *folk systematics*, *folk biological classification*, or *folk taxonomy*) is the study of how the 'folk' (i.e. non-scientists, especially people in preliterate communities) classify, name and reason about the biological universe (Berlin et al., 1973; Berlin, 1973; Atran, 1999; Brown, 2000; Malt & Majid, 2013). In other words, folk biology is the classification and nomenclature knowledge 'shared by most mature speakers of a language rather than knowledge held by just a few specialists'[5] (Brown, 1984, p. 1). As Atran (1999) observes, classifying animals and plants into 'species-like groups' is something that human beings all over the world do.

At first glance, drawing a direct comparison between the ways different cultures and languages classify fauna and flora may not be as easy as other semantic fields, since plants and animals that exist in different geographical locations vary (Majid & Malt 2013). However, cross-cultural studies on naming and classification of animals and plants have shown that the naming and classification is not entirely random and they follow universal tendencies. According to Berlin (1973), the basis of folk classification is the morphological (i.e. pertaining to organisms' form and structure) similarities and differences of organisms. Classification based on the organisms' usefulness (e.g. their cultural significance and utility) is done only rarely (Berlin, 1973).

[5] Berlin (1973) asserts that folk taxonomy is the basis of modern scientific taxonomy. It is often said that the 18th-century biologist Carolus Linnaeus devised a system for hierarchical classification of organisms, which formed the foundation of today's taxonomic hierarchy in biology (Hoefnagels, 2018). According to Berlin, however, it would be more accurate to say that Linnaeus and his predecessors 'formally codified' what was already present in folk biology among the preliterate people (Berlin, 1973).

In 1973, Berlin, Breedlove and Raven published a cross-language study on folk biology that outlined the striking universal patterns that found in classification and naming of animals and plants across cultures. According to the study, languages classify organisms into hierarchical groupings of greater and lesser inclusiveness. 'Mountain robin', 'robin', and 'bird' are examples of three groupings with different degrees of inclusiveness (cf. Brown, 1984; Atran, 1998).

2.2.1.1 *Classification of plants and animals.*

Berlin et al. (1973) outlined nine universal principles of classification and naming of plants and animals in folk biology[6] which are summarised below (see also Berlin et al., 1973; Berlin, 1973; Berlin, 1992; Brown, 1984; Brown, 2000):

1. Every language has words for groupings of organisms with varying degree of inclusiveness. Each of these groupings is called a *taxon* (pl. taxa).
2. Taxa can be grouped into five categories (or ranks) called *ethnobiological categories*. The five ethnobiological categories are: *unique beginner* (Level 0), *life form* (Level 1), *generic* (Level 2), *specific* (Level 4), and *varietal* (Level 5).
3. There is a hierarchical relationship between the five ethnobiological categories (Figure 5).
4. Taxa in each ethnobiological category can typically be recognised by their linguistic and/or taxonomic features.

[6] In today's scientific taxonomy life is divided into 8 taxonomic levels (Hoefnagels, 2018):
Domain >> Kingdom >> Phylum >> Class >> Order >> Family >> Genus >> Species
The more similarities two organism share the more taxonomic levels they have in common. The level Domain is the most inclusive level (ie topmost level).
According to the modern taxonomic hierarchy, for example, the European Hare is classified as follows (Wikimedia, 2013, p. 93):
Eukaryote >>Animal >> Chordata >> Mammalia >> Lagomorpha >> Leporidae >> Lepus >> *Lepus europaeus*
The last binomial name in italic is the scientific name of the organism. This scientific system of classification and nomenclature of living things helps uniquely identify each organism and eliminate such issues as different organisms having the same common name. For example, what is commonly called a 'robin' in North America is in fact quite different from its European namesake (in taxonomic classification: *Turdus migratorius* vs. *Erithacus rubecula*).

5. Most languages do not linguistically label the taxon in the ‘unique beginner’ category (i.e. they do not have a term for ‘plant’ or ‘animal’).
6. The ‘life form’ category has very few members, ranging from five to ten taxa. Classes labelled by words such as ‘tree’, ‘grass’, ‘bird’, and ‘mammal’ are examples of life form taxa.
7. The ‘generic’ category typically has the most number of members, with approximately 500 taxa. These taxa are considered the basic building blocks or ‘basic core’ of any folk taxonomy. They are the most commonly referred to taxa, are the most psychologically salient, and are most likely to be among the first taxa terms learned by a child. Generic taxa are usually included under a life form taxon, although there may be some generic taxa (such as ‘cactus’, ‘pangolin’ and ‘platypus’) that are not included in any life form taxa due to their peculiar appearance and/or their importance.
8. The taxa in ‘specific’ category usually occur in contrast sets of two or three; contrast sets[7] with more than ten members are rare and denote organisms with major cultural importance. The same holds for the taxa in ‘varietal’ category (i.e. a subdivision of specific taxa). However, varietal taxa are rare in folk taxonomies. ‘String bean’, ‘kidney bean’ and ‘lima bean’ are examples of specific taxa. ‘Baby lima bean’ and ‘butter lima bean’ are examples of varietal taxa.

[7] A contrast set is a set ‘whose members are immediately included in an identical superordinate taxon’ (Kay, 1971 as cited in Berlin et al., 1973, p. 240). For example, ‘string bean’, ‘kidney bean’, ‘lima bean’, etc. form a contrast set since all of them are immediately included in the superordinate taxon ‘bean’ (Berlin et al., 1973).

9. An ‘intermediate’ category may exist between life form and generic categories. However, there is not enough evidence to suggest that is an ethnobiological category.[8]

[8] ‘Evergreen’ is an example of an intermediate taxon in English (Brown, 1984).

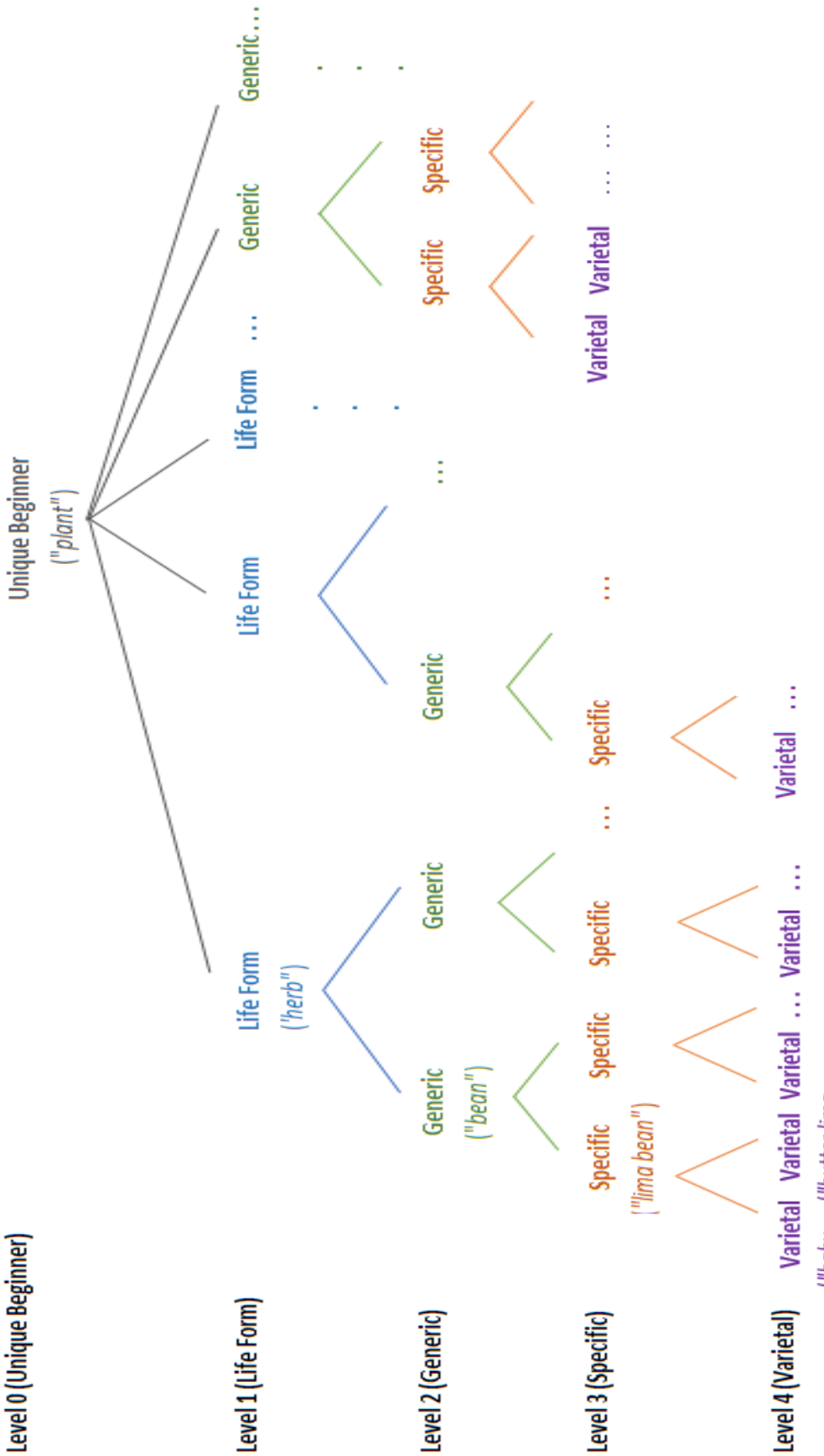


Figure 5. Hierarchical relationship of the five universal ethnobiological categories in folk biology proposed by Berlin et al. (1973)

2.2.1.2 ***Nomenclature of plants and animals.***

In addition to the universal categories, Berlin et al. note there are universal tendencies in naming plants and animals across language[9] and that there is a close relationship between a taxon's name and its rank in folk taxonomy (cf. Berlin et a., 1973; Berlin, 1973). As mentioned earlier, most languages lack a lexical term for the taxon of unique beginner rank (i.e. 'plant' or 'animal'). In the absence of a lexical term, languages use other methods, such as descriptions or specific grammatical devices in order to refer to the domain of plants or animals such. In Tzeltal (a Mayan language), for example, plants are referred to as things 'that grow from the earth but do not move' whereas animals are referred to as creatures that 'move by their own power' (Berlin, 1973, p. 267). Many languages, such as American Indian languages, have separate classifiers for plants and animals (Berlin, 1973). Languages that do have a lexical term for the unique beginner taxon often use an identical or very similar term to a subordinate life form taxon. Sometimes, the name of the unique beginner taxon is a compound word formed by adding the names of two or more life form taxa.

Life form taxa often have ancient names. In many languages, some life form taxa may have an identical name to one of their subordinate generic taxa. According to Berlin (1973), the reason for this polysemy is probably because over time the most salient or culturally significant generic taxon rises in status to stand for the entire life form category it belongs to. For example, in Digueño, an aboriginal language of Mexico (of Yuman–Cochimí family of languages), the word for 'live oak' also stands for the concept of 'tree' (Berlin, 1973).

For the generic taxa (which form the core of any folk taxonomy), it is often impossible to provide an etymological analysis of their names since they are also usually ancient names;

[9] According to Berlin et al. (1973), there are two types of lexical terms for plants and animals found across languages: 1) Primary lexemes, which can be simple or complex. (Complex primary lexemes can themselves be of two types: productive or unproductive.) 2) Secondary lexemes, which are very similar to productive primary lexemes. Primary lexemes are (almost always) used for the unique beginner, life form, and generic taxa, whereas for sub-generic taxa (i.e. specific and varietal taxa) secondary lexemes tend to be used.

in the cases where an analysis is possible, the name is usually found to be descriptive of some quality of the taxon in question[10] (Berlin, 1973). Many generic taxa names, especially for animals with distinctive sounds such as birds and frogs, are based on onomatopoeia (Berlin, 1973). Brown (1984) also notes that the terms for generic taxa (at least in small-scale language communities) tend to be 'unmarked' and (phonologically or morphologically) simpler than other taxa terms. It is, however, also common to find generic taxa names that are formed by adding a modifier to another generic taxon name (both taxa are conceptually related but none is a subordinate of the other); 'apple' and 'horse apple' are examples of such generic taxa ('horse apple' is not a type of apple, it simply resembles an apple) (Berlin, 1973).

Specific taxa generally have binomial names consisting of a generic taxon name and a modifying adjective (which describes the colour, texture, size, location or another apparent characteristic of the specific taxon). 'Lima bean', 'string bean' and 'kidney bean' are examples of specific taxa. Binomial specific taxa names are more marked, but they also show the relationship between these taxa and their superordinate (generic) taxa (cf. Brown, 194). Some specific taxa with monomial names are also found; in such cases (usually) the specific taxon's name is identical to the superordinate generic taxon it belongs, and the specific taxon is considered 'the best known or most widely distributed' (Berlin, 1973, p. 265).

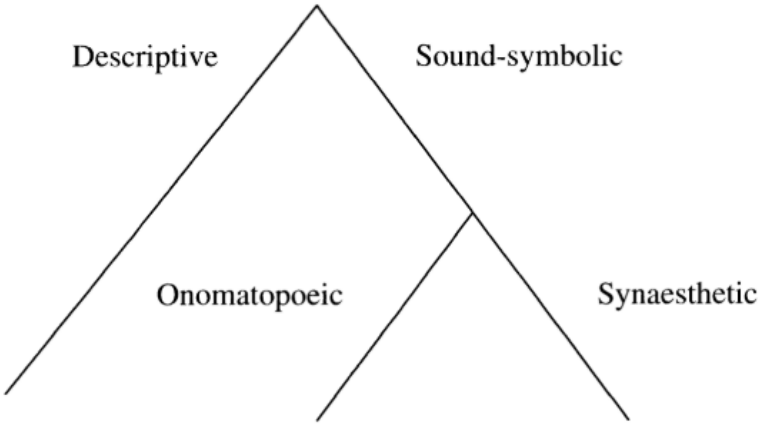
Finally, the nomenclature of varietal taxa is very similar to that of the specific taxa. Varietal taxa names are formed by adding a modifier to a specific taxon name. Varietal taxa names stand for plants (and occasionally animals) with high cultural significance. 'Baby lima bean' and butter lima bean' are examples of varietal taxa.

[10] Berlin gives the example of Tewa (of Kiowa-Tanoan family of languages) in which the word for 'white fir' (in Tewa: 'tenyo') literally means 'large tubes', 'presumably due to the hollow stems used in pipes' (Berlin, 1973, p. 262).

2.2.1.2.1 Sound symbolism in nomenclature of animal terms.

Berlin (1992, 2006) believes that the nomenclature of animals is far from arbitrary. He argues that many animal names are generally of two types: 1) *descriptive* phrases, and 2) *sound-symbolic* phrases; sound-symbolic phrases are themselves of two types, *onomatopoeic* and *synaesthetic* (

Figure 6).



‘redheaded woodpecker’ ‘cuckoo’ ‘wampang’ [large butterfly]

Figure 6. Different types of animal names (original image from Berlin, 2006, p. S26).

Descriptive animal names describe an attribute of the referent, such as ‘redheaded woodpecker’ in English. Animal names with onomatopoeic sound symbolism mimic the typical sound the referent makes, such as the bird referred to as ‘cuckoo’ in English (note that onomatopoeic words are never an ‘exact imitation of natural sounds’ and their realisation in different languages varies based on the phoneme inventory and phonotactic rules of that language that constrain the permissible combinations of phonemes (Duan, 2012, p. 56)). Animal names motivated by synaesthetic sound symbolism are much less understood (Berlin, 2006). Synaesthetic sound symbolism[11] can be defined as ‘the cross-modal mapping that unites specific speech sounds and one or more distinct sense modalities (sight, touch, smell, taste)’ (Berlin, 2006, p. 26). ‘Wampang’ (‘large butterfly’) and ‘wichikip’ (‘small, inconspicuous

[11] Also referred to as phonaesthesia (cf Levin et al., 2003 as cited in Berlin, 2006)

butterfly') are examples of synaesthetic sound symbolism in Aguaruna (of Jivaroan family of languages in Peru); most people can make a good guess which name belongs to which butterfly by hearing the sounds (cf. Belin, 2006).

Synaesthetic sound symbolism in the semantic field of animals may be more common than it is thought; especially since it is linked to sensory sensations of size, shape, and movement, it might be used in animal names because of the association with the animal's size, shape, or movement (cf. Berlin, 2006). For example, front vowels and high frequency consonants are commonly associated with features such as 'rapid movement', 'long/slender/sharp shape' and 'small size', while back vowels and low frequency consonants are commonly associated with features such as 'slow movement', 'short/round/smooth shape' and 'large size' (cf. Berlin, 2006). However, sound symbolism, especially the relationship between form and meaning within semantic domains, is still an understudied area of research and there are yet many unanswered questions (Berlin, 2006; Carolis et al., 2017).

2.2.1.2.2 Lexicalisation order of life forms.

In his book *Language and Living Things*, Brown (1984) identifies five botanical life form, 'tree', 'grerb' (= grass + herb), 'bush', 'vine' and 'grass', and five zoological life forms, 'bird', 'fish', 'snake', 'wug' (= worm + bug) and 'mammal'. He describes each of the zoological life forms as follows (for more details about botanical life forms see Brown, 1984):

> *Bird:* A relatively large creature (as compared to, for example, bugs) with wings and usually feathers and a beak/bill. (In its greatest extension this class may also include flying mammals such as bats. Occasionally it may be extended to other flying creatures such as flying insects.)
>
> *Fish:* A creature with a streamlined body, fins and (usually) gills. (In its greatest extension this class may also include fish-shaped mammals such as dolphins and

whales. Occasionally it may be extended to other aquatic creatures, such as turtles and crocodiles.)

Snake: A featherless, furless, elongated creature (usually) without an appendage. (In addition to snakes and/or worms, this class may in its greatest extension also include creatures such as lizards and eels. Occasionally it includes other elongated creatures such as reptile-like insects.)

Wug: A small creature that is not a bird, fish or snake. (In addition to including insects and other small creatures such as spiders, this class is often extended to worms as well (wug = worm + bug). Occasionally it includes small lizards, tortoises and frogs.)

Mammal: Large creature that is not a bird, fish or snake. (This class is often extended to other large (non-mammalian) animals such as iguanas and crocodiles, or large tortoises and frogs.)

These five life forms are highly distinctive in nature and are therefore particularly salient (Brown, 1984). An interesting manifestation of such classifications is that for example, when a certain disease is found in robins people automatically assume that such a disease is more likely to be found among members of the 'bird' category than among non-birds (Atran, 1998).

According to Brown, there is a strong universal tendency for languages to lexicalise life form terms in fixed orders. For animal terms this order is as follows (for lexicalisation order of botanical life forms see Brown, 1984):

Stage 0: Language lacks a lexical term for life form categories.

Stage 1: Language has a lexical term for *one* of the life form categories 'fish', 'bird', or 'snake'.

Stage 2: Language has lexical terms for *two* of the life form categories 'fish', 'bird', or 'snake'.

Stage 3: Language has lexical terms for the *three* life form categories ‘fish’, ‘bird’, and ‘snake’.

Stage 4: Language adds a lexical term for either ‘wug’ or ‘mammal’.

Stage 5: Language has lexical terms for all five life form categories.

The implication of the lexicalisation hierarchy of zoological life forms is that if a language has, say, a term for ‘mammal’, it also has terms for ‘fish’, ‘bird’, and ‘snake’.

According to Brown, languages in large urban societies tend to have more lexicalised terms for life forms than languages in small societies. Brown states this is because in small-scale societies there is less need to refer to general plant and animal concepts. This is in line with Ellen’s (1993) observation that languages lexicalise the things that (a) possess economical or cultural significance, (b) are salient, or (c) are closely related to something significant or salient (although the line between the three is not always clear). Brown even speculates that in small-scale societies, life form terms, even when they are lexicalised (e.g. ‘bird’), may not be as salient for people as the generic terms (e.g. ‘robin’ and ‘eagle’). (Brown’s proposal to verify this speculation is to carry out studies of word frequency counts in small-scale societies.)

2.2.2 **Folk biology in sign languages.**

Classification and nomenclature of plants and animals in sign languages have not been systematically studied yet. In *Principles of Categorization*, Rosch (2002) mentions two studies on how humans classify things in American Sign Language (ASL), one carried out by Rosch et al. in 1976 and the other by Newport and Bellugi in 1978. Those studies found that ‘basic level’ categories (which in the context of the folk biology correspond to the generic taxa) are ‘most often coded by single signs and super- and subordinate categories [are] likely to be missing’ (Rosch, 2002, p. 259). Folk biology in sign languages still remains to be studied.

In the nomenclature of animals in the previous section, it was mentioned that sound symbolism has been suggested (cf. Berlin, 1992, 2006) to be involved in animal terms in

spoken languages, in particular due to the salient visual properties of animals such as size, shape, and movement. Since size, shape, and movement are all visual characteristics and sign languages use the visual-spatial modality, it would be interesting to see how iconicity is used in the semantic field of animals in sign languages.

In recent years research on various aspects of iconicity has increased. One of the areas of research on iconicity that has gained attention is the study the patterns found in the way iconicity is used (i.e. iconic strategy) within semantic domains. Cross-linguistic studies suggest that sign languages tend to favour certain iconic strategies for certain semantic fields. Padden et al. (2013) refer to this systematic patterning of the iconic strategies as 'patterned iconicity'. The idea that the nature of the referent influences the choice of iconic strategy is not new. In his 1980 study of Enga Sign Language (in Papua New Guinea) Kendon had already noted that signers use a variety of strategies in iconic depiction. In the following section, I outline the iconic strategies found in the semantic field of animals.

2.2.2.1 ***Patterned iconicity in semantic field of animals.***

In his study, Kendon (1980) noted several ways that a referent can be represented in a sign. For example, an animal can be represented through 'enactment' in which a pattern action of the referent is depicted, or through 'body modelling' in which the signer's body or a body part represents the referent (Kendon, 1980). However, a sign such as 'bird', in which the signer moves their arms in a flapping motion to represent the bird's wing, can be viewed both as using 'enactment' (because a pattern action of the bird (i.e. flapping wings) is depicted) as well as 'body modelling' (because the signer's arms represent the bird's wings).

In their 2017 cross-language study of patterned iconicity, Hwang et al. identified three main iconic strategies based on the role of the body: 1) manipulation, 2) object, and 3) personification (Hwang et al., 2017). The strategies are defined as follows:

1) *Manipulation strategy:*[12]the head and body of the signer represent the head and body of an actual human agent. The body is used to show the human agency. An example of manipulation strategy is the second component of the sign for COW in Pakistan Sign Language (PSL) where the signers' hands depict the act of milking a cow (Figure 7).

Figure 7. COW in PSL.

2) *Personification strategy:* the signer maps the body of a non-human entity onto their own body. An example of personification strategy is the first component of the sign for COW in PSL (pictured in Figure 7) where the signers' hands depict the cow's horns on the signers' head (the signer's body stands for the cow's body).

3) *Object strategy:* the signer's hand(s) (and not the body) depict features of the referent. The role of the signer's body is de-emphasised. (In some cases the head may be used for portraying roundness, but even then the rest of the body is not part of the sign.) An example of object strategy is the sign for COW in Namibian Sign Language (NSL) where the signer shows the cow's head and horns on one hand (away from the body); the signer's extended index finger and pinkie stand for the cow's horns (Figure 8). If the signer only outlines the shape of the referent by

[12] In an earlier study Padden et al. (2013) had shown that for tools and handheld items the strategy referred to here as manipulation is itself divided into two main strategies: a) handling strategy, where the signer's hand forms the way the object is held, and b) instrument strategy, where the signer's hand resembles the shape of the object. Hwang et al. (2017) make a distinction between Padden et al.'s instrument strategy and their own object strategy by drawing attention to the role of the body: in the former (i.e. instrument) the signer's body represents the human body, while in the latter (i.e. object) the body no longer stands for the human body.

moving their hand, it is still considered object strategy because of the role of the body is de-emphasised.

Figure 8. COW in NSL.

According to Hwang et al., in the semantic field of animals personification strategy is the most common strategy, followed by object strategy; manipulation strategy was found to be the least common strategy for animal signs. Hawng et al. state that in the three different semantic fields they studied (namely, tools, animals, and fruits & vegetables), personification strategy is exclusively used for the semantic field of animals. According to them, the use of manipulation strategy for animals depends on 'cultural practices' and it is used when the animal in question is 'associated with canonical actions' (Hwang et al., 2017, p. 594); in other words, the animals represented with manipulation strategy have 'distinctive uses' within that culture that 'sets them apart' from other animals (Hwang et al., 2017, p. 595). Smaller animals and less mammalian animals are often (but not always) represented by object strategy.

Perhaps Hwang et al.'s finding that manipulation strategy is the least commonly used strategy for animal signs is not surprising given what was suggested by Berlin (1973) (in Section 2.2.1): humans classify the organic world based on the morphological similarities and differences of the organisms, not based on their utility or their cultural significance to humans. In other words, the animal's appearance and behaviour would generally be more prominent for

humans than animal-human interaction, and that could be why in the iconic depiction of animals representing the way humans manipulate an animal is less common.

3 Methodology

This chapter is in two parts: Material (3.1) and Analysis (3.1.4). Material introduces the data used for the study (Berbey SL data as well as data from 10 unrelated sign languages).The Berbey SL data was taken from Berbey SL corpus (section 3.1.1). Ten animal terms were selected from the corpus (section 3.1.1.1). Prior to the analysis the signs corresponding to the animal terms needed to be ID glossed (section 3.1.2.1). In addition to Berbey SL, the animal sign in 10 other sign languages were also analysed; the data for those came from sign language dictionaries (section 3.1.3). In Analysis it is explained how the analysis of the study was carried out.

3.1 Material

3.1.1 Berbey SL corpus.

The Berbey SL corpus is part of a greater Dogon Sign Language Corpus compiled at Leiden University Centre for Linguistics (for more information see Nyst et al., 2012; Nyst, n.d). The Berbey SL corpus is comprised of 2 hours and 45 minutes of video recordings, as well as annotations and metadata. The videos are 50 files with varying lengths (available in .mpg format), containing video recordings of the 5 deaf Berbey signers. The annotations accompanying the videos are in the format of ELAN[13] annotation files (.eaf files) and are in French (see the section on ID glossing). The videos are recorded both in indoors and outdoors settings. The videos recorded outdoors (outside the house or in nature) include two or more signers having a conversation while sitting, standing or walking. In the videos recorded indoors, a signer is sitting comfortably on the floor or on a stool in front of the camera, either next to an interviewer or by themselves. In the indoor videos in which a signer is seated next to the interviewer, the signer and the interviewer are engaged in a conversation. When a signer

[13] Software for creation of complex annotations on video and audio resources, developed by The Language Archive (https://tla.mpi.nl/tools/tla-tools/elan/).

is sitting by themselves, they are taking part in an elicitation task: the interviewer shows the signer a picture (occasionally part of the picture can be seen on camera) and the signer produces the corresponding sign. Most of the times (but not always; see the section on corpus inconsistencies) after the signer produces the sign corresponding to a picture, the interviewer's voice is heard saying a word in French (presumably corresponding to the picture shown, regardless of what the signer has signed).

3.1.1.1 *Animal signs.*

All the animal signs were produced during the elicitation process (except for 'snake' that is found in the spontaneous outdoors conversation as well). The animal signs are signed by 4 different Berbey signers. A list of the animal terms in the Berbey corpus was already available. I used the list as a guide to search for the animal terms in the corpus (some of them actually did not exist in the corpus). Table 1 shows the list of the animal terms found in the Berbey SL corpus.

1	ANTELOPE	'antelope'	14	LIEVRE	'hare'
2	BELIER	'ram'	15	LION	'lion'
3	BICHE	'deer'	16	OISEAU	'bird'
4	CAIMAN	'caiman'	17	POISSON	'fish'
5	CANARD	'duck'	18	POULE	'chicken'
6	CHAMEAU	'camel'	19	RAQUIN	'shark'
7	CHAT	'cat'	20	RHINOCEROS	'rhinoceros'
8	CHEVAL	'horse'	21	(SANGLIER)	'boar'
9	ELEPHANT	'elephant'	22	SERPENT	'snake'
10	ESCARGOT	'snail'	23	SINGE	'monkey'
11	HIPPO	'hippopotamus'	24	SOURIS	'mouse'
12	JAGUAR	'jaguar'	25	VACHE	'cow'

13	LAPIN	‘rabbit’	26	ZEBRE	‘zebra’

Table 1. List of (French) animal terms found in the Berbey SL corpus.

SANGLIER (‘boar’) did not originally exist in the corpus, but it was mentioned in the list. However, for reasons that I will explain in the corpus inconsistencies section, it was added. Due to constraints of time, the animal terms listed above, I chose only 10 animals for the analysis. The selected 10 animals are as follows: ‘bird’, ‘fish’, and ‘snake’ (corresponding to Berlin et al. (1973) and Brown’s (1984) life forms, explained in the Literature Review), as well as ‘chicken’ and ‘duck’ (both are birds), ‘horse’ and ‘zebra’ (both of horse family, but one with distinctive skin patterns), and ‘camel’ (has hump(s) as a unique distinctive feature), and ‘antelope’ and ‘boar’.

3.1.2 **Corpus annotations and ID glossing.**

As mentioned earlier, the Berbey SL corpus originally comes with French annotations (in ELAN). The annotations provide French glosses for the signs seen in a video (Figure 9). For each signer there are two tiers of annotations (one for the right and another for the left hand); non-manual components of a sign are not annotated.

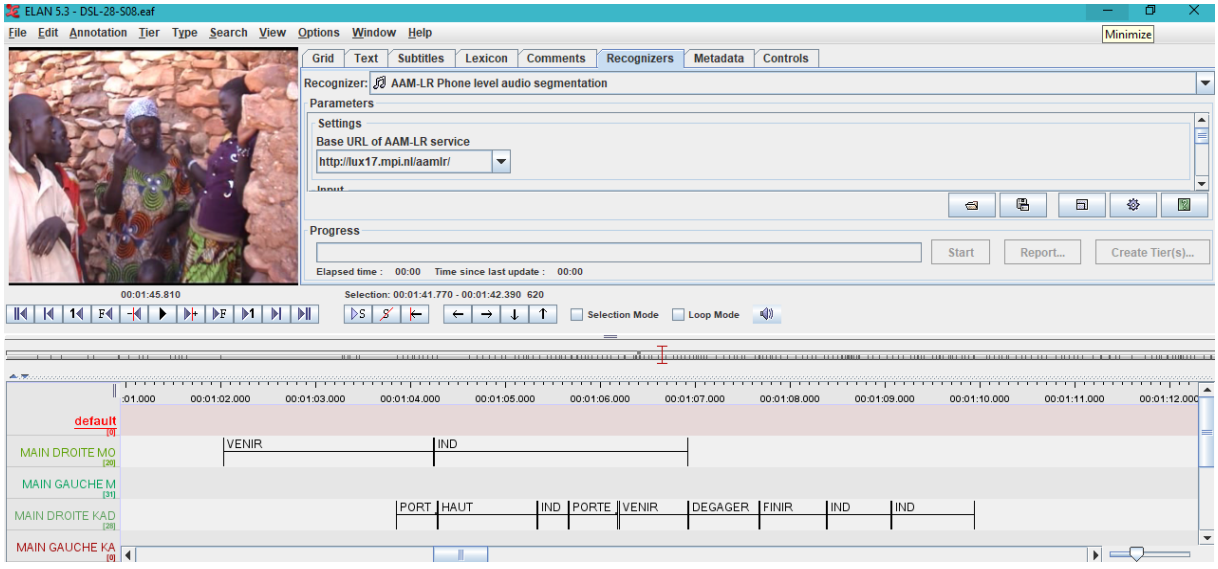


Figure 9. A screenshot of Berbey SL corpus with its original French annotations in ELAN.

However, these glosses do not distinguish between different variants of a sign. For example, there are multiple signs in the corpus (some of them by different signers) that are glossed in French as OISEAU. However, not all of these signs are necessarily identical – they may differ in one or more formational components. In order to distinguish between different sign variants corresponding to the same concept, each sign variant needs to be *ID glossed*, i.e. be assigned a unique annotation (see for example Fenlon, Schembri, Johnston & Cormier, 2015 for a discussion of corpus approaches to sign language research). Therefore, prior to my analysis for the present study, I had to annotate the animal signs in the Berbey SL corpus with ID glosses. Figure 10 shows an example of a sign (for 'bird') in ELAN with its original French annotation (OISEAU) and the English ID gloss I assigned to it (BIRD-A1).

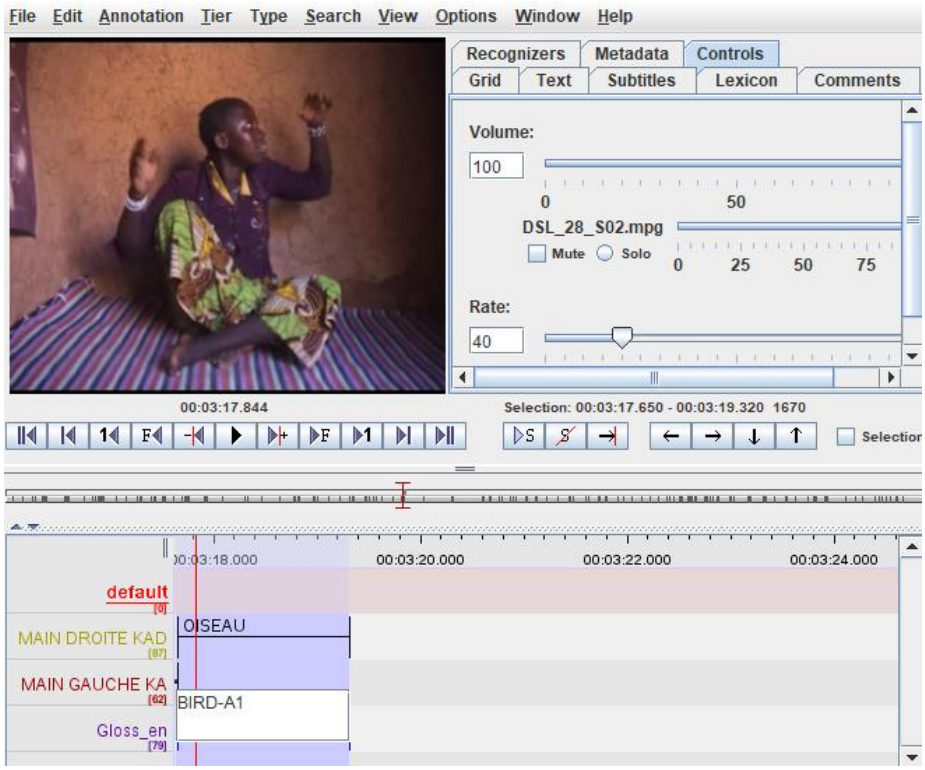
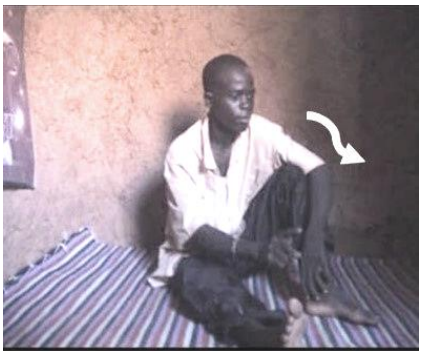


Figure 10. Example of the original French annotation of a sign and the English ID gloss assigned to it in ELAN.

For ID glossing the animal signs, I followed the *Annotation Conventions for the Corpus NGT* (Crasborn et al., 2015) guidelines. For each animal term, I translated the French annotations into English, appending the lexical variants with a letter (starting from A), and the

phonological variants with a number (starting from 1), respectively. *Lexical variants* refer to the signs for a concept that differ in more than one formational parameter. *Phonological variants*, on the other hand, refer to the signs for a concept that differ in only one formational parameter. For example, the four signs in Figure 11, were all originally annotated as SERPENT; however, they are not identical to each other. The first two signs differ in handshape (open-B hand vs 1-hand), so these are phonological variants of each other (ID glossed as SNAKE-A1 and SNAKE-A2). The third and fourth sign differ from each other, as well as from the first two signs, in more than one formational parameter (handshape and movement). Therefore, there are lexical variants of each other (ID glossed as SNAKE-B and SNAKE-C).

SNAKE-A1



SNAKE-A2

SNAKE-B

SNAKE-C

Figure 11. English ID glosses assigned to lexical and phonological variants of ‘snake’.

It should be noted, however, that the distinction between phonological lexical and phonological variants is not always clear cut. Neither is it always easy to judge whether the nature of the observed variation in signing is phonetic or phonological. For example, whether the observed difference in hand location is due to assimilation with the place of articulation of the preceding/following sign or it is a consistently alternative way of signing.

3.1.2.1 ***Corpus inconsistencies.***

As mentioned in Berbey SL Corpus section, in the elicitation of animal signs, most of the times after the signer has produced a sign the interviewer’s voice is heard saying a French word. Ideally, the French annotation should be identical to the voiced word, and they both should match the sign that is produced by the signer. However, that was not always the case for Berbey SL animal signs. There are were a number of cases in which there was a mismatch between two, and in a few cases between all three (i.e. mismatch between voice over, annotation, and sign). For example, in the video we see the signer looks at a picture and then produces a sign in which bilateral tusks seem to be depicted (Figure 12), but the French

annotation is JAGUAR and interviewer's voice said RHINOCEROS. In cases such as this it was hard to judge whether to trust the annotation, the voice over, or neither.

Figure 12. An example of a mismatch between a sign, its annotation and voice over. French annotation is JAGUAR, followed by the interviewer's voice saying RHINOCEROS.

One solution was to look at other JAGUAR and RHINOCEROS signs and which one was more similar to this sign; however, this solution was easier said than done due to within-signer and between-signer variation. In the particular example given above, there were a number of other signs annotated as RHINOCEROS, in which the voice over also said RHINOCEROS; those signs were very similar to the one shown above (by the same signer as above). In one case, however, a single horn on the signer's forehead was depicted which was no doubt depiction of a rhinoceros. In the list of animal signs there was one animal with bilateral tusks that could not be found in the corpus search. It became apparent that it is less likely that the Berbey signer is depicting two tusks instead of one horn by mistake in the other signs, and instead it is more likely that the interviewer may have called a different animal as 'rhinoceros' by mistake. Since in the list of the animal names there was an animal with bilateral tusks, namely, SANGLIER ('boar'), that matched the iconic image in the signs in question, and since no sign for SANGLIER could be found in the corpus search, I decided that the mysterious signs in question were SANGLIER and were annotated as RHINOCEROS by mistake. In some of those signs the placement of the supposed tusks are a little bit different (see the signs for 'boar' in Results section); however, for the sake of consistency, I ID glossed all the RHINOCEROS

signs (except for the one with one horn) as variants of ‘boar’. In the Results chapter, I have mentioned whenever there was a mismatch between the annotation, voice over, and the sign.

3.1.3 Sign language dictionaries.

In addition to Berbey SL, the animal signs in 10 other sign languages were also analysed. These languages include two African sign languages (Malian Sign Language, LaSiMa and Namibian Sign Language, NSL), an emerging urban sign language (Nicaraguan Sign Language, ISN), and seven unrelated urban sign languages. Table 2 shows the list of the sign languages and their dictionary. For the sake of consistency, only one dictionary was used per language even if more than one dictionary existed (e.g. ASL has multiple online and print dictionaries).

Abbreviation	Sign Language Name	Dictionary Reference
ASL	American Sign Language	SpreadTheSign, 2015
BSL	British Sign Language	SpreadTheSign, 2015
DGS	German Sign Language (Deutsche Gebärdensprache)	SpreadTheSign, 2015
ISN	Nicaraguan Sign Language (Idioma de Señas de Nicaragua)	ANSNIC, 1997
JSL	Japanese Sign Language	SpreadTheSign, 2015
LaSiMa	Malian Sign Language (Langue des Signes Malienne)	Pinsonneault, 1999
NSL	Namibian Sign Language	SignWiki Namibia, n.d.
PSL	Pakistan Sign Language (Isharon Ki Zubann)	SpreadTheSign, 2015
TID	Turkish Sign Language (Türk İşaret Dili)	SpreadTheSign, 2015
ZGS	Chinese Sign Language (Zhōngguó Shǒuyǔ)	SpreadTheSign, 2015

Table 2. List of the 10 additional sign languages used in the analysis.

3.1.4 **Analysis.**

For the analysis, I looked at the signs for each of the 10 animals in Berbey SL and 10 sign language dictionaries and tried to identify the iconic image that was depicted in the sign (e.g. in the sign provided above in Figure 12 the depicted image is that of the animal's tusks). Moreover, identified the iconic strategy used in each sign based on Hwang et al.'s (2017) criteria mentioned in Literature Review (e.g. in Figure 12 the iconic strategy is personification since the singer is mapping the animal's tusks onto his own face and his body stands for the body of the animal). For some signs (both in Berbey SL and other sign languages) it was not possible to determine with certainty what was being depicted in the sign; I have marked uncertain interpretations in the Results with '(?)'.

In addition to the information regarding iconic strategy and iconic image in Berbey signs, for future reference I noted the information about the frequency of the signs (how many times the specific variant occurred in the corpus, and by how many signers) as well as whether the sign was simple or complex. For complex signs I have also mentioned what each component of the sign is depicting (if different components use different iconic strategies, more than one strategy is mentioned for that variant). Below is an example of the analysis of a 'bird' variant in Berbey SL.

Still image taken of the sign found in Berbey SL corpus	←	
ID gloss I gave to the sign	←	BIRD-A2
Number of times the sign was found in the corpus & by how many signers (if frequency >1)	←	Frequency: 6 (3 signers)
Sign's morphology (simple or complex)	←	Simple
Iconic strategy of the sign & iconic image	←	Personification (wings)

General remarks about the sign ← Remarks: in 2 cases the interviewer is heard saying ‘duck’

The following is some signs from Berbey SL corpus that were found in some complex animal signs:

KILL

EAT

DRINK/WATER

JAGUAR

Figure 13. Signs in the Berbey SL that were found in some complex animal signs.

4 Results

This chapter provides the findings of the present study. In the first section (section 4.1) the results are provided for each of the 10 animal terms in alphabetical order. The second section (4.2) provides other observations (not part of the analysis) that were made in the course of the study. The third section (4.3) briefly provides some remarks regarding the classification and nomenclature of animals in Berbey SL. Finally, the fourth (4.4) section provides a summary of the findings regarding patterned iconicity.

4.1 Animal Signs

In this section the results of analysis of iconic strategy and iconic image in 10 animal signs in Berbey SL as well as 10 other sign languages (for a list of abbreviations of sign languages refer to Appendix A). The 10 animal signs resulted in 37 ID glosses in Berbey SL, which reflects the high degree of (within-signer and between-signer) variation in the signing. Still images of all the Berbey SL ID glosses are provided. The animals are presented in the alphabetical order (of their English names). The animals are: 1) antelope, 2) bird, 3) boar, 4) camel, 5) chicken, 6) duck, 7) fish, 8) horse, 9) snake, and 10) zebra. For each animal, first the Berbey SL results are given, then the results of the other 10 sign languages, followed by a summary of both results.

4.1.1 **Antelope.**

a) Antelope in Berbey SL.

In total 5 (lexical and phonological) variants were found for ‘antelope’ in the Berbey SL corpus (Figure 14). All the ‘antelope’ signs in Berbey SL use personification strategy. Except for ANTELOPE-C, all the variants depict the animal’s horns. ANTELOPE-C seems to be referring to ‘the animal that is killed/eaten by a predator’ (i.e. antelope); it is not clear if the signer is merely describing the ‘antelope’ or if this indeed a way of referring to ‘antelope’.

However, since in the first component the signer's body stands for the body of an animal I have marked it as personification strategy.

ANTELOPE-A1
Frequency: 1
Simple
Personification (horns)
Remarks: Handshape is a 1-hand.

ANTELOPE-A2
Frequency: 1
Simple
Personification (horns)
Remarks: Handshape is a 1-hand.

ANTELOPE-A3
Frequency: 2 (same signer)
Simple

Personification (horns)

ANTELOPE-B
Frequency: 1
Simple
Personification (horns)
Remarks: Similar to RAM-A2

ANTELOPE-C
Frequency: 1
Complex (claws^KILL^EAT)
Personification (being killed by a jaguar)
Remarks: The first component is similar to the sign for JAGUAR (given in the beginning of chapter)

Figure 14. Lexical variants of ‘antelope’ in Berbey SL.

b) Antelope in other SLs.

Half of the languages analysed lacked a sign ‘antelope’ in their dictionary. Of the remaining 5 languages, 4 used personification strategy (showing the horns) and one (DGS) used object strategy (showing movement). Table 3 summarises the findings across all analysed languages.

ANTELOPE

Language	Iconic Strategy	Iconic Image
ASL	-	-
BSL	P + fingerspelling	horns
DGS	O	movement
JSL	-	-
LaSiMa	-	-
NSL	-	-
ISN	-	-
PSL	P	horns
TID	P	horns + other
ZGS	P	horns
Berbey SL	P (5)	horns (4) other (1)

Table 3. Summary of the iconic strategies and their motivation for the 'antelope'. (M=Manipulation strategy, O=Object strategy, P=Personification strategy. The numbers in parentheses indicate the number of variants.

Out of 5 variants for 'antelope' in Berbey SL only one (ANTELOPE-C) did not depict the horns of the animal. In the majority of other sign languages analysed, the data (only available for half of the languages) the horns for 'antelope' are depicted. It seems that the most salient attribute of 'antelope' in the eyes of Berbey signers and those languages is the horns.

4.1.2 **Bird.**

a) Bird in Berbey SL.

In total 5 (phonological and lexical) variants were found for 'bird' in the Berbey SL corpus (Table 4). Personification strategy is the dominant strategy for 'bird' signs in Berbey

SL. BIRD-A4 and BIRD-B use manipulation strategy in addition to personification. When the personification strategy is used the bird's wings are shown (except for BIRD-B where it is not clear if the first component of the sign is depicting the bird's wings, its body or if the hands are merely preparing for the catching movement that follows). When manipulation strategy is used (BIRD-A4 and BIRD-B) the signs presumably depict the act of catching a bird by a human. (I have assumed that EAT refers to the bird's act of eating (hence personification strategy); however, it could be that EAT is referring to a human consuming a bird as food, in which BIRD-A3 will have manipulation strategy in addition to personification strategy.) BIRD-A1, in which the signer depicts a bird flapping its wings, is the simplest Berbey SL 'bird' and might be the most general way to refer to 'bird' in Berbey SL.

BIRD-A1
Frequency: 8 (3 signers)
Simple
Personification (wings)
Remarks: in 2 cases the interviewer says CANARD ('duck')

BIRD-A2
Frequency: 1
Complex (wings^movement)
Personification (wings & movement)
Remarks: the signer's shoulders/hands move alternatively.

BIRD-A3
Frequency: 1
Complex (EAT^wings)
Personification (eating & wings)
Remarks: =DUCK-A2

BIRD-A4

Frequency: 1

Complex (EAT^wings^catch by human)

Personification (eating & wings)+Manipulation

BIRD-B

Frequency: 1

Complex (wings or body(?)^catch by human)

Personification+ Manipulation

Remarks: Similar to CHICKEN

Table 4. Lexical and phonological variants of ‘bird’ in Berbey SL.

b) Bird in other SLs.

All of the 10 sign languages analysed use personification strategy for 'bird', with 6 of them showing the bird's beak, 3 showing the bird's wings, and 1 (PSL) showing both the beak and the wings. Table 5 summarises the findings across all analysed languages.

BIRD

Language	Iconic Strategy	Iconic Image
ASL	P	beak
BSL	P	beak
DGS	P	beak
JSL	P	beak
LaSiMa	P	wings
NSL	P	beak
ISN	P	wings
PSL	P	beak + wings
TID	P	wings
ZGS	P	beak
Berbey SL	P (3) P+M (2)	wings (1) wings + movement (1) eating + wings (1) wings(?) + human catch (1) eating + wings + human catch (1)

Table 5. Summary of the iconic strategies and their motivation for the ‘bird’.

4.1.2.1 *‘Bird’ as a life form.*

As was observed by Brown the class ‘bird’ contains organisms that have wings and (usually) feather and a beak (see lexicalisation of life forms in Literature Review). If these visual characteristics (wings/feather/beak) are what set the birds apart from other organisms then it is not surprising that ‘bird’ signs in Berbey SL (except for one dubious case) have a component that showed the bird’s wings. The other 10 analysed sign languages show the beak (most common), wings, or both (least common), all of which are bird features described by Brown.

4.1.3 **Boar.**

a) Boar in Berbey SL.

In total 4 (phonological) variants were found for ‘boar’ in the Berbey SL corpus (Figure 15). All the ‘boar’ signs in Berbey SL use personification strategy in which the animal’s tusks are depicted.

BOAR-A1
Frequency: 1
Complex (body^tusks)
Personification (body and tusks)
Remarks: The signer’s facial expressions (frowning) when depicting the animal’s body suggests a ferociousness animal.

Original corpus annotation was RHINOCEROS (followed by the interviewer’s voice).

BOAR-A2

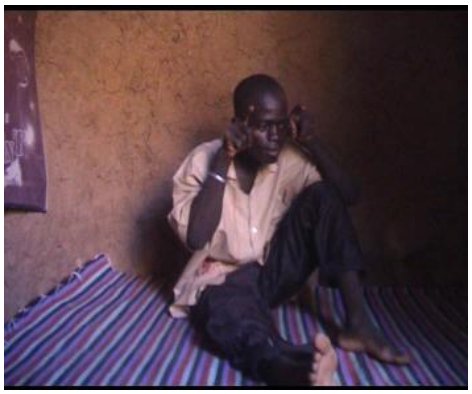
Frequency: 1
Simple
Personification (tusks)

Remarks: Original corpus annotation was RHINOCEROS (followed by the interviewer's voice).

BOAR-A3

Frequency: 1
Simple
Personification (tusks)

Remarks: Original corpus annotation was JAGUAR and the interviewer's voice said RHINOCEROS.



BOAR-A4

Frequency: 1

Simple
Personification (tusks)
Remark: Original corpus annotation was RHINOCEROS followed by the researcher's voice. For the sake of consistency, this sign is also considered a variant of 'boar', although the location of the hands are higher than is expected for tusks.

Figure 15. Phonological variants of 'boar' in Berbey SL.

b) Boar in other SLs.

Three of the languages analysed (LaSiMa, ISN, and PSL) lacked a sign for 'boar' in their dictionary. In some of the languages the sign for 'boar' (also known as 'wild pig') is based on the sign for 'pig', suggesting an influence from the surrounding spoken language (e.g. in ASL sign first the word 'wild' is finger spelled, followed by the sign for 'pig'). Only three of the languages (BSL, JSL, and NSL) depict the boar's tusks (the rest of the signs depict the snout). All the 7 languages use personification strategy for 'boar'.

BOAR

Language	Iconic Strategy	Iconic Image
ASL	fingerspelling + P	other (wild^PIG)
BSL	P	tusks
DGS	fingerspelling + P	snout (wild^PIG)
JSL	P	tusks
LaSiMa	-	-
NSL	P	tusks
ISN	-	-
PSL	-	-
TID	P	snout

ZGS	fingerspelling (?) + P	snout
Berbey SL	P (4)	tusks (4)

Table 6. Summary of the iconic strategies and their motivation for the 'boar'.

Berbey SL and all the other languages with available data used personification strategy for 'boar'. All the Berbey SL signs for 'boar' depicted the tusks while only three of the other sign languages depicted the tusks.

4.1.4 **Camel.**

a) Camel in Berbey SL.

In total 2 (phonological) variants were found for 'camel' in the Berbey SL corpus (Figure 16). All 'camel' signs in Berbey SL use personification strategy, and the signer depicts with their hand the camel's neck movement when it walks. The hand (depicting the neck) seems to be an extension of the signer's body (the signer's body standing for the camel's body) thus the iconic strategy is personification.

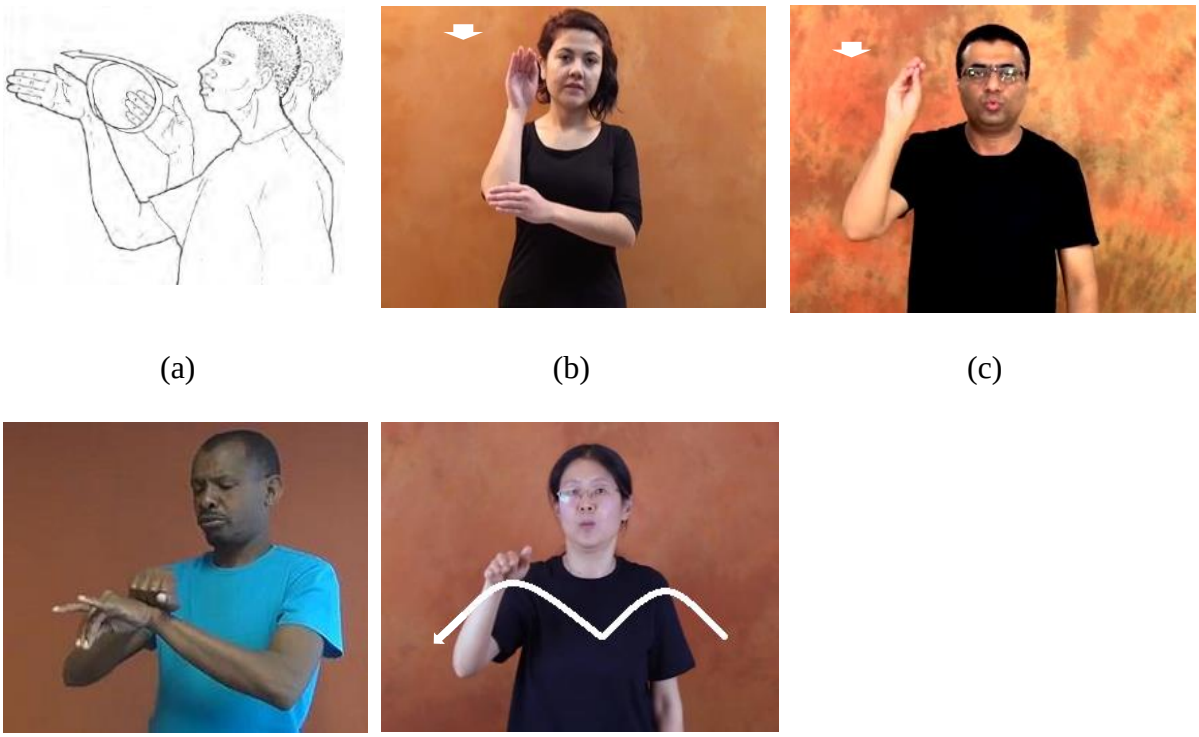
CAMEL-A1
Frequency: 3 (3 signers)
Simple
Personification (animal's neck movement)

CAMEL-A2
Frequency: 1 (same signer)
Simple
Personification (animal's neck & body movement)
Remarks: The signer moves her upper body up and down in addition to moving her hand.

Figure 16. Lexical variants of 'camel' in Berbey SL.

b) Camel in other SLs.

Of the 10 sign languages analysed, only one language (LaSiMa) uses personification strategy for 'camel'. The LaSiMa sign for 'camel' is similar to CAMEL-A2 in Berbey SL (Figure 17-a). In ISN, TID (Figure 17-b) and PSL (Figure 17-c) the signer's hand and forearm are away from the signer's body and stand for the head and neck of the camel (ISN also has an extra component where the signer outlines the camel's hump) so they use object strategy; in NSL (Figure 17-d) one hand shows the generic ANIMAL handshape and fist of the other hand represents the camel's hump, thus using object strategy. The use of object strategy by means of a generic ANIMAL handshape seems to be common in NSL for animal sings (Figure 18). The five remaining languages, i.e. ASL, BSL, DGS, JSL, and ZGS (Figure 17-e), only outline the camel's hump; these signs also use object strategy due to the de-emphasised role of the body (see patterned iconicity in Literature Review).



(a) (b) (c)

(d) (e)

Figure 17. ‘camel’ in (a) LaSiMa, (b) TID, (c) PSL, (d) NSL, and (e) CGS.

Figure 18. Generic ANIMAL handshape in NSL.

CAMEL

Language	Iconic Strategy	Iconic Image
ASL	O	humps
BSL	O	humps
DGS	O	humps
JSL	O	humps
LaSiMa	P	neck & body movement
NSL	O	ANIMAL-hand + hump
ISN	O	humps & neck
PSL	O	head & neck
TID	O	head & neck
ZGS	O	humps
Berbey SL	P (2)	Neck movement (1) neck & body movement (1)

Table 7. Summary of the iconic strategies and their motivation for ‘camel’.

In the Berbey SL sign, only the (neck) movement of the camel is depicted. LaSiMa, PSL, and TID also show the neck/body movement without depiction of the humps. NSL depicts a single hump and the rest of the languages depict double-humps.

4.1.5 **Chicken.**

a) Chicken in Berbey SL.

In the Berbey SL corpus only one instance of ‘chicken’ was found (Figure 19). In the first component of the sign the chicken is depicted flapping its wings (personification strategy) and the second component shows the act of catching a chicken by a human (manipulation strategy).

CHICKEN

Frequency: 1
Complex (wings^human catch)
Personification (wings) + Manipulation (human catching the animal)
Remarks: Similar to BIRD-B; First component = BIRD-A1;

Figure 19. 'chicken' in Berbey SL.

b) Chicken in other SLs.

The majority (7 out of 10) of the sign languages analysed use personification strategy for 'chicken'. Showing the chicken's beak is the most common iconic image (ISN shows both the beak and the wings). PSL and TID use object strategy whereby the index finger of the dominant hand taps on the palm of the other hand, representing a chicken's beak pecking at the ground. JSL and LaSiMa are exceptions: JSL depicts the chicken's comb followed by the signer pinching the skin. LaSiMa uses manipulation strategy whereby a human catching a chicken by its neck is depicted (Figure 20). Table 8 summarises the findings across all analysed languages.

Figure 20. 'Chicken' in LaSiMa uses manipulation strategy.

CHICKEN

Language	Iconic Strategy	Iconic Image
ASL	P	beak
BSL	P	beak
DGS	P	beak
JSL	P	comb + skin
LaSiMa	M	human catch
NSL	P	beak
ISN	P	beak+ wings
PSL	O	beak
TID	O	beak
ZGS	P	beak
Berbey SL	P + M (1)	wings + human catch

Table 8. Summary of the iconic strategies and their motivation for the ‘chicken’.

Except for JSL and LaSiMa, the ‘chicken’ signs in all languages show a birdlike feature of the chicken (wings in Berbey SL and beak or beak + wings in other languages). JSL shows the chicken’s comb and skin while LaSiMa shows the act of catching a chicken by its neck by a human (with one hand). Berbey SL ‘chicken’ sign also has a component (in addition to wings) that shows catching a chicken by a human (with two hands). Thus Berbey SL and LaSiMa, both languages of Mali, are the only languages that depict the human catch and use manipulation strategy for ‘chicken’.

4.1.6 **Duck.**

a) Duck in Berbey SL.

In total 6 (lexical) variants were found for ‘duck’ in the Berbey SL corpus (Figure 21). All the ‘duck’ signs in Berbey SL have personification strategy, with DUCK-A3 additionally

using object strategy. All the signs have a component that shows flapping of the wings or (as in DUCK-B and DUCK-C) the arms are kept still, suggesting the wings of a flightless bird. In DUCK-A3 the signer uses his hand to depict the duck's head and its movement (object strategy), but he also moves his own neck, i.e. the body of the signer also stands for the body of the animal (personification); therefore, this sign uses both object and personification strategy simultaneously.

DUCK-A1
Frequency: 5 (3 signers)
Simple
Personification (wings)
Remarks: Similar to BIRD-A1 but the hands are kept particularly lax.

DUCK-A2
Frequency: 1
Complex (EAT^wings)
Personification (eating & wings)
Remarks: =BIRD-A3

DUCK-A3

Frequency: 1

Complex (wings^head movement)

Personification + object (wings & movement)

Remarks: In the second component the signer also moves his own neck while the hand represents the duck's head.

DUCK-A4

Frequency: 1

Complex (wings^WATER^straight direction)

Personification (wings)

Remarks: The interviewer says OISEAU ('bird').

DUCK-B

Frequency: 3 (same signer)

Simple

Personification (waddling movement & wings)

Remarks: There is a slight body shake by the signer (without arm movement, suggesting a flightless bird).

DUCK-C
Frequency: 1
Simple
Personification (waddling movement & wings)
Remarks: The signer moves her shoulder up and down alternatively like a seesaw while the arms are held still (suggesting a flightless bird).

Figure 21. Lexical variants of 'duck' in Berbey SL.

b) Duck in other SLs.

No data was available for TID. The rest of the languages all use personification strategy for 'duck'. All these languages depict the duck's beak (although with a different handshape than the beak in 'bird'); JSL additionally depicts the duck's (neck) movement. Table 9 summarises the findings across all analysed languages.

DUCK

Language	Iconic Strategy	Iconic Image
ASL	P	beak
BSL	P	beak
DGS	P	beak
JSL	P	beak + movement
LaSiMa	P	beak
NSL	P	beak
ISN	P	beak

PSL	P	beak
TID	-	-
ZGS	P	beak
Berbey SL	P (5) P+O (1)	wings (1) wings + movement (2) wings + other (2) wings + movement (1)

Table 9. Summary of the iconic strategies and their motivation for the 'duck'.

Personification strategy is used in all of the 'duck' signs; one variant in Berbey SL also uses object strategy in addition to personification. In the 'duck' signs in Berbey SL and other languages a feature that shows 'birdness' of the duck is depicted (either the wings or the beak).

4.1.7 **Fish.**

a) Fish in Berbey SL.

In total 4 (phonological) variants were found for 'fish' in the Berbey SL corpus (Table 10). All the 'fish' signs in Berbey SL have object strategy where the hand depicts the shape and wavy motion of fish; two signs (FISH-A3 and FISH-A4) have an extra component that seem to be using manipulation strategy (it is not clear what the extra components are depicting. The extra components in FISH-A3 could be WATER followed by a human hitting the fish head with a rock. In FISH-A4 the extra component could be the act of exchanging money/buying/selling). FISH-A1 and the first component in FISH-A3 and FISH-A4 are identical to SNAKE-A1.

FISH-A1
Simple
Frequency: 4 (3 signers)

Object (shape & movement)

Remarks: = SNAKE-A1

FISH-A2
Frequency: 1
Complex (wiggling movement^straight movement)

Object (shape & movement)

Remarks: the interviewer says CAIMAN

FISH-A3
Frequency: 1
Complex (movement^WATER^hitting the fish with rock(?))

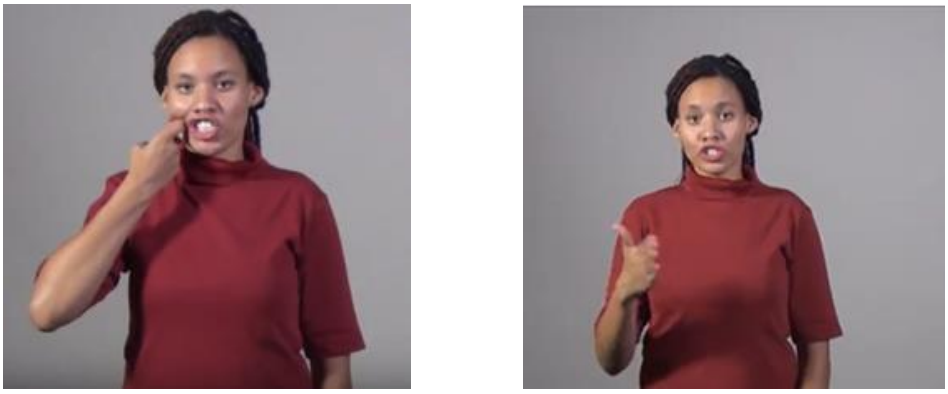
Strategy: Object + Manipulation

FISH-A4 Frequency: 1 Complex (movement^exchanging money(?))
Object + Manipulation

Table 10. Lexical and phonological variants of ‘fish’ in Berbey SL.

b) Fish in other SLs.

For BSL and TID the signs it is not clear what is being depicted. The rest of the languages use the object strategy to show the streamlined body and wiggling/zigzag movement of fish. This ‘fish’ sign is identical to ‘snake’ sign in some languages (see the section for snake). NSL has a second variant for ‘fish’, in which personification strategy is used (gill shown on signer’s face); this is the only sign that uses personification strategy for ‘fish’. NSL ‘fish’ variants are shown in Figure 22. Table 11 summarises the findings across all languages analysed.



(a) (b)

Figure 22. Two variants of ‘fish’ in NSL, (a) using personification strategy, and (b) using object strategy.

FISH

Language	Iconic Strategy	Iconic Image
ASL	O	shape & movement
BSL	(?)	(?)
DGS	O	shape & movement
JSL	O	shape & movement
LaSiMa	O	shape & movement
NSL	P (1) O (1)	gill shape & movement
ISN	O	shape & movement
PSL	O	shape & movement
TID	(?)	(?)
ZGS	O	shape & movement
Berbey SL	O (2) O+M (2)	shape & movement (2) shape & movement +other (2)

Table 11. Summary of the iconic strategies and their motivation for the 'fish'.

For 'fish' all languages use object strategy to depict streamlined shape and zigzag movement of the fish (Berbey SL has variants that additionally use manipulation strategy). NSL has a second variant in which personification strategy is used (the fish gill is depicted).

4.1.7.1 ***'Fish' as a life form.***

As was observed by Brown (1984) the class 'fish' contains organisms that have 'a streamlined body, fins and (usually) gills' (see lexicalisation of life forms in Literature

Review). If these features are what set the fish apart from other organisms, then it is not surprising that all the 'fish' signs in Berbey SL and (8 out of 10) other languages contain a component in which the hand represents the streamlined shape of fish. This 'fish' sign is identical to 'snake' sign in some languages (see the section for snake).

4.1.8 **Horse.**

a) Horse in Berbey SL.

In total 3 (lexical) variants were found for 'horse' in the Berbey SL corpus (Figure 23). HORSE-A uses personification strategy whereby the galloping of the horse is depicted. HORSE-B and HORSE-C use manipulation strategy in which controlling the horse's reins by a human is depicted. HORSE-A1 is similar to some signs found for 'zebra' (ZEBRA-A1 and ZEBRA-A2) (see the section for zebra).

HORSE-A

Frequency: 4 (2 signers)
Simple
Personification (galloping)

HORSE-B

Frequency: 3 (same signer)
Simple
Manipulation (controlling the reins)

HORSE-C
Frequency: 2 (same signer)
Simple
Manipulation (controlling the reins)

Figure 23. Lexical variants of 'horse' in Berbey SL.

b) Horse in other SLs.

In ASL dictionary no sign for 'horse' was found. In the remaining 9 languages, manipulation and object strategies are the most common strategies: 4 languages use manipulation (although one (JSL) may be object strategy), 3 languages use object strategy, and 2 languages use personification strategy for 'horse'. When manipulation strategy is used controlling the reins of a horse by a human is depicted (except for JSL which is less clear what is depicted). When object strategy is used, in two languages (ISN and TID) the hands depict a human riding a horse, i.e. human manipulating the horse; but since the role of the body is de-emphasised object strategy is used. In personification strategy, one language (BSL) outlines the horse's head shape on her own head (so the signer's body stands for the horse's body) while in the other (ZGS) the horse's ear is depicted. Table 12 summarises the findings across all analysed languages.

HORSE

Language	Iconic Strategy	Iconic Image

ASL	-	-
BSL	P	head
DGS	M	controlling the reins
JSL	M (?)	controlling the reins (?)
LaSiMa	M	controlling the reins
NSL	O	ANIMAL-handshape + bit + movement
ISN	O	person riding a horse
PSL	M	controlling the reins
TID	O	person riding a horse
ZGS	P	ear
Berbey SL	P (1) M (2)	galloping (1) controlling the reins (2)

Table 12. Summary of the iconic strategies and their motivation for the 'horse'.

There is less uniformity in the iconic strategies used for 'horse'. Manipulation strategy is more frequent in Berbey SL and slightly more frequent in other sign languages, in which controlling the horse reins by a human is depicted. A human riding a horse is the most common iconic image, even if it is shown by means of object strategy (in ISN and TID).

4.1.9 **Snake.**

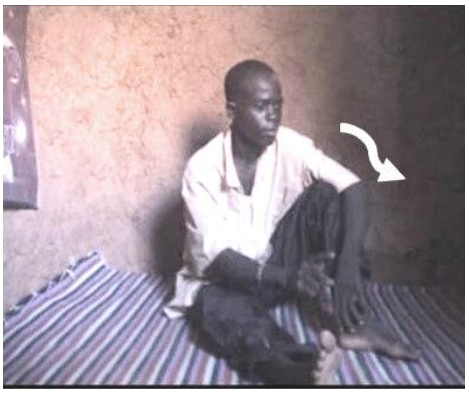
a) Snake in Berbey SL.

Four (phonological and lexical) variants were found for 'snake' in the Berbey SL corpus (Table 13). (Note that 'snake' was the most frequent animal term found in the Berbey SL corpus. However, I have included only those signs that were signed by one of the four participants who took part in the elicitation task in the analysis.) All the 'snake' signs in Berbey SL use object strategy. In SNAKE-A1 the hand (and possibly the arm) stands for the limbless

body of the snake while showing the wavy motion of snake (this variant is identical to FISH-A1). In SNAKE-A2 the index finger stands for the elongated and limbless body of a snake. In SNAKE-B the hand seems to depict a snake coiling into curves. SNAKE-C could be depicting the snake as it jumps and bites its target (the fingers standing for the mouth and the rest of the arm standing for the body of the snake).

SNAKE-A1

Frequency: 6 (2 signers)
Simple
Object (Shape & movement)
Remarks: =FISH-A1



SNAKE-A2

Frequency: 3 (same signer)
Simple
Object (Shape & movement)

SNAKE-B Frequency: 1 Simple Object (coiling up)
 SNAKE-C Frequency: 1 Simple Object (sudden jumping/biting) Remarks: the interviewer says BICHE (‘deer’)

Table 13. Lexical variants of ‘snake’ in Berbey SL.

b) Snake in other SLs.

Object strategy is used for ‘snake’ in 9 out of 10 sign languages analysed. One language (ZGS) only uses personification strategy. ASL, BSL, and ISN use personification strategy in addition to object strategy. When object strategy is used mainly the snake’s shape and/or its rapid zigzag movement is shown; the whole arm can be viewed as representing the snake’s elongated body (except for cases where the index finger alone represents the elongated body of the snake, such as in TID); in one language (PSL), the signer’s hand/arm depict the raised body of the snake instead (Figure 25).

In DGS the signs for ‘snake’ and ‘fish’ are identical (except for the mouthing). LaSiMa also uses the same handshape as DGS for both ‘snake’ and ‘fish’, but the signs are distinguished by different hand movements as well as the placement of the opposite hand on the wrist (Figure 27). When personification strategy is used the snake’s split tongue is depicted, and the signer’s head/body stand for the snake’s head/body (Figure 24). Table 14 summarises the findings across all analysed languages.

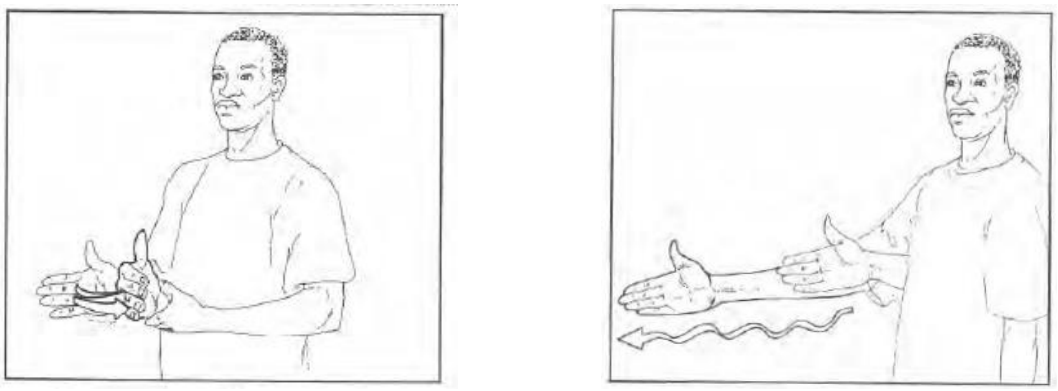
Figure 24. ‘Snake’ in ZGS uses personification strategy.

Figure 25. ‘Snake’ in PSL.

a) FISH

b) SNAKE

Figure 26. The manual component of the signs for ‘fish’ and ‘snake’ in DGS are identical.



a) FISH b) SNAKE

Figure 27. ‘Fish’ vs. ‘snake’ in LaSiMa.

SNAKE

Language	Iconic Strategy	Iconic Image
ASL	P + O	tongue + shape & movement
BSL	P + O	tongue + shape & movement
DGS	O	shape & movement
JSL	O	shape & movement
LaSiMa	O	shape & movement
NSL	O	shape & movement
ISN	P + O	tongue + shape & movement
PSL	O	shape
TID	O	shape & movement
ZGS	P	tongue

Berbey SL	O (4)	shape & movement (2) shape & movement (1) shape + other (1)

Table 14. Summary of the iconic strategies and their motivation for the 'snake'.

Object strategy is used in all Berbey SL 'snake' signs. Except for one language that uses personification strategy for 'snake', all the languages analysed also use the object strategy for snake (some combining it with personification). When object strategy is used the snake's shape and movement is shown, while in personification strategy its forked tongue is shown. The DGS sign for 'snake and 'fish' are identical; some 'snake and 'fish' variants in Berbey SL are also identical.

4.1.9.1 *'Snake' as a life form.*

As was observed by Brown the class 'snake' contains organisms that are featherless, furless, elongated, and (usually) without appendage (see lexicalisation of life forms in Literature Review). If these are the main features that represent 'snake-ness', it would not be surprising to find them in the iconic image of 'snake' signs. All the Berbey SL signs can be viewed as showing the elongated and limbless body of the snake, especially if the entire arm is viewed to stand for the body of the snake (in SNAKE-A2 the index finger alone represents the elongated body of the snake). The same applies to the majority of the 10 languages analysed (ZGS is an exception). Three languages additionally depict the snake's forked tongue. There is only one language (ZGS) that depicts the snake's tongue and no other feature (snake's tongue is not a 'snake-ness' feature mentioned by Brown).

4.1.10 **Zebra.**

a) Zebra in Berbey SL.

In total 3 (lexical and phonological) variants were found for 'zebra' in the Berbey SL corpus (Figure 28). All the 'zebra' signs in Berbey SL use personification strategy; ZEBRA-

A1 and ZEBRA-A2, which are similar to HORSE-A1, depict the zebra galloping, while in ZEBRA-B a panting and frightened animal (presumably frightened to see a predator) is depicted.

ZEBRA-A1
Frequency: 2 (2 signers)
Simple
Personification (galloping)
Remarks: similar to HORSE-A1

ZEBRA-A2
Frequency: 1
Simple
Personification (galloping)
Remarks: similar to HORSE-A

ZEBRA-B
Frequency: 1
Simple

Personification (panting/frightened)

Figure 28. Lexical and phonological variants of ‘zebra’ in Berbey SL.

b) Zebra in other SLs.

The ISN dictionary did not have a sign for ‘zebra’. Of the remaining 9 languages, 8 use personification (either alone or in combination with another strategy) for ‘zebra’. NSL uses object strategy. In all the languages the zebra’s striped skin is depicted (either alone or in combination with the HORSE sign). Table 15 summarises the findings across all sign languages analysed.

ZEBRA

Language	Iconic Strategy	Iconic Image
ASL	P	stripes
BSL	P	stripes
DGS	P	stripes
JSL	P+M (?)	stripes^HORSE
LaSiMa	M+P	HORSE^stripes
NSL	O	ANIMAL handshape+stripes
ISN	-	-
PSL	M+P	HORSE^stripes
TID	P+O	stripes+whiskers^HORSE
ZGS	P	stripes^HORSE
Berbey SL	P (3)	galloping (2) panting (1)

Table 15. Summary of the iconic strategies and their motivation for’zebra’.

Figure 29. ‘zebra’ in NSL.

What is striking in all ‘zebra’ signs in Berbey SL is that none of them depict the zebra’s stripes, whereas in all the languages analysed the zebra’s stripes are depicted. Berbey SL signs depict a characteristic movement (galloping) or behaviour (being frightened) of the animal. In 5 of the sign languages the sign for zebra is a compound made of a HORSE component and a component that shows the stripes, i.e. zebra is considered a ‘striped horse’. The Berbey SL ‘zebra’ signs that depict galloping are also similar to a ‘horse variant (HORSE-A1).

4.2 Other Observations

4.2.1 Mouthing.

Mouthing (i.e. mimicking the way the mouth moves when uttering a spoken language word) was not observed in any of the Berbey SL animal signs, which could be because this emerging language has not yet been influenced by a spoken language.

4.2.2 Pointing.

In the data there were a number of cases, such as Figure 30 and Figure 31, where the animal sign is preceded or followed by a pointing sign in which the signer points their index finger at a location in the space; this seems to imply where the animal in question is typically found or where it was seen (e.g. ‘on the ceiling’, ‘up in the sky’, ‘up north’ etc.). Sometimes in addition to pointing, the signer also signs SEE (i.e. pointing the index finger to their own eye) and/or nods their head, implying ‘I’ve seen it’. There are also cases where the signer, after

looking at the animal picture, does not produce any animal sign at all and only points at a location in space. Figure 32 shows the sign for ‘mouse’ (not included in the analysis) where the signer points at several locations on the ceiling with her index finger, without producing an animal sign. It is not clear in cases such as this whether the signer is implying where the animal was seen/can be found or whether pointing at the animal’s location is a way of referring to the animal in question (see Discussion).

direction (?) PT BIRD-A1

Figure 30. An instance of an animal sign being preceded by pointing (pointing is glossed as PT).

ZEBRA-A1 PT

Figure 31. An instance of an animal sign being followed by pointing.

Figure 32. In the sign for ‘mouse’ the signer only uses pointing.

4.3 Classification of Animals

Based on the limited data available it was not possible to see how the animals are classified in Berbey SL based Berlin et al.’s (1973) folk biology taxonomy. Three possible life forms were found: ‘bird’, ‘fish’, and ‘snake’ (see Discussion chapter). The rest of the animals are generic taxa.

4.3.1 **Unique beginner (Level 0).**

No signs for ‘animal’ were found in the Berbey SL corpus. However, it is not clear whether this is because no sign exists in this language yet for ‘animal’ or because the concept was simply not included in the corpus. According to Berlin et al. (1973), it is common for languages not to have a lexicalised term for the unique beginner category and further research will make it clear if Berbey SL is also one the languages that lack a term for this category. If so, it would be interesting to investigate how Berbey signers refer to the concept of ‘animal’ in the absence of a lexical term. All other sign languages (except for LaSiMa) had a lexical sign for ‘animal’ in their dictionary. It would not be surprising if further research reveals these sign languages originally lacked such a term and in the process of standardisation and dictionary making a term for ‘animal’ was coined (see for example Johnston, 2003 for a discussion on sign language dictionaries and standardisation).

4.3.2 **Life form (Level 1): 'bird', 'fish', and 'snake'.**

Berbey SL has signs for 'bird', 'fish' and 'snake', but no terms for 'wug' (worm + bug) and 'mammal' were found in the Berbey SL corpus. The first three terms can be viewed as possible life form terms.

4.3.3 **Generic (Level 2).**

The rest of the animals found in the Berbey SL corpus (even the ones that were not included in the analysis) are generic taxa. However, how these generic taxa are classified remains to be answered with future research (e.g. maybe they occur at Level 1 or maybe they are classified under a Level 1 life form). However, similarities were found between the signs for 'chicken' and 'duck' with the signs for 'bird', as well as between the signs for 'horse' and 'zebra'.

4.4 Patterned Iconicity

In order to have a rough idea of how common each iconic strategy was in the data I counted the overall strategies used (in Berbey SL, since animal signs in Berbey SL had different number variants, in counting of the iconic strategies I considered how many animal terms had at least 1 variant with a certain strategy. If an animal used more than one strategy, each strategy was counted once. For the other 10 sign languages, I considered the total number of the times each strategy was used for an animal across languages.).

The predominant strategy used in animal signs in Berbey SL is **personification:** 8 out of 10 animal terms used personification strategy; 'fish' and 'snake' are the only signs in Berbey SL that have no variants with personification strategy. In other 10 sign languages analysed, too, **personification** is the predominant strategy for animals. After personification, **manipulation** strategy is most common in Berbey SL: it is used in the variants for 'bird', 'chicken', 'duck', 'fish' (although they are marked with a question mark), and 'horse'. This is while in other 10 sign languages **object** strategy is the second most common: the only animals

for which no language uses object strategy are ‘bird’, ‘boar’, and ‘duck’. Finally, the least common strategy in Berbey SL is **object** strategy (only found in ‘fish’ and ‘snake’), whereas in other sign languages **manipulation** strategy is the least common strategy (only used in ‘chicken’, ‘horse’, and ‘zebra’ signs that are based on ‘horse’).

5 Discussion

This chapter discusses the results of the analysis of 10 animal signs in Berbey SL and 10 sign language dictionaries. The chapter is divided into three main parts. Part 5.1 briefly discusses the findings in term of classification and nomenclature (folk taxonomy). Part 5.2 is dedicated to the discussion of the findings in terms of iconicity. Lastly, part 5.3 discusses some final observations that were made during the study.

5.1 Classification of Animals in Berbey SL

Three animal terms were found in the Berbey SL data that correspond to the three (out of five) life form taxa identified by Brown (1984), namely, 'bird', 'fish', and 'snake'. It is not clear what material was used for the elicitation of animal terms in the Berbey SL corpus and what criteria were used for the original (French) annotations; therefore, it cannot be determined with certainty whether the 'bird', 'fish', and 'snake' signs found in the corpus refer to the entire life form classes or only to some of the organisms within each class. Hence I consider these three *possible* life forms in Berbey SL. For example, (one or more of) the three terms could be what Brown (1984) calls an *incipient* life form, i.e. a life form term that only includes animals lacking an individual name (as opposed to a full-fledged life form term that includes both named and unnamed animals). For instance, let us assume Berbey SL has only two bird terms: 'chicken' and 'duck'; if any birdlike organism that is *not* a chicken or a duck is referred to as 'bird' in Berbey SL, then the term 'bird' is an incipient life form in this language (a full-fledged life form category, by contrast, would include chicken as duck, as well as all the birds for which there is still no name in Berbey SL). According to Brown (1984), incipient life form terms may often emerge in a language before full-fledged life form terms. However, if the three terms found in the corpus are found with future research to be in fact full-fledged life forms, then that means Berbey SL is a Stage 3 language according to Brown's (1984) framework.

5.2 Iconicity in Animal Signs

The animal signs in Berbey SL were found to be highly iconic. Interestingly, the same was found for the other 10 sign languages, which included established urban sign languages such as ASL as well as emerging urban sign languages such as ISN. This raises the question as to why such a high degree of iconicity exists in animal signs, both in an emerging sign language like Berbey SL and in the more established ones. Is this high degree of iconicity unique to the semantic field of animals? If so, is that because animal signs are not used as frequently as other signs so they have undergone fewer (phonological) changes? Or perhaps the dictionary makers deliberately decided to include the most iconic signs in the dictionary? Could it be that this high degree of iconicity is due to the nature of the referents in this semantic domain? As mentioned in Literature Review, Berlin (1992, 2006) had already noticed that many animal names reflect some characteristic of the animal in question, such as its shape, size, or movement, by means of sound symbolism. Depiction of characteristic movement or behaviour of an animal in addition to its visual characteristics was common in animal signs across languages (even in the signs for 'fish' and 'snake' the typical zigzag motion of the animals was shown in addition to their shape); in Berbey SL there were signs (such as ZEBRA-A) in which only the animal's movement (galloping) was depicted. Could it be that iconicity is used extensively in animal signs because an animal's morphological features and behaviour can be readily reflected in a visual sign through iconicity? These are some of the questions that yet remain to be answered. In what follows I discuss some observations regarding iconic image and iconic strategy.

5.2.1 Iconic image and similarities of animals.

Here I first discuss the iconic image in 'bird', 'fish', and 'snake' signs with respect to the features Brown (1984) listed for these three life forms (introduced in lexicalisation of life forms in Literature Review). Then I discuss the evidence for 'bird-ness' of 'chicken' and 'duck'

based on their iconic image. Afterwards, I discuss the iconic image in ‘zebra’ and its similarity to ‘horse’.

5.2.1.1 *‘Bird’.*

As it was shown in the Results chapter all the Berbey SL signs for ‘bird’ had a component in which the iconic image (the wings) was in line with what Brown (1984) had listed as the distinct features of birds. The iconic images in the other 10 sign languages analysed (beak, wings, or both) were also in line with Brown’s description. If the order in which Brown has listed the visual features of birds implies their degree of importance or salience of these features (i.e. the existence of wings being the most salient feature), that may explain why in Berbey SL (an emerging language) the wings are considered the main characteristic of birds (i.e. due to their greater salience). However, it is less clear why the majority of the other (older) sign languages prefer the beak over the wings. It could be that in their early days those languages also depicted the wings, or the wings and the beak together (like in PSL example), and in time the sign became simplified (for reasons such as ease of communication) and only the beak component remained. Interestingly, ISN, which is also a relatively young language, is one of the three languages in the findings that depict the wings.

In her 1975 study on the historical change in ASL, Nancy Frishberg also noted that the original Old French sign for bird (from which the modern ASL sign was derived) was a complex sign depicting first the bird’s beak and then its wings; over time the sign lost one of its components (i.e. the wings) and only the beak remained (Frishberg, 1975). Based on Frishberg’s observation, it could be a common historical change for complex signs to either assimilate their components or, when assimilation is not possible, to drop one component. However, the question still remains as to why in the majority of ‘bird’ signs the wings were dropped and the beak remained. Further research, especially on emerging sign languages

(which provide the opportunity to study language formation and evolution from its early days) may answer this question.

5.2.1.2 *'Fish'.*

All languages showed the streamlined body of 'fish'. NSL had an additional variant in which the gill was shown. One possible reason why this sign was the only one that depicted the gill could be that, based on Brown's listed features of 'fish-ness', gills seem to be a less important feature of fish than its streamlined body or fins (not all fish have gills).

5.2.1.3 *'Snake'.*

Although the 'snake' signs in Berbey SL and the majority of other languages analysed depicted the elongated body of the snake, a few sign languages (ASL, BSL, and ZGS) preferred the depiction of the snake's tongue. The snake's tongue is not listed by Brown (1984) among the most salient features of snakes. However, it could be that in the three sign languages mentioned the snake's tongue has gained salience due to the associations found in the surrounding spoken language and culture (as reflected in the English idiom 'to speak with a forked tongue').

Another question is why there are instances of identical signs for 'snake' and 'fish' (e.g. in DGS or some variants in Berbey SL). One possible reason for this similarity could be that snakes, like fish, have a streamlined body, are limbless and can have a wavy motion, all of which can be much more easily depicted in a sign using the hand. Another possible answer is that perhaps in DGS and Berbey SL the signs appear identical, they are not intended as identical: i.e. in 'snake' the whole arm also stands for the elongated body the snake, while in 'fish' only the hand is part of the sign (recall the LaSiMa signs for 'snake and 'fish' in which the opposite hand was put on the wrist of the dominant hand, as if to make it clear that from the wrist up is not part of the sign, and thus distinguishing it from 'snake' handshape).

5.2.1.1 *'Chicken' and 'duck'.*

'Chicken' and 'duck' signs both have a bird feature (wings) depicted in them in Berbey SL. So Berbey signers appreciate 'birdness' of chicken and duck, even when they are not a prototypical flying bird. The same is true for other analysed sign languages (with the exception of JSL and LaSiMa) in which the beak is depicted.

5.2.1.2 *'Horse' and 'zebra'.*

The similarity between some 'zebra' and 'horse' signs in Berbey SL suggests that the similarity between horses and zebras (at least in their movement) is notable to Berbey signers. It is interesting that signers intuitively show the 'horse-ness' of zebra while according to scientific taxonomy, too, zebras and horses are both equids. In at least half of the other sign languages analysed the sign for 'zebra' is a compound based on 'horse'. Could it be that the languages that have a simple sign for zebra in which the stripes are depicted used to have a component for 'horse' and in time they lost that component? (No sign for 'zebra' was available for ISN to see how that emerging language depicts zebra). More research is needed to answer this question.

One more puzzling question, however, is why the 'zebra' sign in Berbey SL does not depict zebra's stripes. Aren't zebra's stripes one of its most salient features? All other sign languages unanimously depicted the zebra's stripes. A preference for depicting the animal's characteristic movement and behaviour is found in some other animal signs in the Berbey SL corpus as well (that were not included in the analysis), while for other 10 sign languages depiction of characteristic movement or behaviour was less common. For example, for 'rabbit' Berbey SL depicts the animal hopping (and catching?) while other sign languages depict the rabbit's ears or front teeth; for 'lion' Berbey SL depicts either the animal's claws (implying dominance) and/or its act of biting, while other sign languages depict its mane or whiskers. Even in some 'bird' and 'duck' signs the animal's movement (e.g. waddling movement or

movement of the neck) was depicted alongside its appearance (wings). However, for slow-moving animals such as ‘boar’, as well as cow’, ‘elephant’, and ‘rhinoceros’ (not included in the analysis) their physical appearance (such as possession of tusks or a trunk) seems to be more salient to Berbey signers.

One possible reason could be related to the prevalence of these animals in the environment Berbey signers live in. Berbey signers may have seen many of these animals in nature (based on the information available on the Internet all these animals exist in Mali, although it is not clear if they are prevalent around Berbey area as well or not). In the corpus the signers sometimes mention that they have already seen a certain animal or where the animal can be found. It could be that’s since Berbey signers have observed these animals and their behaviour closely (As opposed to only know them from a picture or video) they are more familiar with the characteristic movement and behaviour of these animal and therefore these features are more salient to Berbey signers. For slow-moving animals, on the other hand, perhaps their movement does not draw the attention of Berbey signers as much, therefore their physical appearance is depicted in the iconic image instead of their characteristic movement.

5.2.2 **Iconic image: is it entirely unpredictable?**

It is often said in discussions of sign language iconicity that although an iconic sign bears some resemblance to its referent (and is therefore non-arbitrary), what aspect of referent is selected (i.e. iconic image) is arbitrary (cf. Kendon, 1980; Hou, 2018). For example, in her study of iconic patterning in San Juan Quiahije Chatino Sign Language, for example, Hou (2018) notes that in the sign for ‘cat’ some signers depict its whiskers while others depicts a biting action. Hou states ‘the choice to select a sign for representing a referent is arbitrary’ (Hou, 2018, p. 592); she consequently concludes that the choice of iconic image is unpredictable, especially in a new language. Although this observation generally may be true, some of the findings in the present thesis raise the question as to how arbitrary the ‘selection’

of iconic image really is. Put another way, is it possible (for a given animal) to predict a set of features that are most likely to be represented in an iconic sign? This question arises from comparing the iconic images for each animal across the languages analysed. Moreover, for three animals – 'bird', 'fish', and 'snake' – one of the characteristics that Brown (1984) had listed for each of them was found in the iconic image their sign.

It appears that each organism has a set of salient features (that most people notice) which makes them stand out from the rest of the organisms (such as the ones Brown listed for bird, fish, and snake) and the iconic image will be selected from one of those features (for example, Brown did not mention the fact that birds lay egg as their salient characteristic, and interestingly this feature was not depicted in any of the signs analysed). Of course, even when a set of salient features can be identified for a given organism, it can still be argued that what feature from this set is selected in the iconic image is arbitrary. However, the main point here is that a set of salient features would be limited and therefore there is some degree of predictability in terms of the most likely iconic images (the more salient the feature, the more likely it is to be in the iconic image). To illustrate this point further I provide another example.

In the signs for 'antelope' and 'boar', the horns and tusks are depicted in most, if not all, cases (both in Berbey SL signers and other sign languages analysed). Does this automatically mean that every animal that has horns/tusks will be depicted by it horns/tusks? In order to find out, I took a look at the signs for other horned animals available in the Berbey SL corpus (which were not included in the analysis). These animals were: 'cow', 'elephant', 'ram' and 'rhinoceros' (the signs annotated as 'deer' were excluded because they were not clear; e.g. one of them showed what looked like tusks on the signer's face, instead of horns on head). Indeed, it was found that for all but one of these animals, the horns (or 1 horn, for 'rhinoceros') were predominantly depicted. However, one animal violated this pattern: 'elephant'. In Berbey SL 'elephant' was shown by depiction of its trunk (most common) or

giant ears; depiction of tusks was least common (in which the signer put her fist at one side of her mouth at the supposed location of a tusk). The other 10 sign languages unanimously depicted the elephant's trunk. Although elephants have tusks, they are not the only salient feature of the elephants: their trunk and huge ears are also salient; and perhaps for most people the trunk is the most salient feature of the elephant, therefore it is more likely to be selected as the iconic image.

What this observation suggests is that for each animal, there may be a set of features (e.g. certain pattern on the skin, physical feature, characteristic movement or behaviour) that is most salient to the majority of people, such as the ones Brown found for bird, fish and snake. The iconic image will be selected from one of those most salient features. Factors such as cultural significance of the animal or its prevalence in the signers' environment may create new associations with that animal in the mind of people, and these new associations may affect what is considered salient; for example 'chicken' becomes associated with the act of catching a chicken by a human for LaSiMa and Berbey signers, characteristic movement an animal that is often observed in the signers' environment becomes more salient to them. More research is needed to answer the question of possible predictability of iconic image.

5.2.3 **Patterned iconicity.**

The results showed that both in Berbey SL and the 10 sign languages analysed, personification strategy was the dominant iconic strategy for animal signs. An example of a sign with personification strategy was BIRD-A1 in Berbey SL where the sign's arms represented the bird's wings, and the body of the bird was mapped onto the signer's body. This is in-line with Hwang et al.'s (2017) finding (see Literature Review) that in the semantic domain of animals, personification strategy is the most common strategy. The extensive use of object strategy for animal signs in NSL by means of a generic ANIMAL handshape, even for animals that many sign languages used personification (see the sections for 'camel' and 'zebra'

in the Results chapter) suggests that it is possible to depict every given animal sign by means of object strategy. However, languages do not do that; instead, they prefer to use personification strategy in which the signer's body stands for the body of the animal. A possible explanation for this preference of personification strategy for animal signs could lie in humans' tendency to use *anthropomorphism* in language.

Anthropomorphism is attributing human characteristics to non-human entities and is common across languages (Sutton-Spence & Napoli, 2010). Humans use anthropomorphism for different reasons, for example in an attempt to better understand animal behaviour (e.g. saying the dog is 'smiling' just because it shows its teeth). Since sign languages use the visual-gestural modality and the signer's body can readily represent the body of another entity, they can exploit anthropomorphism even more than the spoken languages do (cf. Sutton-Spence & Napoli, 2010 for a detailed discussion of anthropomorphism in sign languages). Thus it is reasonable to expect a high tendency for mapping an animal's body onto a human body in sign languages. This could explain why personification strategy (i.e. the signer's body standing for an animal's body) is the most commonly used iconic strategy found in the semantic field of animals (Sutton-Spence & Napoli (2010) note that in poetry and storytelling anthropomorphism can go beyond the realm of animals and even inanimate objects are mapped onto a human body).

Anthropomorphism may also explain why in Berbey SL for a ferocious animal like 'boar' the signer assumes a frowning facial expression (as though the animal is 'angry'), and for an animal of prey such as 'zebra' a fearful expression was portrayed (as though the animal is in 'panic'); the underlying assumption in both cases is that animals experience and display emotions such as anger and fear in the same way as humans do. On the other hand, the reason why object strategy is favoured for 'fish' could be because the size and shape of fish and the fact that it lives in water make this animal highly distinct from humans, therefore there is a

lower tendency to map the fish body onto the human body. Anthropomorphism may also account for the tendency to portray the animal's characteristic movement and behaviour in some Berbey signs (mentioned at the end of the previous section): the way an animal carries itself or behaves may be viewed and portrayed as if it is motivated by human intentions.

Manipulation strategy, in which the signer's body stands for a human body and a human action of manipulation of an animal is depicted, was the second most common strategy in Berbey SL animal signs. An example of manipulation strategy was HORSE-C in which the signer depicted the act of controlling a horse's reins. This is contrary to Hwang et al.'s (2017) finding that manipulation strategy is the least common strategy for animal signs. However, in the other 10 sign languages manipulation strategy was indeed the least common strategy used. The animal signs in Berbey SL in which manipulation strategy is used are 'horse' (for which manipulation strategy was common in other sign languages as well), and 'bird', 'chicken', 'duck' and 'fish'. In particular, 'chicken' with it a component that shows the human catch is interesting (the human catch found in 'chicken' in LaSiMa as well) because Hwang et al. (2017) had also mentioned two signing communities in Mexico (Z and Chatino), one of which depicts the act of snapping the chicken's neck in preparation for consumption (manipulation strategy), and the other the chicken is shown being cut. Since chicken, duck, and fish can all be consumed by humans the reason manipulation strategy is used for their signs in Berbey SL might have to do with their significance for human consumption (however, for 'bird' it is less clear why manipulation is used). As Hwang et al. noted manipulation strategy in animals signs is 'used in forms where referent objects are associated with canonical actions and reflect cultural practices' (Hwang et al., 2017, p. 594).

Finally, the least common strategy in Berbey SL was found to be object strategy (contrary to Hwang et al.'s finding, as mentioned above), while in other 10 sign languages it was manipulation strategy. In object strategy role of the signer's body is de-emphasised (body

does not represent a body) and only hands (usually away from the body) represent the animal or some features of the animal. Object strategy was only found in the signs for ‘fish’ and ‘snake’ in Berbey SL. For ‘fish’ other languages unanimously used object strategy as well. NSL had a second variant for ‘fish’ using personification strategy, which shows it is possible to use personification even for ‘fish’; but for some reason languages prefer to use object strategy for this animal instead of personification. Object strategy was found in the ‘snake’ signs in the majority of other languages as well (some in combination with personification strategy). One reason for this preference to depict fish and snake using object strategy could be related to the size of these animals. Hwang et al. observe that object strategy is often (but not always) used for smaller animals such as ‘fish and spiders, and other, less mammalian animals’ (Hwang et al., 2017, p. 595) as well as ‘many-legged insects’ (Hwang et al., 2017, p.595, 586) the object strategy is more likely to be used. According to Hwang et al., this is due to those animals’ ‘smaller size and the difficulty of mapping onto the human body’ (Hwang et al., 2017, p.595, 586).

5.3 Other Remarks

5.3.1 Signing variation.

A noticeable degree of lexical and phonological variation (both between-signer and within-signer) was observed in the animal signs signed by the 4 Berbey signers. Berlin (1992) had also observed a noticeable degree of synonymy (i.e. lexical variation) and phonological variation in naming of animals and plants across speakers of some spoken languages, in particular in small-scale societies; he noted that this linguistic variation may reduce in time for animals or plants with cultural significance. Berlin noted that the underlying reasons for such variation are yet to be fully explored (Berlin, 1992). However, the variation found in Berbey SL animal signs may not be specific to the animal domain; it may be common in other semantic fields as well (no research available yet). Emerging rural sign languages have been reported to

have a high degree of variability in their lexicon. The same reason that de Vos (2011) suggested for high variation in rural sign languages (see Introduction) may also apply to Berbey SL: since there is only a small number of Berbey SL signers, they are aware and tolerant of each other's idiosyncrasy in signing. In other words, since the community is small and everyone is familiar with each other's signing variety, they can understand each other's signing and therefore there is not much pressure or need for conforming to a certain way of signing.

5.3.2 **Pointing.**

As mentioned under other observations in the Results chapter, in a sign such as 'mouse' (not included in the analysis) the signer points at several locations on the ceiling (without producing any animal sing). It could be that the signer is informing the interlocutor where they have seen the mouse (or where the mouse is typically found). Alternatively, it could be that the signer is making reference to a shared knowledge between themselves and the interlocutor: since they both know that the mouse is typically found on the ceiling (or roof), by pointing at that location they are implying 'that animal that [we know] is found on the ceiling'; in other words, it could be that instead of naming the animal, the location where it is typically found is named (or more accurately, pointed at).

Pointing may be a common strategy in rural sign languages (cf. de Vos & Pfau, 2015; Kendon, 1980) and it was mentioned in the Literature Review (colour terms in sign languages) that Kata Kolok signers use two common strategies were found: naming an object with the intended colour and pointing at an object in the environment that has the intended colour. In the case of Berbey signers the pointing would not be directed at a present referent (animal) in the environment, but rather at its typical location. Kendon (1980) in his study of Enga signs had found that not only pointing is used extensively by Enga signers, but also there are cases in which pointing is directed at something that is not the intended referent, but represents the intended referent; Kendon gives the example of Enga signers pointing at a string bag to mean

‘the action of carrying those things that are typically carried in string bags’, which in the given context meant ‘food’ (Kendon, 1980, p. 90). Whether or not pointing serve such a purpose in Berbey SL remains a question that future research may answer.

6 Conclusion

This study examined iconicity in the semantic domain of animals in Berbey SL and compared it to 10 other sign languages in terms of the iconic strategy and iconic image. Animal signs were found to be highly iconic across all sign languages analysed. A high degree of iconicity in the semantic domain of animals makes the study of this domain in sign languages highly relevant, especially since studies of this domain in spoken languages have shown a preference for classification and nomenclature of animals based on the organism's morphological. Features such as size, shape, and movement can be visually reflected in an iconic sign with ease. In terms of iconic image in animal signs some patterns emerged that suggest the selection of iconic image may not be arbitrary. The results of this study suggest that the organisms' similarities may be reflected in the iconic image of their signs.

In terms of iconic strategy, previous research had found that the most common iconic strategy in the semantic field of animals is personification strategy, followed by object and manipulation strategies (Hwang et al., 2017). In Berbey SL and the 10 sign languages analysed personification strategy was the most extensively used strategy. An explanation for this preference for personification could lie in the humans' preference for anthropomorphism, i.e. attributing human characteristics to non-human entities. Due to the visual-gestural nature of sign languages the signer's body can readily represent the body of an animal. The second most common strategy in Berbey SL was manipulation strategy, while in other 10 sign languages it was object strategy. The reason most languages favour object strategy over manipulation strategy could be that, as was mentioned in Literature Review by Berlin (1992), in general humans see, name and classify the animals based on their morphological characteristics and not based on their utility for humans. However, the reason why Berbey SL does not conform to this general observation could be because of cultural significance of those animals in Berbey culture.

Additionally, as an emerging family sign language, Berbey SL showed high variation of within and between signers in the animal signs. Frequent use of pointing was also observed. High variation in the lexicon and frequent use of pointing are properties that have been reported by other researchers as well in the studies of emerging and small-scale sign languages.

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Appendix A – Abbreviations of Analysed Sign Languages

Abbreviation	**Sign Language Name**
ASL	American Sign Language
BSL	British Sign Language
DGS	German Sign Language (Deutsche Gebärdensprache)
ISN	Nicaraguan Sign Language (Idioma de Señas de Nicaragua)
JSL	Japanese Sign Language
LaSiMa	Malian Sign Language (Langue des Signes Malienne)
NSL	Namibian Sign Language
PSL	Pakistan Sign Language (Isharon Ki Zubann)
TID	Turkish Sign Language (Türk İşaret Dili)
ZGS	Chinese Sign Language (Zhōngguó Shǒuyǔ)