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Children's knowledge and contact with native fauna: a comparative study between Portugal and Spain

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ABSTRACT

The present study compared Portuguese and Spanish children in the 6th year of primary school in terms of their knowledge and live experience of animals from the Iberian Peninsula (IP) and the African savannah. A questionnaire was administered to 420 children from state schools, 215 from Portugal and 205 from Spain. The questionnaire included photos of eleven mammals from each region. The pupils had to identify them, to say if they had observed them live and where, and if they are native in the IP. The results showed a greater knowledge of both groups of the savannah species, also the ones most had seen live. However, the Spanish children had a better performance in the identification of the native mammals and which animals are native on IP, probably because these children are from a less urban zone, with more direct contact with some of the species presented. The school does not seem to play, in either group, an important role in the learning about native species. Boys from both countries performed better than girls on the issues under study. A high percentage of children from both countries think that several of the savannah species occur wild on the IP.

KEYWORDS

Primary school; Mammals; African savannah

Introduction

In recent decades the decline of contact with nature by adults and children has occurred across the world (Soga and Gaston, 2016). The reasons for that include the increase of human population in urban and suburban areas (Miller and Spoolman, 2012), the indoor overdependence on technological devices (Louv 2010), the increase of hours spent at home watching movies, playing video games or surfing the internet (Pergams and Zaradic, 2006), or the over scheduling of children's lives (Hofferth, 2009). Also, unplanned direct contact with natural and semi-natural places has been replaced by indirect contact in places where nature is managed, such as zoos, botanic gardens and other thematic parks, and by symbolic contact, contact with nature through the media (Kellert, 1997, 2005). Kellert (1997) discusses the impact of these changes, since he argues that direct contact is the best way to promote physical and psychic well-being, to stimulate curiosity and imagination, to increase self-confidence and self-esteem and to develop the connection with nature.

However, the predominance of indirect and symbolic contact with nature has other less frequently debated consequences, related to the kind of knowledge that can be acquired about the natural world. Falk, Heimlich, and Bronnenkant (2008) argue that zoos, aquariums, nature

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centres, botanic gardens, science museums, parks and other similar places provide opportunities to learn about nature. Nevertheless, since zoos are perhaps the most visited indirect contact places in the world (Frost, 2011), it is to be expected that children's learning can be conditioned by their collections and educational resources.

In Europe and the United States, zoos clearly favour charismatic megavertebrates to the detriment of native species (Gippoliti and Amori, 1998; Hancocks, 2007; Skibins and Powell, 2013), with emphasis on the large mammals of the African savannah, among others. As Hancocks (1996) points out, visitors to California zoos learn about the problems that elephants and tigers are facing in their ecosystems but nothing is said about the impact of chaparral destruction and its consequences on autochthonous animal life.

The symbolic contact through the media is also an important source of information about nature. However, if Ballouard, Brischoux, and Bonnet (2011) recognize this importance and influence on children concerning biodiversity and conservation issues, they also consider that their focus is on the few iconic and exotic species, thus helping to limit children's knowledge about local biodiversity.

Based on the above stated trends, this study was developed with pupils from the two countries that are part of The Iberian Peninsula, Portugal and Spain, and has the following aims:

(i) To compare primary school children's knowledge of mammals native to the Iberian Peninsula and those native to the African Savannah (identification and association with the correct geographic area).
(ii) To know if the animals of both regions have ever been seen live and if so in which concrete places.
(iii) To check differences in the children's knowledge against their country of origin (Portugal or Spain) and gender.

The first aim, to compare children´s knowledge of the fauna of both regions, was considered important due to the following reasons: i) the influence of indirect and symbolic contacts with nature on children seems to favour exotic fauna, not only for zoos influence but also for the presence of Savannah animals in iconographic artefacts: clothing, toys, educational games, and pieces of furniture or even musical instruments for children (Almeida, 2007); ii) if the size of an animal is one of the features that can influence children´s interest (Knight et al., 2003; Herzog, 2010), animals from the African savannah are clearly at an advantage; iii) a few studies found that children and even adolescents of different countries, like The United States or The Netherlands, think that lions and elephants are part of the native fauna of their own countries (Strommen, 1995; Verboom, Kralingen, and Meier, 2004); iv) the results of different studies about the knowledge of young people concerning native or non-native species has not always been coincident, since they used different methodological processes. For instance, a study by Patrick and Tunnicliffle (2011) involving English and American school children asked the participants to name animals from different taxonomic categories. The English pupils named more exotic animals but the American more endemic ones. In a study with very young children, aged 4 and 5, in Malta, non-native animals were spontaneously more often cited, like the tiger, the lion or the crocodile, and, not surprisingly, television was the main source of their information (Tunnicliffe et al., 2008). And in a study promoted by Tomás (2005) with 1509 Portuguese children from three different years of schooling, 6th, 8th and 9th, involving schools from rural areas and small cities in the hinterland of the country, asked students to name spontaneously six animals from the local fauna, and the majority mentioned pets and farm animals, almost ignoring the wild animals. In fact, several other studies highlight the unfamiliarity with native species. A study by Prokop and Rodák (2009) with Slovakian pupils from the 6th grade concluded that several common birds in this country were unknown to more than two thirds of them. Also, a study by Lindemann-Matthies (2002) concluded that Swiss children and adolescents could only name a few species of

local fauna and flora. Even so, a study by Bermudez, Batistón, and Capocasa (2013) with 338 pupils from the 4th, 5th and 6th year of schooling from state and private schools in Córdoba, Argentina, obtained better results in the identification of native species. Thus, just by checking the different results in the studies just cited, we can conclude that more studies are needed.

The second aim of the study is based on the claim of Tunnicliffe and Reiss (1999) that outdoor experiences are an important source of children's learning. But the prevalence of direct or indirect forms of contact with nature can promote differently the knowledge of native or exotic species. For instance, in the zoos of Lisbon and Madrid, native fauna is practically absent, confirming the trend already exposed of the presence of exotic fauna in these institutions.

Finally, the third aim wants to check if the level of identification of native fauna and its live observation are similar in the pupils from Portugal and Spain, knowing that each country has its own school system and cultural identity. In fact, school can contribute to improving students' correct knowledge about animals (Prokop, Kubiatko, and Fančovičová, 2007), but learning is a dynamic process that can occur due to most diverse factors and sources. Therefore, Heimlich and Falk (2009) note the importance of taking into consideration the learners' motivation and agency, which depend on their range of experiences and processes of socialization. In this context, several studies have concluded that boys have a greater knowledge about animals than girls (e.g. LaHart, 1978; Kellert and Berry, 1987; Huxham et al., 2010). But, since more recent studies are preferentially focused on gender differences concerning attitudes towards animals, where females revealed more empathy and pro animal welfare attitudes (see, e.g. Taylor and Signal, 2005; Schlegel and Rupf, 2010; Walker et al., 2014), gender differences related to the animal world knowledge is an important dimension to continue to be explored.

To conclude, there are not many conclusive studies on children's knowledge about vertebrates (Randler, 2008). The same can be said of their knowledge about native fauna and several authors highlight the need for a basic knowledge about animals or plants as a way of learning about biodiversity (see, e.g., Gaston and Spicer, 2004; Radler, Lig, and Kern, 2005). And knowledge of local biodiversity is fundamental to develop conservationist attitudes (see, e.g. Caride and Meira, 2001; Tomažič, 2011; Collado et al., 2015). Therefore, it is feared that the loss of direct contact with nature may be jeopardizing this aim.

Method

The research is framed in a mixed paradigm, combining qualitative and quantitative approaches. It is a descriptive and cross-cutting research, as data has been collected once for each participant.

Sample

The sample is composed of 420 children (211 boys and 209 girls) mean age 11.5 (SD = 0.798), from Portugal and Spain. The Portuguese children numbered 215 (105 boys and 110 girls), mean age 11.7 years (SD = 0.918), and the Spanish children 205 (106 boys and 99 girls), mean age 11.2 years (SD = 0.552).

The children in both countries were attending the 6th year of primary education during the school year of 2016/2017. Two main reasons justify the selection of this school grade to carry out the study. Firstly, in the previous school years, and especially during the 5th grade, the curriculum in both countries is centred on life diversity and the relations between living beings (animals and plants) and their environment (LOMCE, 2013; Aprendizagens essenciais – Ciências Naturais, Direcção Geral de Educação, n.d. [the essential learning for the 5th year of schooling in Portugal]). Secondly, and according to Balmford et al. (2002), children have an enormous capacity for learning about the living world, a capacity that, according to Randler (2008), tends to decrease during adolescence, which may affect the interesting and knowledge of species.

The Portuguese children were from five state schools in the region of Lisbon, and the Spanish ones from six in the Ciudad Real region. They were randomly chosen from a long list of schools that cooperate on initial teacher training courses with the institutions to which the researchers belong. And the final selection included schools from a wide range of social and economic backgrounds. The classes of pupils finally chosen were not involved in any project dealing with animals or other subjects related to biodiversity and conservation. The contexts in both countries have some particularities. The region of Lisbon is much more urbanized than the region of Ciudad Real, a small city in the interior of Spain, which allows a more direct contact with the countryside. However, both areas have several nature parks and other protected areas surround them, more precisely eight in the Lisbon area and six in the Ciudad Real. This makes it possible to go on a study or family trip and return within the day.

Procedure

A questionnaire was designed for data collection. It included a high quality colored image of 22 animals, all mammals, eleven from the Iberian Peninsula fauna and eleven from the African Savannah. The focus was on animals since children seem to reveal an innate preference for these living creatures (Jacobs, 2009; Patrick and Tunnicliffle, 2011), due to the fact that we are also animals (Tunnicliffe, 2001). Within animals the option was for mammals. In fact, several studies have focused on children's preferences in the animal world: e.g. size, aesthetics, intelligence and phylogeny and relatedness to humans are main features in this preference (see, e.g. Knight et al., 2003; Herzog, 2010). And, not surprisingly, mammals are the favourite animals (Prokop and Fancovicova 2013), and also normally the taxonomic group with which school students can more readily identify, followed by birds (Yli-Panula and Matikainen, 2014; Patrick et al., 2013; Patrick and Tunnicliffle, 2011).

The animals selected were arranged up to 6 on each A4 page, and the order was established randomly, and were: from the Iberian Peninsula, the badger (*Meles meles*), the brown bear (*Ursus arctos*), the fox (*Vulpes vulpes*), the genet (*Genetta genetta*), the Iberian lynx (*Lynx pardinus*), the mongoose (*Herpestes ichneumon*), the otter (*Lutra lutra*), the rabbit (*Oryctolagus cuniculus*), the red deer (*Cervus elaphus*), the wild boar (*Sus scrofa*), the wolf (*Canis lupus*); and from the African Savannah, the black rhinoceros (*Diceros bicornis*), the cheetah (*Acinonyx jubatus*), the elephant (*Loxodonta africana*), the giraffe (*Giraffa reticulata*), the gnu (*Connochaetes taurinus*), the hippopotamus (*Hippopotamus amphibius*), the hyena (*Crocuta crocuta*), the leopard (*Panthera pardus*), the lion (*Panthera leo*), Thomson's gazelle (*Gazella thomsonii*), and the zebra (*Equus quagga*). The images of the animals were not in scale, but the animals were framed against their habitat, which gave a certain perception of scale.

The Iberian fauna selection was made based on the inventory of mammals coordinated by Mathias (1999) and the work of Purroy and Varela (2016) and complied with several criteria: animals with a small population, in danger, but particularly emblematic in both countries (e.g. the Iberian lynx, the wolf and the brown bear); animals of at least a medium size, not in danger of extinction, and with a broad distribution in the territory (all the others). It should be noted that all the animals included in the questionnaire can be found in nature in both countries, with the exception of the bear, extinct in Portugal by the late eighteenth century (Baeta Neves, 1967). However, due to the recovery of the population in the north of Spain an unintended reintroduction may be possible, as a few kilometers from the border several animals have been seen (Ruiz-Olmo, 2012).

The African savannah megamammals were selected based on internet sites of several national parks, like the Kruger, South Africa (Kruger National Park, n.d.) or the Serengeti, Tanzania and Kenya (Tanzania National Parks, n.d.), and also based on the animals present in the Madrid Zoo and in the Lisbon Zoo, also including a few in danger of extinction (e.g. the black rhinoceros, the elephant, the lion).

Table 1. The questions of the questionnaire and the type of question (closed or open).

Question	Type of question
1. What is the name of the animal in the picture?	Open question
2. Have you ever seen this animal live?	Closed question (Yes, No, Do not Know)
3. If you answered yes, where exactly did you see it?	Open question
4. Does this animal live in the wild on the Iberian Peninsula?	Closed question (Yes, No, Do not know)

After the identification of the pupils' school, age and gender, the questions posed for each animal and the type of question (closed or open) are in Table 1.

The questionnaire was approved by the school directors and also by the pupils´ teachers. The directors of the institutions did not require any written consent from children´s relatives, since they considered a diagnostic activity in the field of science education, and helpful for the teaching practice process of their teachers. The anonymity of the answers was guaranteed. Before administration, the pupils were informed about the main aim of the questionnaire and it was highlighted that it was not an assessment test, but simply an anonymous diagnostic activity. Even so, they were informed that they could refuse to participate or stop to answering it during the process. However the children were enthusiastic trying to identify the animals, and were advised against oral comments. Once the questionnaires were handed out, the questions were read aloud, with clarification if requested.

Validity and reliability of the questionnaire

The validity and reliability of the questionnaire were assessed for this instrument. Validity is considered as evidence that the content of a test corresponds to the content of the construct it was designed to cover (Field, 2009). Thus, a panel of four independent experts in Science Education (2 from Portugal and 2 from Spain) assessed each question of the instrument in terms of relevance and clarity, linguistic aspects, relevance, selection and quality of images. The intervention of experts resulted in modification of the item related to visual contact with animals for a better understanding in the Spanish version, and the addition of the rabbit as a common mammal on Iberian Peninsula. This increased the number of Iberian mammals from the initial ten to eleven, so one more Savannah mammal, the gnu, was added to restore the balance between the two groups. The modified version was assessed again by the panel of experts and considered as definitive. Reliability is considered as the ability of a measure to produce consistent results (Field, 2009). To verify the reliability, the instrument was applied to a pilot sample of 24 children. They were asked if they had any difficulty regarding the different questions. The answers were analyzed and no ambiguous answers, or answers responding to a different question, were found. Even so, we considered it important to clarify the meaning of Question 4. Therefore, images of natural contexts and of places where nature is managed were shown for a better understanding of the meaning 'living in wild'.

Reliability was tested by applying the Kuder-Richardson 20 test, the general version of Cronbach's alpha, as answers are not on the Likert scale (Cortina, 1993; Feldt, 1969). The result, 0.864, indicates very good reliability of the instrument. Thus, the questionnaire can be considered as a valid and reliable instrument for the purpose for which it was designed.

Data analysis

For each animal, the absolute and relative frequency of the correct answers in their identification by country and gender of the participants were calculated. For the purposes of applying statistical tests misidentify the animal or not to know its name was coded in the same way. Frequencies of responses by country and gender were also calculated in relation to the

observation of each animal live. In this question, only those pupils who had previously identified the animal correctly and those who did not know its name were counted. It was assumed that a pupil could not know the name of an animal but, even so, have seen it live. Yet, the wrong identification of an animal by a participant led to the elimination of all answers to the subsequent questions.

The locations where the participants had seen the animals were categorized and codified into three categories: 1-Urban places (streets, pet shops, people's houses, circuses and other animal shows); 2-Places where nature is managed (zoos, thematic parks, animal reserves with limited areas, farms); 3-Natural and semi-natural places, with spontaneous observation experiences (forests, fields, beaches, nature parks and reserves). In terms of calculating the absolute and relative frequency of these categories, when a participant mentioned more than one place, codified within more than one category, the one with the lowest degree of human interference was always given precedence.

Karsten (2005) considered that people normally have difficulties in being space specific, and this is also more evident with children, since, usually, they do not choose or decide the majority of the places they visit. That is why responses with a high level of generality (e.g., I saw a fox in Alentejo – a region in center-south of Portugal) were accepted. However, some answers were not considered due to impossibility (e.g. I saw a wolf in Sintra mountains – a nature park near Lisbon).

Finally, in relation to the existence of an animal living in the wild on the Iberian Peninsula, the relative and absolute frequency of the correct answers, by country and gender, were also calculated. In this calculation, only the responses of the participants who identified an animal and those who said they did not know its name were considered. In this last question it was considered that the observation of the morphological characteristics of the animal could provide clues as to whether it was a species native to the Iberian Peninsula.

Some inferential statistics tests were applied, using IBM SPSS Statistics 23. The chi-square statistical test was used to verify statistically significant differences between the results of the identification of the animal, live observation and existence in the wild on the Iberian Peninsula, according to the country and gender of the participants. When replications of Chi-Square analysis have been carried out, the Bonferroni correction of the initial level of significance ($p = 0.05$) has been considered. In those cases, an adjusted critical p-value has been calculated taking into account the multiple testing (22 tests, one for each animal; $p_{adjusted} = 0.002$), and applied table-wide (Tables 2, 4, 5 and 7).

Finally, the sum of correct answers for the animals of the Iberian Peninsula and the savannah was calculated for each participant. Two points were assigned for each correctly identified animal, with the possibility of 22 points each group scoring (11 animals x 2); one point was given to those who could not identify the animal but did not say anything wrong and zero for those who gave another name to the animal. The verification of differences between the means obtained in both groups of animals according to the country and the gender of the participants was compared, applying a Mann-Whitney U test. This test was chosen after using the Kolmogorov-Smirnov test, which showed that the data were not normally distributed and determined the use of non parametric statistic tests. The same procedure and use of a similar statistical test were used in relation to the number of live animals observed in each of the groups (animals of the Iberian peninsula and of the savannah) and to the number of correct responses in relation to their presence in nature in the Iberian Peninsula, according to the country and gender of the participants.

Results

Table 2 shows the results obtained concerning the identification of the animals of both groups, animals from the Iberian Peninsula and from the African Savannah, by country and gender of the participants.

Table 2. Absolute and relative frequency of correct answers in the identification of the animals of both groups (Iberian Peninsula and African Savannah) according to the country (P-Portugal; Sp-Spain) and gender of the participants. The Bonferroni correction for critical p-value has been considered table-wide ($p = 0.002$). The statistically significant differences resulting from the application of the Chi-square test are in bold.

Iberian Animals	P	Sp	*p.*	Boys	Girls	*p.*	Savannah Animals	P	Sp	*p.*	Boys	Girls	*p.*
badger	17 (7.9)	15 (7.3)	0.820	17 (8.1)	15 (7.2)	0.734	black rhinoceros	193 (89.8)	191 (93.2)	0.213	198 (93.8)	186 (89.0)	0.076
bear	213 (99.1)	202 (98.5)	0.679	210 (99.5)	205 (98.1)	0.214	Cheetah	144 (67.0)	101 (49.3)	**0.000**	129 (61.1)	116 (55.5)	0.242
fox	199 (92.6)	199 (97.1)	0.038	199 (94.3)	199 (95.2)	0.678	Elephant	213 (99.1)	204 (99.5)	1.000	210 (99.5)	207 (99.0)	0.622
genet	0	4 (2.0)	0.056	2 (0.9)	2 (1.0)	1.000	Giraffe	214 (99.5)	199 (97.1)	0.329	207 (98.1)	204 (97.6)	0.750
lynx	116 (54)	144 (70.2)	**0.001**	142 (67.3)	118 (56.5)	0.022	Gnu	18 (8.4)	57 (27.8)	**0.000**	48 (22.7)	27 (12.9)	0.009
mongoose	2 (0.9)	0(0)	0.499	2 (0.9)	0 (0)	0.499	hippopotamus	208 (96.7)	198 (96.6)	0.928	205 (97.2)	201 (96.2)	0.574
otter	71 (33)	86 (58.0)	0.059	98 (46.4)	59 (28.2)	**0.000**	Hyena	132 (61.4)	155 (75.6)	**0.002**	143 (67.8)	144 (68.9)	0.804
rabbit	215 (100)	203 (99.0)	0.238	209 (99.1)	209 (100)	0.499	Leopard	115 (53.5)	81 (39.5)	0.004	102 (48.3)	94 (45.0)	0.489
red deer	117 (54.4)	173 (84.4)	**0.000**	149 (70.6)	141 (67.5)	0.485	Lion	214 (99.5)	205 (100)	1.000	211 (100)	208 (99.5)	0.498
wild boar	167 (77.7)	172 (83.9)	0.106	210 (99.5)	205 (98.1)	0.214	Thomson's gazelle	66 (30.7)	73 (35.6)	0.285	84 (39.8)	55 (26.3)	0.003
wolf	185 (86.0)	174 (84.4)	0.734	178 (84.4)	181 (86.6)	0.514	Zebra	214 (99.5)	203 (99.1)	1.000	210 (99.5)	206 (98.6)	0.371

Table 3. Statistical comparison of the means of correct answers concerning the naming of the animals of both groups (Iberian Peninsula and African Savannah) obtained by the participants by country and gender, using the Mann Whitney U test.

	Portugal (mean)	Spain (mean)	Mann Whitney U	*p*
Iberian Animals	17.055	17.692	165005.5	**0.000**
Savannah Animals	19.027	19.137	21349.5	0.573
	Boys (mean)	Girls	Mann Whitney U	*p.*
Iberian Animals	17.578	17.151	18221.0	**0.002**
Savannah Animals	19.374	18.779	17780.0	**0,000**

Concerning the animals of the Iberian Peninsula, statistically significant differences were observed only in relation to the lynx and the red deer, motivated by a higher percentage of respondents from Spain who identified these animals. However, it should be noted that the genet, the mongoose and the badger are practically unknown to a large majority of children in both countries. Regarding the savannah animals, statistically significant differences were found for three animals, with a forth close to the significant level, due to opposite tendencies in the two groups of children: the Portuguese pupils identified in greater number the cheetah and the leopard, and the Spaniards the gnu and the hyena. Concerning the African Savannah animals, only the gnu was identified by a few children but even so with a higher frequency when compared with the three least identified animals from the Iberian Peninsula.

Based on the gender of the children, the statistically significant differences were for the otter (animals of the Iberian Peninsula), and near the significant level for the Thomson's gazelle (animals of the savannah). These differences were the result of a larger number of boys who were able to identify these animals.

The sum (Σ) of correct answers per participant was counted per group of animals. The Mann Withney U test was used to compare the means of the results of the participants, according to their country and gender (Table 3).

The Spanish children showed a better performance in the identification of the animals of the Peninsula, and the boys of both countries obtained a better performance, both in the identification of the Iberian and the savannah species. It should be noted that the means obtained by the children, independently of their country and gender, are always higher for savannah animals.

Regarding the live observation of the animals of the two groups and the location where this occurred, the results by country and gender are found respectively in Tables 4 and 5. Only the children who identified the animal correctly or who left the item blank (i.e. did not misidentify the animal) were considered.

It should be noted that the number of children who claimed to have seen the animals of the Iberian Peninsula live is small, the rabbit being the exception among the Portuguese children and the rabbit, the red deer, the wild boar and the fox among the Spanish group. Consequently, this group of animals was seen by more of these children. The experience of direct contact with nature, in natural and semi-natural areas, by the Portuguese children was only significant in the case of the fox and the rabbit. The Spanish group showed a higher frequency of direct contacts, especially in the case of the rabbit, the fox, the red deer and wild boar.

In the case of the savannah animals, the Portuguese children showed a higher frequency of live observations. In both groups, these animals were mostly observed through indirect contact experiences (zoos and other thematic parks with animals). Although with a much lower incidence, it should be noted that some savannah animals had been observed in circuses, as is the case with elephants.

Concerning the observation of the animals live, taking into account the gender of the participants, the results are shown in Table 5.

The number of boys who reported having seen a fox, a genet, an otter, a wild boar and a wolf was higher when compared with girls, and the differences are statistically significant in the case of the first two animals just mentioned. The direct contact experiences of the boys were also higher

Table 4. Absolute and relative frequency of the children who claimed to have seen the animals of both groups (Iberian Peninsula and African Savannah) live, according to their country (P-Portugal; Sp-Spain). The statistically significant differences resulting from the application of the Chi-square test appear in bold and n1 corresponds to the subsample of children from both countries who did not miss misidentify the animal in the previous question of the questionnaire. The Bonferroni correction for critical p-value has been considered table-wide ($p = 0.002$).

Iberian Animals	P(n1)	P (live) freq	1 freq (%)	2 freq (%)	3 freq (%)	Sp(n1)	Sp (live) Freq	1	2	3	*p*
Badger	63	**3 (4.8)**	-	*2 (66.7)*	*1 (33.3)*	86	**7 (8.1)**	-	*5 (71.4)*	*2 (28.6)*	0.044
Bear	214	**72 (33.6)**	-	*70 (97.2)*	*2 (2.8)*	203	**93 (45.8)**	*2 (2.2)*	*76 (81.7)*	*15 (16.1)*	**0.000**
Fox	209	**55 (26.3)**	*1 (1.8)*	*4 (7.3)*	*50 (90.5)*	204	**103 (50.5)**	*4 (3.9)*	*16 (15.5)*	*83 (80.6)*	**0.000**
Genet	172	**1 (0.6)**	-	*1 (100)*	-	145	**12 (8.3)**	*1 (8.3)*	*11 (91.7)*	-	**0.000**
Lynx	190	**29 (15.3)**	-	*28 (96.6)*	*1 (3.4)*	190	**55 (28.9)**	*1 (3.4)*	*28 (50.9)*	*27 (49.1)*	**0.001**
mongoose	188	**2 (1.1)**	-	*28 (96.6)*	*1 (3.4)*	168	**6 (3.6)**	-	*4 (66.7)*	*2 (33.7)*	**0.000**
otter	180	**44 (24.4)**	-	*37 (84.1)*	*7 (15.9)*	163	**56 (34.4)**	*1 (1.8)*	*29 (51.8)*	*26 (46.4)*	0.416
rabbit	215	**184 (85.6)**	*84 (45.7)*	*49 (26.6)*	*51 (27.7)*	205	**199 (97.1)**	*31 (15.6)*	*9 (4.5)*	*159 (79.9)*	0.011
red deer	145	**53 (36.6)**	-	*36 (67.9)*	*17 (32.1)*	125	**120 (64.9)**	*1 (0.8)*	*20 (16.7)*	*99 (82.5)*	**0.000**
wild boar	194	**52 (26.8)**	-	*26 (50.0)*	*26 (50.0)*	188	**118 (62.8)**	*7 (5.9)*	*24 (20.3)*	*87 (73.7)*	0.156
wolf	203	**10 (4.9)**	-	*5 (50.0)*	*5 (50.0)*	192	**70 (36.5)**	*3 (4.3)*	*35 (50.0)*	*32 (45.7)*	**0.001**
Savannah Animals	P(n1)	P (live) freq.	1	2	3	Sp(n1)	Sp (live) freq.	1	2	3	*p*
black rhinoceros	212	**138 (65.1)**	-	*135 (97.8)*	*3 (2.2)*	201	**98 (48.8)**	-	*96 (98.0)*	*2 (2.0)*	**0.001**
cheetah	151	**53 (35.1)**	-	*50 (94.3)*	*3 (5.7)*	109	**28 (25.7)**	-	*26 (92.9)*	*2 (7.1)*	0.106
elephant	214	**173 (80.8)**	*6 (3.5)*	*164 (94.8)*	*3 (1.7)*	204	**130 (63.7)**	*19 814.6)*	*108 (83.1)*	*3 (2.3)*	**0.000**
giraffe	215	**184 (85.6)**	-	*180 (97,8)*	*4 (2.2)*	202	**118 (58.4)**	-	*114 (96.6)*	*4 (3.4)*	**0.000**
gnu	121	**27 (22.3)**	-	*26 (96.3)*	*1 (3.7)*	164	**31 (18.9)**	*3 (9.7)*	*20 (64.5)*	*8 (25.8)*	0.480
hippopotamus	213	**143 (67.1)**	-	*141 (98.6)*	*2 (1.4)*	201	**88 (43.8)**	-	*87 (98.9)*	*1 (1.1)*	**0.000**
hyena	200	**21 (10.5)**	-	*19 (90.5)*	*2 (9.5)*	201	**48 (23.9)**	-	*45 (93.7)*	*3 (6.3)*	**0.000**
leopard	154	**51 (33.1)**	-	*51 (100)*	-	114	**30 (26.3)**	-	*28 (93.3)*	*2 (6.7)*	0.231
lion	214	**169 (79.0)**	*6 (3.6)*	*160 (94.1)*	*3 (1.8)*	205	**120 (58.5)**	*4 (3.3)*	*112 (93.3)*	*4 (3.3)*	**0.000**
Thomson's gazelle	188	**35 (18.6)**	-	*33 (94.3)*	*2 (5.7)*	159	**37 (23.3)**	-	*27 (73.0)*	*10 (27.0)*	0.287
zebra	215	**172 (80.0)**	-	*169 (98.3)*	*3 (1.7)*	205	**123 (60.0)**	-	*113 (91.9)*	*10 (8.1)*	**0.000**

Table 5. Absolute and relative frequency of children who reported seeing the animals of both groups (Iberian Peninsula and African Savannah) live, according to gender. The statistically significant differences resulting from applying a chi-square test appear in bold and n2 corresponds to the subsample of children from Portugal – P and Spain - Sp of both genders who did not misidentify the animal in the previous question of the questionnaire. The Bonferroni correction for critical p-value has been considered table-wide ($p = 0.002$).

Iberian Animals	P(n2)	Boys (live) freq.	1 freq (%)	2 freq (%)	3 freq (%)	Sp(n2)	Girls (live) freq.	1	2	3	*p.*
badger	73	**4 (5.5)**	-	*2 (50.0)*	*2 (50.0)*	76	**6 (7.9)**	-	*5 (83.3)*	*1 (16.7)*	0.556
bear	211	**83 (39.3)**	-	*72 (86.7)*	*11 (13.3)*	206	**82 (39.8)**	*2 (2.4)*	*74 (90.2)*	*6 (7.3)*	0.922
fox	206	**94 (45.6)**	*1 (1.1)*	*12 (12.8)*	*81 (86.2)*	207	**64 (30.9)**	*4 (6.3)*	*8 (12.5)*	*52 (81.3)*	**0.002**
genet	138	**11 (8.0)**	*1 (9.1)*	*10 (90.9)*	-	179	**2 (1.1)**	-	*2 (100)*	-	**0.002**
lynx	190	**52 (27.4)**	-	*35 (67.3)*	*17 (32.7)*	190	**32 (16.8)**	*1 (3.1)*	*20 (62.5)*	*11 (34.4)*	0.013
mongoose	167	**5 (3.0)**	-	*3 (60.0)*	*2 (40.0)*	189	**3 (1.6)**	-	*2 (66.7)*	*1 (33.3)*	0.482
otter	168	**64 (38.1)**	-	*38 (59.4)*	*26 (40.6)*	175	**36 (20.6)**	*1 (2.8)*	*28 (77.8)*	*7 (9.4)*	**0.000**
rabbit	211	**189 (89.6)**	*53 (28.0)*	*25 (13.2)*	*111 (58.7)*	209	**194 (92.8)**	*62 (32.0)*	*33 (17.0)*	*99 (51.0)*	0.240
red deer	164	**88 (53.7)**	*1 (1.1)*	*24 (27.3)*	*63 (71.6)*	166	**85 (51.2)**	-	*32 (37.6)*	*53 (62.4)*	0.655
wild boar	194	**97 (50.0)**	*1 (1.0)*	*28 (28.9)*	*68 (70.1)*	188	**73 (38.8)**	*6 (8.2)*	*22 (30.1)*	*45 (61.6)*	0.028
wolf	195	**48 (24.6)**	*2 (4.2)*	*22 (45.8)*	*24 (50.0)*	200	**32 (16.0)**	*1 (3.1)*	*18 (56.3)*	*13 (40.6)*	0.033
Savannah Animals	P(n1)	P (live) freq.	*1*	*2*	*3*	Sp(n1)	Sp (live) freq.	*1*	*2*	*3*	*p.*
black rhinoceros	209	**117 (56.0)**	-	*113 (96.6)*	*4 (3.4)*	204	**119 (58.3)**	-	*118 (99.2)*	*1 (0.8)*	0.629
cheetah	132	**46 (34.8)**	-	*44 (95.7)*	*2 (4.3)*	128	**35 (27.3)**	-	*32 (91.4)*	*3 (8.6)*	0.191
elephant	211	**149 (70.6)**	*16 (10.7)*	*130 (87.2)*	*3 (2.0)*	207	**154 (74.4)**	*9 (5.8)*	*142 (2.2)*	*3 (1.9)*	0.387
giraffe	210	**146 (69.5)**	-	*142 (97.3)*	*4 (2.7)*	207	**156 (75.4)**	-	*152 (97.4)*	*4 (2.6)*	0.182
gnu	128	**32 (25.0)**	*1 (3.1)*	*26 (81.3)*	*5 (7.7)*	157	**26 (16.6)**	*2 (7.7)*	*20 (76.9)*	*4 (15.4)*	0.078
hippopotamus	210	**113 (53.8)**	-	*111 (98.2)*	*2 (1.8)*	204	**118 (57.8)**	-	*117 (99.2)*	*3 (0.8)*	0.409
hyena	199	**28 (14.1)**	-	*25 (89.3)*	*3 (10.7)*	202	**41 (20.3)**	-	*39 (95.1)*	*2 (4.9)*	0.099
leopard	129	**36 (27.9)**	-	*34 (94.4)*	*2 (5.6)*	139	**45 (32.4)**	-	*45 (100)*	-	0.426
lion	211	**149 (70.6)**	*8 (5.4)*	*136 (91.3)*	*5 (3.4)*	208	**140 (67.3)**	*2 (1.4)*	*136 (97.1)*	*2 (1.4)*	0.464
Thomson's gazelle	169	**40 (23.7)**	-	*35 (87.5)*	*5 (12.5)*	178	**32 (18.0)**	-	*25 (78.1)*	*7 (21.9)*	0.191
zebra	211	**144 (68.2)**	-	*138 (95.8)*	*6 (4.2)*	209	**151 (72.2)**	-	*144 (95.4)*	*7 (4.6)*	0.370

for several of the animals considered. In the case of the savannah animals, there are no statistically significant differences by gender to report.

The sum (Σ) of responses per participant who claimed to have seen the animals live was counted by group (Iberian Peninsula and African Savannah animals). The Mann Whitney U test was used to compare the means of the results of participants according to their country and gender (Table 6).

The statistically significant differences arise by country for both groups of animals, but with opposite tendencies. The Spanish children observed the Iberian animals live more frequently, while the Portuguese observed more the species from the savannah.

Finally, with regard to the identification of the species as belonging to native Iberian fauna, the results by country and by gender are shown in Table 7.

In the identification of the species that live in the wild on the Iberian Peninsula, the Spanish children also performed better than the Portuguese, and statistically significant differences were verified for three animals. In the case of savannah animals, the most relevant data is the high percentage of children from both countries who considered that several of these animals are also to be found in the wild on the Iberian Peninsula. Regarding gender differences, it should be noted

Table 6. Statistical comparison of the means obtained by group of participants in relation to having seen animals of both groups (Iberian Peninsula and African Savannah) live by country and gender, using the Mann Whitney U test.

	Portugal (mean)	Spain (mean)	Mann Whitney U	*p.*
Iberian Animals	11.511	13.502	12151.0	**0.000**
Savannah Animals	15.176	13.736	16358.0	**0.000**
	Boys (mean)	Girls (mean)	Mann Whitney U	*p.*
Iberian Animals	12.559	12.406	21220.5	0.502
Savannah Animals	14.308	14.641	20694.0	0.274

Table 7. Frequency of the children who correctly identified the Iberian Peninsula native species, by country (P-Portugal; Sp-Spain) and gender. The frequencies associated with the savannah animals are from children who correctly considered them as non-native. The statistically significant differences resulting from use of a Chi-square test appear in bold and n3 corresponds to the subsample of children from both countries and genders who did not misidentify the animal in the first question of the questionnaire. The Bonferroni correction for critical p-value has been considered table-wide ($p = 0.002$).

Iberian Animals	n3	P	n3	Sp	p.	n3	Boys	n3	Girls	p.
badger	64	14 (21.9)	86	18 (20.9)	0.889	73	21 (28.8)	77	11 (14.3)	0.030
bear	214	91 (42.5)	203	111 (54.7)	0.013	211	109 (51.7)	206	93 (45.1)	0.183
fox	209	115 (72.2)	204	165 (80.9)	0.039	206	168 (81.6)	207	148 (71.5)	0.016
genet	171	9 (5.3)	146	30 (20.5)	**0.000**	138	19 (13.8)	179	20 (11.2)	0.486
lynx	190	98 (51.6)	190	122 (64.2)	0.013	190	117 (61.6)	190	103 (54.2)	0.146
mongoose	187	18 (9.6)	171	22 (22.9)	0.331	170	25 (14.7)	188	15 (8.0)	0.044
otter	180	62 (34.4)	163	64 (39.3)	0.355	168	72 (42.9)	175	54 (30.9)	0.021
rabbit	215	196 (91.2)	205	191 (93.2)	0.445	211	199 (94.3)	209	188 (90.0)	0.097
red deer	145	75 (51.7)	186	161 (86.6)	**0.000**	164	119 (72.6)	167	117 (70.1)	0.615
wild boar	193	102 (52.8)	186	144 (77.4)	**0.000**	192	136 (70.8)	187	110 (58.8)	0.014
wolf	203	129 (63.5)	193	132 (68.4)	0.309	196	136 (69.4)	200	125 (62.5)	0.148
Savannah Animals	n3	P	n3	Sp	p.	n3	Boys	n3	Girls	p.
black rhinoceros	212	107 (50.5)	201	111 (55.2)	0.334	209	127 (60.8)	204	91 (44.6)	**0.001**
cheetah	151	92 (66.9)	109	61 (56.0)	0.422	132	86 (65.2)	128	67 (52.3)	0.036
elephant	214	126 (58.9)	204	121 (59.3)	0.928	211	142 (67.3)	207	105 (50.7)	**0.001**
giraffe	215	122 (56.7)	201	136 (67.7)	0.022	209	151 (72.2)	207	107 (51.7)	**0.000**
gnu	121	39 (32.2)	164	48 (29.3)	0.591	128	54 (42.2)	157	33 (21.0)	**0.000**
hippopotamus	213	98 (46.0)	201	107 (53.2)	0.142	210	113 (53.8)	204	92 (45.1)	0.076
hyena	200	90 (45.0)	201	96 (47.8)	0.579	203	110 (54.2)	198	76 (38.4)	0.002
leopard	154	78 (50.6)	114	66 (57.9)	0.240	129	77 (59.7)	139	67 (48.2)	0.059
lion	214	130 (60.7)	205	121 (59.0)	0.719	211	141 (66.8)	208	110 (52.9)	0.004
Thomson's gazelle	188	66 (35.1)	159	51 (32.1)	0.552	169	74 (43.8)	178	43 (24.2)	**0.000**
zebra	215	99 (46.0)	205	111 (54.1)	0.097	211	127 (60.2)	209	83 (39.7)	**0.000**

that the boys performed better than the girls, but the differences were only statistically significant in relation to several animals of the savannah.

The sum of responses per participant who identified correctly the native animals of the Iberian Peninsula and those which are non-native was counted and the means of the results, according to their country and gender, were compared by using a Mann Whitney U test (Table 8).

The Spanish children were marginally better at identifying the native animals of the Iberian Peninsula, and the differences are statistically significant. Even so, the means in both groups are lower when compared to those related to naming the animals. By gender, boys performed better in the identification of non-native animals, and differences are statistically significant.

Discussion

The main results of the present study indicate a greater difficulty, on the part of children from both countries, in the identification of the animals of the Iberian Peninsula when compared to the animals of the African Savannah. Three animals obtained a very low identification frequency: the genet, the mongoose and the badger, which curiously have a large territorial distribution and are not in danger of extinction. Nevertheless, the Spanish children had a better performance in the identification of the animals of the Iberian Peninsula and also in their correct association to this geographic region. The live observation of the animals of the Peninsula was very low, but also here the Spanish children revealed a greater direct contact with these animals. On the other hand, the Portuguese children observed more the animals from the Savannah in contexts in which nature is managed (mainly zoos). The misidentification of several savannah animals as being native to the Iberian Peninsula was another relevant result. Overall the boys from both countries performed better in identifying the animals of both groups in their geographical attribution and revealed greater live contact with the animals of the Peninsula.

Thus, in addition to the result obtained by Patrick and Tunnicliffe (2011), namely that school is an insignificant source of learning about the animal world, the present study also found, even more specifically, that schooling has not contributed in either country to an increase in knowledge about the Iberian fauna, as it has rarely been cited as a context in which children have seen animals in the wild.

The better performance of the Spanish children in the identification and contact with native fauna, even considering that it was the case with only a few of these animals, could be related to the children's geographic residence, a small city, and more experiences of direct contact with nature. In this contact, the role of school seems to be irrelevant, according to the type of places pupils mentioned (e.g. 'on my grandmother's farm near Malagón' or 'in the country where I usually go on holiday'). This result is in line with a study by Zhan, Goodale, and Chen (2014) with Chinese children which concludes that direct contact with nature in children is in inverse proportion to urbanization: it is greater in rural areas and small cities and less evident in large cities and the metropolis.

In contrast, the knowledge of the Portuguese children does not seem to be greatly influenced by various natural areas that are within easy reach of Lisbon. And therefore, they reveal a greater capacity to identify the animals of the African Savannah due to a greater number of experiences of indirect contact, shown, for instance, in the number of references to the Lisbon zoo. There were also very few children from either country who reported having been in direct contact with the savannah animals through visits to the large African national parks.

Table 8. Statistical comparison of the means obtained by participants concerning the identification of native and non-native fauna by country and gender, using the Man Whitney U test.

	Portugal (mean)	Spain (mean)	Mann Whitney U	*p.*
Iberian Animals	10.227	11.624	14325.0	**0.000**
Savannah Animals	14.614	14.600	21958.5	0.949
	Boys (mean)	Girls (mean)	Mann Whitney U	*p.*
Iberian Animals	10.943	10.875	21768.0	0.820
Savannah Animals	15.279	13.928	17873.5	**0.001**

A large number of children from both countries were not able to identify the species which live in the wild on the Iberian Peninsula. And the performance is worse when compared to their ability to name the animals. This means that several children know the animals but are unable to relate them correctly to the native fauna of the Iberian Peninsula. This inability resulted from difficulties in identifying the Iberian species, from the lack of knowledge of the morphological characteristics that could predict their association with this natural context, and also from the lack of direct contact with nature. And since a high percentage of children from both countries tend to include on the Iberian Peninsula several savannah animals, this shows difficulties in the relation of an animal to a certain biogeographic region of the planet and may also be related to a lack of understanding of what it means to live in the wild, despite the explanations given before completion of the questionnaire. It is possible that some children consider that theme parks that include exotic animals in semi-captivity may correspond to the occurrence of the species in the wild. Equally, it seems possible to state that school may not be working effectively in this respect, discussing animals without placing them in concrete habitats, perhaps because teachers do not realize that distribution of different life forms in the ecosystems is something that needs to be explored in greater depth.

An analysis of the document for 'the essential learning for the 5th year of schooling in Portugal (Direção Geral de Educação, n.d.)' supports this idea. It is expected, for example, that students (i) relate the characteristics of the different animals to the environment; (ii) relate their diets to different habitats, but through generic decontextualized approaches, focusing only on the distinction of different terrestrial or aquatic ecosystems (forests, lakes, estuaries, etc.) The Royal Decree of minimum contents in education in Spain (BOE 2014), indicates that a student, when finishing primary education, should identify the main characteristics of animals, and the characteristics and components of different types of ecosystems (meadows, ponds, forests, coast and cities) and types of live creatures, but there is no specific reference to local or exotic contexts, in precise geographical areas.

One result with implications for teaching procedures is the poor performance of the girls, especially in naming the animals of both groups and in the identification of the native animals of the Iberian Peninsula. Thus considering that more recent studies already cited are focused on different gender attitudes towards animals, and that a relatively recent study by Páramo and Galvis (2010) did not find gender differences concerning children´s knowledge of wildlife, more research is needed.

Educational implications

The children's greater knowledge of exotic species to the detriment of native animals is something that should be considered by formal and non-formal education. In fact, the contact with nature helps to develop awareness about local environmental issues, to improve the understanding of ecosystems and to generate empathy towards the environment (Evans et al., 2007). Therefore, knowledge of the fauna of nearby ecosystems is a main education issue for the conservation of ecosystems from a middle- and long-term perspective (García Fernández and Sánchez Emeterio, 2017).

Thus, a more diversified approach to animal species seems to be needed from the earliest years of schooling. Since the curriculum does not also include this need, it may also explain why teachers are less concerned with native species. The schools' options, in terms of outdoor activities in places where nature is managed, such as zoos and other thematic parks, will continue to enhance the knowledge of exotic fauna. Increasing the experiences of direct contact with nature can also be a way to counteract this tendency, taking also into consideration the quality of this contact. In fact, Oliveira et al. (2018) concluded that students from rural areas, with more contact with nature, also have a greater aversion to certain species like foxes, due to conflicts with human economic activities. The planning of activities by schools seems to be particularly important for girls who, in this study and others cited above, tend to know less about wildlife. If it is true that nature fieldtrips are rarely compensated by the direct observation of mammals, since some are

crepuscular or nocturnal or because they tend to shun the places most frequented by humans, the organization of activities centred on the identification of tracks and traces (footprints, faeces, behaviour marks, etc.) can be an alternative, helping to give greater prominence to the Iberian mammals. Moreover, on these visits other taxonomic groups should not be forgotten.

These activities may also lead to a more effective understanding of what a natural context means and which animals may be sighted in a certain region, as opposed to the places where nature is managed and where animals can be seen without effort. Even more, animals are often arranged too close to each other, even when their biogeographic origin is included on the information boards. Therefore, outdoor activities would also seem essential for a better structuring of children's thinking, since many of them still think that zebras and giraffes can be found throughout the territory of the peninsula.

The result of the present study should also be taken into account in the options of entities that keep animals in captivity. Knowing that the permanence of captive animals is a controversial subject (Almeida, García Fernández, and Strecht-Ribeiro, 2017), it would be important that places like zoos offer a greater regional specialization, if, in fact, they want to have a role in the conservation status of these species and to develop pro-conservation attitudes in their visitors. As Skibins and Powell (2013) argue, flagship species don´t have to be the traditional charismatic megafauna. In fact, to be part of the national or regional heritage could be part of a strong conservationist message to be explored by the zoos.

Lastly, this study can also be important for those who are responsible for the production of media contents (TV programmes, web page authors, text book authors, etc.) to give greater exposure to the native fauna. And if, for example, there are already programmes on the native fauna of the Iberian peninsula, some of them available on Youtube, it is important to continue to diversify this type of content, which could also encourage teachers to pay more attention to native fauna in the activities they set, particularly if pre-service and in-service teachers' courses are especially attentive to the present issue.

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