Species literacy: the perception and cultural portrayal of animals

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Part II:

Cultural Sources

The **jackdaw** (Nederlands: **kauw**) pair-bonds for life. Pairs stay together within flocks and nest in cavities.

Chapter 4

Animals in Fashion: Portrayal of Animal Biodiversity on Children's Clothing

Abstract

While cultural products such as clothes are usually not designed with an educational goal in mind, they may still raise biodiversity awareness. This study explored the portrayal of animal biodiversity on children's clothing marketed by three major clothing retailers in the Netherlands. Findings showed that although nonhuman animals were a common theme, diversity was quite low. The portrayal was centered on mammals, in particular exotic and domestic species, and a gender binary was uncovered, restricting animals such as dinosaurs to boys' clothes and butterflies to girls' clothes. Moreover, portrayals were often highly simplified and anthropomorphic, which reduced recognizability. The results show that children's clothes currently do not offer a balanced and iconic depiction of animal biodiversity needed for broadening people's perceptions. In order to achieve a more extensive representation that can help connect people with biodiversity, a shift in ideas will be required of what animals are suitable to portray.

4.1   Introduction

While the human population grows and the world becomes increasingly urbanized, many non-human animals are rapidly dropping in numbers (Ceballos et al., 2017; Dirzo et al., 2014). To halt the decline, it is vital that the public is aware of animal diversity. However, previous studies have concluded that laypeople's perceptions of biodiversity are limited. For instance, many children are only aware of a small number of domestic and exotic species that they also show affinities towards, while they experience difficulty with identifying native animals (Ballouard et al., 2011; Celis-Diez et al., 2017; Genovart et al., 2013; Hooykaas et al., 2019, Chapter 2; Lindemann-Matthies, 2005). This limited and biased perception may prevent children from building lasting connections to biodiversity (Cox & Gaston, 2015), and could negatively affect future support for conservation (Kim et al., 2014; Wilson & Tisdell, 2005).

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Previous authors have linked the low levels of awareness about biodiversity to a decline in direct exposure. This "extinction of experience" may inhibit people from learning about animal biodiversity (Kai et al., 2014; Pilgrim et al., 2007, 2008), and could lead to an increasing, emotional separation of people from nature (Miller, 2005; Soga & Gaston, 2016). However, people learn about animals not only through direct encounters with real animals, but also through exposure to cultural representations of animals. Representations of animals are found in society in many shapes and forms, in the media, architecture, art, and in cultural products that range from toys to clothes. Together, these cultural sources reflect how society relates to animals, but more importantly in this context they also make biodiversity accessible to the general public in new ways (Kellert, 2002). For instance, people are far more likely to encounter vulnerable, reclusive, or exotic species vicariously than in real life outdoors (Courchamp et al., 2018).

Especially in highly urbanized countries, cultural representations play an increasing part in shaping people's perceptions of biodiversity (Prévot-Julliard et al., 2015; Soga, Gaston, Yamaura, et al., 2016). By offering indirect ways of experiencing animal diversity, these portrayals may compensate for a reduction in direct experiences. This links to cultivation theory, which highlights the impact of vicarious experience on people's perceptions (Gerbner, 1969; Potter, 2014). Indeed, there are indications that exposure to animal portrayals in cultural sources such as the media triggers interest and engagement (Fernández-Bellon & Kane, 2019; Fukano et al., 2020; Soga, Gaston, Yamaura, et al., 2016), fosters species

literacy (Alves et al., 2014; Ballouard et al., 2011; Dixon et al., 2005; Hooykaas et al., 2019, Chapter 2), and may help build positive attitudes towards animals (Barbas et al., 2009; Barney et al., 2005; Fukano et al., 2020; Kalof et al., 2015). In line with this, the International Union for Conservation of Nature partnered up with fashion brand Lacoste in 2018 for a campaign in which the usual crocodile emblem on Lacoste polos was replaced for ten endangered animal species, in an effort to increase awareness of and support for these species.

While some cultural products are purposefully designed to educate people about animals, the majority of them are not. However, by portraying animals the latter do influence people's connections with biodiversity, as it is known that subtle and repeated exposure can induce positive changes in attitudes and preferences (Bornstein & D'Agostino, 1992; Kaikati & Kaikati, 2004; Kalof et al., 2015; Roy & Chattopadhyay, 2010; Zajonc, 1968). Interest in cultural representations of animals has increased in recent decades, although some cultural products have received more attention than others. Most studies have explored the portrayal of animal diversity on the internet (Ballouard et al., 2011; Berland, 2019; Correia et al., 2016; Roberge, 2014; Roll et al., 2016; Schuetz et al., 2015) and in print media (Celis-Diez et al., 2016; Clucas et al., 2008; Genovart et al., 2013; Marriott, 2002; Sousa et al., 2017). One cultural product that has received little attention in studies on animal representations is clothing.

4.1.2 The role of the fashion industry

There has been no extensive study on how the fashion industry portrays and appropriates biodiversity. However, clothes do portray animals, especially those marketed towards young children, who are at a suitable age to learn about animals and whose knowledge levels and affinities towards animals have been shown to affect future perceptions and pro-conservation behaviors in adults (Hinds & Sparks, 2008; Kahn, 2002; Kellert, 1985, 2002; Pilgrim et al., 2007). Moreover, although they are usually not designed to raise awareness about biodiversity, clothes are used in daily life and therefore constitute a frequent public display (Feinberg et al., 1992). As such, children's fashion offers subtle and repeated exposure (Bornstein & D'Agostino, 1992; Roy & Chattopadhyay, 2010), which we regard as a potential route to subtly raise awareness about biodiversity.

However, several factors may compromise opportunities to raise biodiversity awareness through clothes. First, biases in the portrayal could expose people

to animals that they are already familiar with. It has been reported that in other cultural products vertebrates outnumber invertebrates, and that birds, and mammals in particular, predominate over fish, amphibians, and reptiles (Fernández-Bellon & Kane, 2019; Nemésio et al., 2013; Sousa et al., 2017). Exotic and domestic species also seem to be featured relatively often as compared to their native, and wild counterparts (Ballouard et al., 2011; Celis-Diez et al., 2016; Huxham et al., 2006). Such biases are expected in children's fashion too and may stem from deliberate choices by designers based on what animals they expect to appeal to consumers, or from limited and biased perceptions of biodiversity that they hold themselves. The tight link between the fashion, media, and entertainment industry is also likely to influence what animals are portrayed, as cartoon characters are expected to be popular choices to portray. Rather than expand, skewed representations would reinforce biases in people's perceptions of biodiversity.

Secondly, clothing designers use artistic freedom in their designs, which may result in low specificity of portrayals. Whereas realistic or iconic depictions allow for precise identification ("a blackbird"), an animal that is depicted in an artistic or abstract way is likely to be identified at a higher taxonomic level ("a bird"). Designers may even purposefully transform animals into cute and marketable commodities to appeal to consumers (Cole & Stewart, 2016). For instance, anthropomorphism is a widely used stylistic device when portraying animals in cultural products, that may make animals relatable for people (A. A. Y.-H. Chan, 2012; Geerdts, 2016; Root-Bernstein et al., 2013), yet may also reduce recognizability by misrepresenting the true character of a species (Ganea et al., 2014; Geerdts, Van De Walle, et al., 2016; Marriott, 2002). Moreover, a preference for anthropomorphic animals may create a biased inclusion of animals that are more easily anthropomorphized (Huxham et al., 2006), mammals in particular.

4.1.2 Aims of the study

We studied the portrayal of animal biodiversity in childrenswear offered by fashion retailers in the Netherlands, a highly urbanized country in Western Europe, where vicarious sources are expected to play a relatively large part in shaping people's perceptions of biodiversity (Prévot-Julliard et al., 2015), and where biodiversity awareness was found to be low, especially in children (Hooykaas et al., 2019, Chapter 2). By exploring the range of animals featured on

children's clothing we aim to shed light on the species that children encounter in their daily lives, and to determine both the current learning potential and room for improvement.

We determined which taxonomic groups and types of animals were portrayed, to what level the animals were specified, and whether the animals were anthropomorphized. As some animals seem to be culturally associated with either the male or female gender (Lash & Polyson, 1988), and clothes can be an expression of gender identity (Dodd et al., 2000; Goodman et al., 2007), we also investigated possible differences in portrayal between clothes marketed towards different genders.

We formulated the following research questions:
1) Which taxa and types of animals (exotic or native, and domestic or non-domestic) are portrayed?
2) To what taxonomic rank are the portrayed animals specified?
3) What proportion of the portrayed animals are anthropomorphized?
4) How does the portrayal of animal biodiversity differ between clothes marketed towards different genders?

4.2 Methods

We conducted a quantitative content analysis of the animals portrayed on clothes marketed online towards children aged 2-10 by three major clothing retailers in the Netherlands: Zalando, H&M, and C&A. By including these three retailers, we accounted for variation in pricing and target groups, and provided a robust sample of the clothing supply for children offered to Dutch customers.

4.2.1 Data collection

Data were collected on three consecutive days at the beginning of November 2019. Clothes were sampled digitally: for each of the three online stores, we scanned the first 500 newest clothing items offered on their respective websites for boys and girls aged 2-10 (sizes 92-140), making a total of 3,000. Web cookies were deleted between rounds of data collection to increase reliability. We excluded shoes, bags, jewelry, badges, undergarments, and nightwear from the selection. Pictures of clothing items that portrayed animal biodiversity were downloaded

for further processing. Clothing item duplicates marketed both towards boys and girls were regarded as "unisex" and included only once.

4.2.2 Coding of the animals

A codebook was designed to code the animals depicted on the clothes (Online Supplementary Materials: S_Ch4_Codebook). Per clothing item, a maximum of five animal species was coded, scanning the garment horizontally from the top left to the bottom right. Depictions of both extant and extinct animals were included; fantasy creatures (e.g., unicorns) and biodiversity elements such as feathers, footprints, and skin patterns were excluded.

First, each animal was identified at the lowest possible taxonomic level, drawing from the literature and professional experience. Subsequently, the taxonomic affiliation was noted using the English Wikipedia (species, family, order, and class, and whether the animal was an invertebrate or vertebrate). We treated dinosaurs as a taxonomic class, to separate them from other reptiles and birds. In addition, we coded the type of animal (native or exotic, and domestic or non-domestic), using lists of animal species native to the Netherlands and a list of domestic animals.

To explore the level of distortion in the portrayal and recognizability, we finally noted for each animal the lowest taxonomic rank at which it could be identified, and its depiction state (anthropomorphized or not). Animals were coded as anthropomorphic when they showed one or more of the following characteristics: wearing clothes or accessories, human behavior (including human posture), and human facial features – see Figure 4.1.

4.2.3 Intercoder reliability

Coding was performed by two researchers, including the lead author, who checked all data entries. For anthropomorphism, intercoder reliability was calculated by comparing the independent coding of a randomly chosen quarter of the animals. Intercoder reliability was high (percent agreement = 95.2%, Cohen's Kappa = .90), indicating a strong level of agreement between the two coders (McHugh, 2012). The cases where there was disagreement between the two coders were resolved through discussion.

Figure 4.1 Different forms of anthropomorphism. Wearing clothing: a dog wearing a winter hat (a); human behavior: a skiing polar bear (b); human facial expressions: happy dinosaurs (c). These examples from clothing items marketed by C&A (a and b) and Zalando (c) were not part of the final dataset, yet feature portrayals similar to those coded during the project.

4.2.4 Data analysis

A descriptive and statistical analysis of the data was performed in SPSS Statistics (version 25.0). First, we made frequency tables for the taxonomic groups, specificity of the identification, and anthropomorphism, and subsequently we used two-tailed chi-square tests of independence with a significance level of $p \leq 0.05$ to analyze relationships between the categorical variables. To determine differences in portrayal of taxonomic groups per gender, we compared the five most frequently featured classes, and the twelve most frequently featured orders, families, and species. To account for multiple testing, a strict Bonferroni adjustment was applied when making multiple comparisons.

4.3 Results

Of the 3,000 clothing items that were sampled, 18.3% portrayed one or more animals. The clothes constituted mostly sweaters, t-shirts, and trousers, and due to the season hats and mittens were regularly encountered as well. The final dataset (Online Supplementary Materials: S_Ch4_Datasheet) comprised 549 clothing items (H&M: 201, C&A: 217, and Zalando: 131) depicting 827 animals in

total (H&M: 341, C&A: 316, and Zalando: 170). Clothes marketed towards boys (331) featured animals more often than clothes marketed towards girls (215); only three clothing items were unisex.

4.3.1 Taxonomic representation

The vast majority (90.9%) of the animals portrayed on the children's clothing represented vertebrates. Mammals were the most featured class (54.3%), followed by dinosaurs (27.7%), birds (7.5%), insects (7.4%), and arachnids (1.5%). Other classes, whether vertebrate or invertebrate, were present in the dataset only a few times or were lacking altogether, such as amphibians – see Table 4.1.

From the 827 animals, most could be assigned to a taxonomic order (98.3%) and a taxonomic family (84.9%). In total, animals from 34 orders and 74 families were found. Many orders and families were featured only once or twice, yet a few were highly prevalent – see Tables 4.2 and 4.3.

Carnivores were the most common order, representing in particular canids, felids, and bears. Other mammalian orders that were portrayed often included even-toed ungulates and cetaceans, mainly due to a high number of deer, and rodents, due to the prevalence of mice.

Saurischian dinosaurs (e.g., tyrannosaurids) and Ornithischian dinosaurs (mainly ceratopsids and stegosaurids) were portrayed often too, as were butterflies, of which a considerable number concerned brush-footed butterflies. Considering birds, songbirds and "waterfowl" (anseriforms, represented by ducks and swans), were most prevalent.

Only 51.1% of the animals could be identified at the species level. In total, 71 different animal species were encountered, yet only a few, particularly domestic and exotic mammals, were portrayed frequently times – see Table 4.4.

Table 4.1 Frequency of nonhuman animals portrayed on clothes marketed towards boys, girls, and total (including unisex), per taxonomic class.

Class		Boys	Girls	Total	
	Mammals	250	194	449	54.3%
	Dinosaurs	229	0	229	27.7%
	Birds	23	39	62	7.5%
	Insects	0	61	61	7.4%
	Arachnids	12	0	12	1.5%
	Bony fish	5	1	6	0.7%
	Reptiles	4	1	5	0.6%
	Cartilaginous fish	1	0	1	0.1%
	Crustaceans	1	0	1	0.1%
	Snails and slugs	1	0	1	0.1%

Note: The total number of animals was 827 (526 for boys and 296 for girls). The unisex clothing items portrayed five mammals.

Table 4.2 The 12 most featured nonhuman animal orders portrayed on clothes marketed towards boys, girls, and total (including unisex), and their frequency of occurrence.

	Order	Boys	Girls	Total	
	Carnivores	155	65	224	27.1%
	Saurischian dinosaurs	135	0	135	16.3%
	Even-toed ungulates and cetaceans	51	43	95	11.5%
	Rodents	28	50	78	9.4%
	Ornithischian dinosaurs	73	0	73	8.8%
	Butterflies and moths	0	59	59	7.1%
	Rabbits, hares, and pikas	1	19	20	2.4%
	Songbirds	3	16	19	2.3%
	Pterosaurs	15	0	15	1.8%
	Odd-toed ungulates	6	8	14	1.7%
	Anseriforms ("waterfowl")	6	7	13	1.6%
	Spiders	12	0	12	1.5%

Note: The total number of animals was 827 (526 for boys and 296 for girls). The unisex clothing items portrayed one deer (Cetartiodactyla), two bears (Carnivora), and two foxes (Carnivora). The animal icons in black, dark gray, and light gray represent mammals, dinosaurs, and other animals, respectively.

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Table 4.3 The 12 most featured families of nonhuman animals on clothes marketed towards boys, girls, and total (including unisex), and their frequency of occurrence.

Family + example(s)	Boys	Girls	Total	
Canids	67	12	81	9.8%
Felids	36	40	76	9.2%
Deer	41	33	75	9.1%
Mice	23	46	69	8.3%
Tyrannosaurids	56	0	56	6.8%
Bears	38	9	49	5.9%
Ceratopsids	29	0	29	3.5%
Stegosaurids	28	0	28	3.4%
Rabbits and hares	1	19	20	2.4%
Brush-footed butterflies	0	18	18	2.2%
Pteranodontids	15	0	15	1.8%
Ducks, geese, and swans	6	7	13	1.6%

Note: The total number of animals was 827 (526 for boys and 296 for girls). The unisex clothing items portrayed one deer (Cervidae), two bears (Ursidae), and two foxes (Canidae). The animal icons in black, dark gray, and light gray represent mammals, dinosaurs, and other animals, respectively.

Table 4.4 The 12 most featured nonhuman animal species on clothes marketed towards boys, girls, and total, and their frequency of occurrence.

	Class	Boys	Girls	Total	
	House mouse	23	46	69	8.3%
	Dog	54	6	60	7.3%
	Brown bear	23	1	24	2.9%
	Cougar	13	10	23	2.8%
	Moose	15	8	23	2.8%
	Domestic cat	3	18	21	2.5%
	Reindeer	13	6	19	2.3%
	Tiger	16	1	17	2.1%
	T.rex	14	0	14	1.7%
	Raccoon	10	2	12	1.5%
	Red fox	7	5	12	1.5%
	Horse	4	5	9	1.1%

Note: The total number of animals was 827 (526 for boys and 296 for girls). Only 51.1% of the animals were identified as a distinct species. The unisex clothing items did not portray animals specified at the species level. The animal icons in black and dark gray represent mammals and dinosaurs, respectively.

4.3.2 Type of animals

Most animals (72.3%) that were portrayed were extant, while the remainder were dinosaurs and thus (under our definition of this group) extinct. Out of the extant animals for which the origin could be determined (341), two-thirds (67.4%) were exotic (e.g., bear, tiger) and one-third (32.6%) were native (e.g., house mouse, red fox). Furthermore, 30.6% of the extant animals were domestic species (e.g., house mouse, dog, cat, horse, duck, llama). Many represented cartoon characters, e.g., characters from PAW Patrol, Minnie and Mickey Mouse, and Hello Kitty. For a small number of animals (2.8%), it could not be determined whether they were domestic or not (e.g., it was unclear for some rabbits whether they represented a domestic rabbit or a different species).

4.3.3 Portrayals

Often animals were featured prominently as the focal point of the clothing item, although there also were subtle depictions (e.g., logos of brands such as Puma and Abercrombie & Fitch). Most animals were portrayed in unrealistic ways, as the depictions were simplified or abstracted to a varying extent. This influenced recognizability – see Figure 4.2; only 51.1% could be identified at the species level. Furthermore, 13.4% of the animals were identified at the genus level, 20.3% at the family level, and 13.4% at the order level. The remaining 1.7% could only

Figure 4.2 Portrayals ranged from (photo)realistic (a and b) to (highly) abstracted (c and d), influencing the level at which nonhuman animals could be identified; e.g., whereas (b) unmistakably portrays a tiger, (c) depicts penguins, yet which species they represent is unclear. Using contextual information, famous cartoon characters such as Mickey Mouse in (d) were identified at the species level, despite large dissimilarities with the species from which they have been derived. These examples from clothing items marketed by Zalando (a, b, and c) and H&M (d) were not part of the final dataset, yet feature portrayals similar to those coded during the project.

be assigned to a taxonomic class (e.g., "bird"). Mammals were specified at lower taxonomic ranks than animals from other taxonomic classes. Whereas 79.3% of mammals were identified as species, only 17.7% of non-mammalian classes could be assigned to the species rank ($\chi2(1, N = 827) = 311.28$, $p < .001$, Cramér's $V = 0.61$). About half of the mammals identified at the species level (48.9%) represented domestic animals.

About half of the clothing items (52.5%) depicted animals anthropomorphically. Clothes regularly featured anthropomorphized cartoon characters, and other animals with clothing or accessories, human behavior, and/or human facial features. In total, 44.8% of the animals were anthropomorphic, yet the proportion varied between different taxonomic classes ($\chi2(9, N = 821) = 186.10$, $p < .001$, Cramér's $V = 0.48$). Over half of the portrayed mammals (63.5%) and birds (58.1%) showed human characteristics, whereas only 21.9% of dinosaurs and no invertebrates (e.g., insects, arachnids) were depicted in an anthropomorphic way.

4.3.4 Difference in portrayal between genders
The portrayal of biodiversity differed between clothes marketed towards boys and girls, at the class, order, family, and species level – see Tables 4.1 - 4.4, Appendix 4.1. Clothing items marketed towards boys featured more animals (526) than those marketed towards girls (296). This difference seemed to be caused by a large number of dinosaurs, which were only featured on boys' clothes. Without dinosaurs, the number of animals in the dataset would be equal for boys and girls (297 versus 296, respectively). The other large difference between genders was that butterflies were restricted to girls' clothes.

Proportionally, both mammals and birds were more common on girls' clothing. Songbirds, rodents – in particular mice, represented mostly by the cartoon character Minnie Mouse – and rabbits and hares were depicted more often on girls' clothes. In addition, felids, notably house cats, were also found more frequently on girls' clothes. In contrast, canids, in particular dogs, and brown bears, were portrayed more frequently on boys' clothing.

Furthermore, animals portrayed on girls' clothes were anthropomorphized more often (52.2%) than those marketed as boys' clothing (40.9%) ($\chi2(1, N = 816) = 9.75$, $p = .002$, Cramér's $V = 0.11$). This may be explained by the frequent occurrence of cute-ified and feminized animals on girls' clothing (e.g., animals with feminine eyelashes, blushing cheeks, or a ribbon bow) – see Figure 4.3.

Figure 4.3 Nonhuman animals portrayed on girls' clothes were regularly 'cute-ified' and 'feminized', e.g. by adding blushing cheeks and feminine eyelashes (a). These characteristics were not found on boys' clothes (b). These examples from clothing items marketed by C&A were not part of the final dataset, yet feature portrayals similar to those coded during the project.

4.4   Discussion

Cultural products are thought not only to reflect but also impact people's perceptions, often through subtle and repeated exposure (Bornstein & D'Agostino, 1992; Gerbner, 1969; Potter, 2014; Zajonc, 1968), and in a rapidly urbanizing world cultural representations of animals will play an increasing part in shaping people's perceptions of biodiversity (Fernández-Bellon & Kane, 2019; Fukano et al., 2020; Kalof et al., 2015; Prévot-Julliard et al., 2015; Soga, Gaston, Yamaura, et al., 2016; Soga & Gaston, 2016). However, the potential to expand biodiversity awareness through such indirect exposure has been questioned. In this study, we explored children's clothing as a cultural source of information about animals. We sampled clothes from clothing retailers in the Netherlands, a highly urbanized country in Western Europe, and looked for possible biases and distortions in the portrayal of animals.

4.4.1 Biases in the portrayal

Although animals were a common theme in our sample of children's clothes, diversity was low and did not represent global biodiversity. Most animals that we encountered were vertebrates, in particular mammals, in line with previous findings in cultural products such as postal stamps (Nemésio et al., 2013), covers of nature magazines (Clucas et al., 2008), and picture books (Sousa et al., 2017). Besides mammals, dinosaurs were also featured often, and birds placed third. In particular, domestic and exotic animals were portrayed frequently, a pattern that has been found in other cultural sources as well (Burton & Collins, 2015; Celis-Diez et al., 2016; Sousa et al., 2017).

The skewed portrayal is likely to stem from deliberate choices by clothing designers based on what they expect to be popular animals in their target group. For instance, a general disregard of invertebrates by the lay public is well-known, and thought to be derived from the fact that invertebrates are phylogenetically, behaviorally, and physically very different from humans (Batt, 2009; Kellert, 1993; Plous, 1993). Furthermore, animals like spiders, mosquitos, and flies are known to provoke feelings of anxiety, antipathy, or disgust (Davey et al., 1998; Kellert, 1993; Prokop, Usak, Erdogan, et al., 2011), so designers may conclude that invertebrates will not appeal to consumers. In contrast, butterflies are generally loved by the public (Schlegel et al., 2016; Schlegel & Rupf, 2010; Shipley & Bixler, 2017), and not surprisingly they were featured quite regularly, on girls' clothes.

The strong bias towards mammals and dinosaurs also appears to be a strategy of connecting to customers' prior knowledge and interest. Mammals are generally well-known (Genovart et al., 2013; Hooykaas et al., 2019, Chapter 2; Huxham et al., 2006) and their fur and large, forward-facing eyes appeal to people (Smith et al., 2012), while large dinosaurs also are highly popular among children, who are often in awe of these extinct giants. In contrast, reptiles and amphibians often have a bad reputation (Alves et al., 2014; Nates Jimenez & Lindemann-Matthies, 2015b; Prokop et al., 2016), which may explain their scarcity in children's fashion.

Below the class level diversity was also low, even for mammals and dinosaurs. It seems that designers strategically focus on a very small selection of highly charismatic animals (Albert et al., 2018), although the limited portrayal probably also reflects a bias in their own perceptions towards generally well-known species. The prevalence of cartoon characters in the dataset further shows how the bias towards certain animals is partly driven by the entertainment industry,

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which is tightly linked to the fashion industry and benefits from extending brand characters to various products (Hosany et al., 2013). For instance, the frequent occurrence of domestic species can partly be explained by the habit of portraying popular characters such as Mickey Mouse and PAW Patrol. However, domestic species, as well as exotic species, may also be a strategic choice when targeting an international market, as these animals are loved globally (Berland, 2019).

From a conservation perspective, the strong biases in the portrayal are unfortunate, as they may trigger misconceptions about species richness and abundance (Courchamp et al., 2018). Furthermore, many species from seldomly represented groups are threatened with extinction and would have much more to gain by being portrayed than dinosaurs and domestic species, whose survival does not depend on broad-based support for conservation. Although domestic animals can help foster connections between children and animals, it is further not clear to what extent these connections extend to wild animals (DeMello, 2012).

The lack of native species on children's clothes may unintentionally suggest that interesting animals can only be found abroad. This links to Lindemann-Matthies (2005), who reported that Swiss children when asked about their favorite species mainly mentioned exotic animals and rarely expressed their appreciation for native flora and fauna. By portraying predominantly exotic species that can be regarded as charismatic due to their aesthetic appeal, people may also incorrectly assume that animals in exotic places generally have these characteristics, even though many exotic species look very similar to native species.

4.4.2 Specificity and anthropomorphism

Animals were mainly depicted in simplified and unrealistic ways, which compromised recognizability. Only half of the animals, mostly mammals, could be identified at the species level. In particular, many animals were anthropo-morphized. We assume that designers humanize animals for comic effects, e.g., by portraying a bear on a bike, but also to create an emotional bond between the viewer and the depicted animal (A. A. Y.-H. Chan, 2012; Marriott, 2002; Root-Bernstein et al., 2013). Given this, it is important to note that while mammals and birds were regularly anthropomorphized, no human characteristics were assigned to invertebrates. This may give the impression that they are less worthy

of affection and conservation (Root-Bernstein et al., 2013). In line with this thought, invertebrates might benefit from subtle anthropomorphism.

However, extreme forms of anthropomorphization may lead to misconceptions and reduced recognizability. It is unlikely that lay consumers associate cartoon characters like Mickey Mouse with the species that they have been derived from. Cartoon characters based on animals may thus become associated more with humans than with their real-life relatives, so that the emotional connection established through anthropomorphism no longer connects to the actual animal (Anderson & Henderson, 2005; Geerdts, Van de Walle, et al., 2016). Similarly, "cute-ified" depictions may trigger affection, yet not towards real animals (Cole & Stewart, 2016), compromising the potential to raise affinities towards animals.

4.4.3 Gender binary

The portrayal of animal biodiversity on children's clothing differed between genders. Not only did clothes marketed towards boys feature animals more frequently, certain animals were also associated with either boys' or girls' clothes. This links with Lash & Polyson (1988), who reported that people perceive many animals as either feminine or masculine, and to Cole & Stewart (2016), who noted that animal portrayals may act as gendering symbols. While dinosaurs were restricted to the boy section of the online shops, butterflies were only found on girls' clothes. Moreover, dogs and brown bears were found predominantly in the boys' corner, while mice, rabbits, domestic cats, and songbirds were featured more often on girls' clothes. It seems that clothing designers select animals deemed to be masculine (large, tough, and impressive) for boys' clothes, while they choose animals believed to be feminine (small, soft, and pretty) for clothes marketed towards girls. Furthermore, we noticed frequent occurrences of gendering, even in animals not typically associated with femininity. For instance, while deer appeared frequently on both boys' and girls' clothes, they were often and only feminized on the latter.

The gender binary in the portrayal may not directly limit opportunities for children to encounter biodiversity, as boys and girls may still see animals featured on clothes of the opposite gender. Moreover, clothes marketed at either boys or girls can be worn by both. However, through their products retailers do send the message to children that some parts of biodiversity belong to girls and

some to boys. The distinct separation could contribute to differential attitudes towards animals, which links to studies that have suggested that preferences for, emotional affection for, and fear of different types of animals differ per gender (Alves et al., 2014; Kellert & Berry, 1987; Lindemann-Matthies, 2005). This could ultimately impact conservation, as people might become more responsive to campaigns for animals associated with their gender.

The distinction is further questionable, because the differential portrayal reflects classical gender roles and may reinforce gender stereotypes (Cole & Stewart, 2016). Research has demonstrated that already at a young age children internalize traditional gender roles, in interaction with the physical and symbolic environments that surround them (Aubrey & Harrison, 2004; Auster & Mansbach, 2012; Blakemore, 2003; Murnen et al., 2016; Solbes-Canales et al., 2020). These constructs can limit children's opportunities when they grow up. From an equality as well as from a conservation strategic standpoint, it would be better when biodiversity is seen as something shared by everyone, regardless of gender and without implicit messages that certain animals are appropriate only for some. In line with this, we argue that when anthropomorphization is used as a strategy to make animals relatable, gendering is not the best way.

4.4.4 Limitations and future research

We note that portrayals do not automatically translate to what people learn from them and how people's attitudes will be affected. In our study, the animals were identified by experts, based on specific traits that laypeople may not be aware of. It is questionable whether laypeople would reach the same specificity and accuracy in their identification of the animals. People may even misidentify exotic species or generic depictions of animals (e.g., "a deer") as native species that they know. This implies that laypeople may grow positive affinities towards native species when they look similar to generic depictions on clothes, yet from the perspective of species literacy (Hooykaas et al., 2019, Chapter 2), the potential for people to get to know native species through prototypes is very limited. Future research could explore to what extent children are aware of the depicted animals on their clothes and how the way in which animals are portrayed (e.g., realistic, abstracted, or cute-ified) impacts affinities towards animals.

Furthermore, we gathered our data within a short timeframe, whereas today's fast fashion industry constantly produces new hypes and clothing collections

change continuously (Bhardwaj & Fairhurst, 2010). Although the main patterns and biases found in our study are expected to be fairly constant, some animals are associated with particular holidays or seasons, e.g., we found a considerable number of reindeer. Longitudinal studies could explore how the frequencies of different taxa vary through time, e.g., per season.

4.5 Conclusion

Clothes are usually not designed as educational tools, yet like other cultural products that portray animals they may still raise biodiversity awareness. However, in our study we found two patterns that currently limit this potential. First, the portrayal of animals was highly skewed, and differentiated between boys' and girls' clothing. Secondly, many portrayals were abstracted and anthropomorphized, obscuring the connection with the real animals from which they were derived.

Children's clothes currently seem to be dominated by a small subset of animals, many of which regularly appear elsewhere in society too, e.g., in other cultural products, in zoos, or around people's homes as companion animals. This will do little to help children with grasping the rich diversity of the animal kingdom. Although the choice for popular animals is understandable, there are many animals, also from groups currently portrayed rarely, that could inspire innovative designs that spark the interest of consumers. Considering portrayals, it would be inappropriate to criticize clothing designers for depicting animals in a non-realistic way, for instead of being purely referential, portrayals are designed as artistic symbols and metaphors too. In fact, subtle anthropomorphization may actually be a strategic choice for taxa that tend to provoke negative emotions in people. Still, it is questionable whether extreme alterations are needed to make animals appealing to customers.

Overall, we argue that the huge variety of animals that exists worldwide offers much more than the animals currently portrayed on children's clothes. To tap into this potential, a shift in ideas is required of what animals are suitable to portray. As clothes exist between the poles of supply and demand, clothing designers and retailers will need to be convinced that a more diverse portrayal of biodiversity will appeal to customers. Recognizing the increasing agency of the child consumer (Cook, 2004; Crewe & Collins, 2006), future research could explore children's

views on animal portrayals and thereby determine opportunities to diversify. Additionally, while it is important to avoid greenwashing (Bechlivanis, 2019; Delmas & Burbano, 2011; Niinimäki et al., 2020), partnerships between designers and conservationists could help achieve a more extensive representation of animal biodiversity in children's fashion, that would enrich children's perceptions and may ultimately contribute to biodiversity conservation.