

HOW IS THE REINTRODUCTION OF EXTINCT ANIMALS REGARDED THROUGH AGE? A COMPARATIVE STUDY WITH STUDENTS FROM TWO DISTINCT SCHOOL LEVELS.

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Abstract: The Portuguese curriculum includes the issue of endangered species but it omits the reintroductions of endangered or already extinct species. Therefore, this study aimed to verify and compare the position of 435 students, attending the 4th (n1=210, age average 8,8) and the 9th year (n2=225, age average 14,3) of schooling, about the hypothetical reintroduction of three emblematic mammals from the Iberian fauna in Portugal: the wild goat, the bear and the lynx, which has a very different situation in this country. To this end, a questionnaire was applied, also demanding the reasons of their choice. The students of both groups supported the reintroductions with percentages that were very similar, but the reasons for their support had a different frequency. In a very general way, the older students gave more personal and ecological arguments and the younger produced more arguments centred on the animals and on the human being. However, the incidence of ecological arguments was lower than expected, due to the fact that students from the 9th have approached throughout schooling, more precisely at the 3rd, 5th and 8th years, several ecological issues. Some misconceptions about the utility of the animals for humans, especially in the case of the wild goat, and their dangerousness, in the case of the bear and lynx, were also detected. Because this issue has proved to be very controversial in countries that have already started a reintroduction policy of some species of their fauna, we support its discussion during schooling, in Science Education and Environmental Education, for a better understanding of the reasons for and against the reintroductions that may allow reducing the importance of empathy for an animal as the most important one.

Keywords: Animals' reintroductions; Students' perceptions about animals; Science Education

INTRODUCTION

Humanity has been responsible for the extinction of several species in the last 50,000 years. Due to this negative action, the planet lost half of the 200 genera of large mammals (Martin, 2005). Mammals with weight higher than 45 kilos (99 pounds), or even smaller, were the first to be extinct, because they are in any way more sensitive to human action. With the industrial revolution the situation has worsened as a result of population growth, increase in agricultural, industrial and urban areas, and ecological fragmentation. At the same time that some species became extinct, others declined their

populations hugely. To oppose to this reality, ecosystems restoration and species reintroductions were improved in several world regions in the last decades, and some countries decided to improve programs to reintroduce some of species once abundant. In some cases, the issue became extremely controversial, with different society groups arguing in opposite ways, as was the case of the lynx reintroduction in Switzerland (Breitenmoser, 1998), the wolf in Scotland (Nilsen et al., 2007) or the wolf in Norway (Bjerke, Reitan & Kellert, 1998), only to give a few examples. Generally, rural populations are more sceptical about the reintroductions, because they see them as an economic threat; instead, urban people regard them as a compensatory measure for the species eradicated by human action. Other factors like age and ecological literacy are also important, because the younger and those with more qualifications tend to support the reintroductions.

RATIONALE

The Portuguese curriculum emphasizes the problem of species extinctions in the 3rd, 5th and 8th year of Basic School but nothing is referred about the reintroductions. Textbooks, which do not always meet entirely the guidelines of the programs, also ignore this subject. However, it has been discussed in the scientific community, and the media, especially some newspapers, sometimes refer to it.

The present communication is focused on three of the most emblematic mammals of the Iberian Peninsula: the wild goat (*Capra pyrenaica*), the brown bear (*Ursus arctus*) and the Iberian lynx (*Lynx pardinus*), and on how their future presence in Portugal depends on their reintroduction from similar individuals from Spain, where they still survive.

The mountain-goat is a relic of the last glacial period and only the highest peaks of the Peninsula Mountains allowed the necessary conditions for its survival. The subspecies *Capra pyrenaica lusitanica* existed in the Gerês Mountains (north of Portugal) till the XIX century. Its reintroduction from another subspecies in Galicia, from a program begun in 1992, was particularly successful. According to Caetano & Ferreira (2003) the success of this reintroduction was not a surprise because the ancient predators from the wild goat, the wolf and the Iberian Lynx, are practical absent from their habitat, and the mortality of the pups due to foxes, eagles or feral dogs, will be less severe. In fact, according to Gama (2008), the number of wild goats near the Portuguese border amounted to nearly 400 individuals, after fifteen years of its reintroduction. But, because the reintroduction started only with 18 animals, the danger of inbreeding is real, and new intentional reintroductions are supported to ensure the continuity of the species.

The brown bear became extinct in mid-XVII century but it is possible that even in the XX century the incursion of some animals in the Portuguese territory had happened (Alvares & Domingues, 2010). The bear suffered a marked reduction in its distribution area in the Iberian Peninsula due to direct and indirect human action, especially due to the excessive hunting and changes in the vegetation cover in the places where it existed. Considering hunting, it is also important to mention that, during centuries, to hunt bears was part of the warrior preparation of the noble class, which has caused a great decrease in the number of these animals. Today, its permanence in the border region of Sanabria (Spain) allows us to consider the possibility of its reintroduction, even without any intentional measure.

Finally, the lynx, perhaps the most discussed of the three animals due to a few programs

for its conservation well known at the schools, lives a critical situation, despite all the efforts mentioned. The change of its habitat, from scrubland to forests, the hunting and its trophic dependence on the wild rabbit are the main reasons evoked to explain its critical situation (Castro & Palma, 1996). In Portugal, a residual population, distributed by three nuclei separated territorially, genetically isolated, makes its survival very difficult (Santos-Reis & Mathias, 1996) and Albéniz (2006), more recently, considered the presence of the lynx exclusively in Spain. Only its captive breeding, as it is happening in both countries, and its subsequent reintroduction, will enable its future survival. The National Center for Reproduction of the Iberian Lynx (NCRIL), inaugurated in 2009 in Silves, Algarve, brought some hope to the possibility of survival of this species. It aims to breed animals in captivity in order to reintroduce the species in the wild.

METHODS

This study aimed to verify and compare the opinion of two groups of students about the reintroduction of the three above cited mammals. The sample (n=435) included 210 children in the 4th school year (107 boys and 103 girls, age average 8,88) and 225 from the 9th (106 boys and 119 girls, average 14,3). For that purpose, a questionnaire written in Portuguese was applied to know if they agree with their hypothetical reintroduction. For each animal, a statement about the situation of each animal in Portugal was given. Then, students had to select if they agree or not with its reintroduction from several animals brought from Spain, where all these three species still exist in the wild. Finally, a justification was demanded. The validity of the questionnaire was determined by the review of two professors in the field of Methodology of Science. They considered it adequate for both school levels and they didn't propose any changes to it.

A chi-squared test was applied to test the homogeneity between groups (level of significance of $p \leq 0.05$). The same test was also used to verify gender differences, but the results were not statistically significant. Therefore, the results just compare the two school year groups. The reasons for and against the reintroductions were diverse and were categorized as follows: centred on personal aspects, on the human being, on the animal considered and on relational and holistic aspects. These categories were used in other studies involving an ethical dimension about human-nature relationship implemented by the team research to which the authors of the present study belong (see, for instance, Almeida, Strecht-Ribeiro & Vasconcelos, 2012, and Almeida, Vasconcelos, Strecht-Ribeiro & Torres, 2013) and prove to be consistent with the different types of answers from respondents from different ages.

Each member of the research team analyzed separately the codification of the reasons given by the respondents. The answers codified differently were discussed and a few were considered inconclusive.

RESULTS

The results obtained (Table 1) show that the majority of the students from the two groups agreed with the reintroductions, with very close and particularly high percentages in the case of the lynx (respectively, 79% and 81.3%). In fact, in the case of the wild goat, it was even among the younger (85.2% against 66.7%, from the older students) that the position was more favourable with statistically significant differences

(p. = 0.000). The bear was the animal that received less support for its reintroduction, but the percentages were still high (respectively, 64.3% and 64.9%).

Table 1

Level of Significance After the Application of χ^2 to the Students of the 4th and 9th Schooling Year about the Hypothetical Reintroductions of the Wild goat, Bear and Iberian lynx.

	Agree		Don't agree		χ^2
	4 th year	9 th year	4 th year	9 th year	
Wild goat	179 (85.2%)	150 (66.7%)	31 (14.8%)	75 (33.3%)	p. = 0.000*
Bear	135 (64.3%)	146 (64.9%)	75 (35.7%)	79 (35.1%)	p. =0.895
Iberian lynx	166 (79%)	183 (81.3%)	44 (21%)	42 (18.7%)	p. = 0.550

The reasons given by the students for the reintroductions are included in Table 2 (next page). Some differences in the frequency of each category can be observed related to each animal in the two groups.

The older students gave more reasons centred on personal aspects, as in the case of the bear and the lynx, and on the ecosystem, as is the case of the wild goat and the bear. The personal aspects more given were related with aesthetic reasons, the beauty of the animal, and a mere personal preference; the ecosystemic reasons tend to value the increasing of the biodiversity in Portugal or to emphasise the role of the animals in nature.

The younger preferred to justify their opinions more based on arguments centred on the animal and, in the case of the wild goat, centred on the human being. In the first case it was recurrent the idea that it is important that the animals return because that was their place or the justification based on the statement that “all beings have the right to live”. The arguments given to support the reintroduction of the wild goat revealed a misconception about its utility (it gives wool, milk and cheese), that was present even in the older students.

The reasons given by the students against the reintroductions are included in Table 3 (next page).

The older students gave more reasons centred on personal aspects than the younger and argued with ecosystemic reasons, although with a low frequency. A reason centred on personal aspects in this group had a high frequency and was related with the Spanish origin of the animals, what is a bizarre argument and maybe be explained by an old rivalry between the two countries, with a very low relevance in this case. The ecosystemic reasons highlight the fact that the ecosystem has now got used to the absence of the bear or the wild goat or, in the case of the bear, is now too small for it.

Similar arguments centred on the human being were given by students from the two groups, especially considering the dangerousness of the bear, and of the lynx only in the case of the younger. And here, another misconception about the dangerousness of the lynx was detected. Curiously, some students from both groups justify their negative opinion with reasons centred on the animals, considering the difficulties of their adaption or mentioning that the reintroduction proposed was not exactly with similar animals.

Table 2

The Reasons Given by the Students of the Two Groups and Their Categorization to Support the Reintroductions of the Three Animals.

Reasons to support the reintroductions	Wild goat		Bear		Iberian lynx	
	4 th	9 th	4 th	9 th	4 th	9 th
Centred on personal aspects	24	13	27	66	34	100
-I like it	5	7	7	16	10	9
-It's a beautiful animal	17	3	19	50	24	88
-Although unfamiliar	-	3	-	-	-	3
-It comes from Spain	2	-	1	-	-	-
Centred on the human being	54	45	20	20	23	31
-It's an animal that people like	1	-	-	-	-	-
-It's not dangerous / It will be far from people	3	6	4	-	7	-
-We need it / It's useful	-	2	6	-	6	7
-It gives wool, milk and cheese	37	28	-	-	-	-
-It will be a touristic attraction	-	4	-	8	-	12
-People will like to see it	6	1	6	5	7	-
-It's a symbol of the Iberian peninsula	-	-	-	-	-	12
-The country would be richer	7	4	4	7	3	-
Centred on the animal	52	36	50	23	75	32
-To increase the number or to succeed on its preservation	-	11	1	14	4	19
-Its extinction was by our fault	-	2	-	2	-	-
-To return to their previous places	23	15	26	3	47	-
-All beings have the right to live	15	5	14	4	16	7
-It needs a place to live /It's its habitat	7	-	2	-	3	-
-It is a living being	-	-	4	-	5	-
-It can adapt well	2	2	1	-	-	3
-It is a similar animal	2	-	-	-	-	-
-Even knowing that it is not the same animal	-	1	-	1	-	1
-It is a wild animal	-	-	-	1	-	1
-It is fast	-	-	-	-	-	1
-It is sweet and friendly	2	-	2	-	-	-
-It eats plants	1	-	-	-	-	-
Centred on relations with other animals or on the ecosystem	30	48	10	24	14	13
-All animals are important	6	13	-	-	-	-
-To increase biodiversity or the number of species	13	27	4	5	2	3
-To scare the hunters that kill other animals	-	-	-	1	-	-
-The mountains need it or to become more complete	7	-	-	-	2	-
-It's important to nature	4	-	6	-	10	-
-It has a role in the ecosystem	-	8	-	18	-	10
Inconclusive	-	3	12	3	4	-
-It's a lack / It's important	-	3	12	3	4	-
No justification / incomprehensible answer	19	5	16	8	16	7
TOTAL	179	150	135	146	166	183

Table 3

Reasons Against the Reintroductions of the Three Animals Given by the Students of the Two Groups.

Reasons against the reintroductions	Wild goat		Bear		Iberian lynx	
	4 th	9 th	4 th	9 th	4 th	9 th
Centred on personal aspects	6	27	9	16	3	13
-I don't like the animal	1	7	6	1	-	-
-I don't know the animal	-	6	-	-	-	3
-It comes from Spain / They are not our animals	5	14	3	15	3	10
Centred on the human being	-	-	34	26	19	1
-It is dangerous, aggressive and may attack people	-	-	28	23	18	1
-It eats honey like us / it eats our food	-	-	5	1	-	-
-We have got used without it	-	-	1	2	1	-
Centred on the animal	18	23	19	17	9	11
-There are a lot of other goats in Portugal	2	5	-	-	-	-
-It can't adapt now / it is already extinct	9	5	9	8	7	6
-It is not similar to those that existed	7	11	8	5	1	-
-It is a wild animal	-	2	-	-	-	1
-It will be a victim of the hunters	-	-	2	4	1	-
-They should inbreed our animals and not mix	-	-	-	-	-	4
Centred on relations with other animals or in the ecosystem	-	6	-	10	1	2
-It frightens the other animals	-	-	-	1	1	-
-The ecosystem got used to its absence	-	6	-	-	-	-
-The ecosystem is now small for it	-	-	-	7	-	-
-It would cause ecological damage	-	-	-	2	-	1
-Man should not interfere in nature	-	-	-	-	-	1
Inconclusive	-	13	-	4	1	6
-It is not a lack / It is not important	-	13	-	4	1	6
No justification / incomprehensible answer	7	6	13	6	11	9
TOTAL	31	75	75	79	44	42

CONCLUSIONS AND IMPLICATIONS

This study allowed us to verify that students in general support the reintroductions, which is an important result, considering that the subject is not present in the curriculum. However, the percentage of supporters did not increase with age, and only the nature of the reasons given changed a little, with older students revealing a little more ecological literacy. In fact, this result is in part in line with Kellert's (1996) ideas that discourages the study of ecological knowledge before adolescence and encourages during childhood the developing of an emotional attachment to the animals that leads to the recognition of their needs. He defends that the ecological thought is holistic in its nature, and that is why it is difficult for the younger to understand it. But, a study published before, from Eagles and Muffitt (1990), involving Canadian students, concluded that students 12 or 13 years old can understand the ecological roles of animals and use ecological arguments about human-nature relationship. However, in this study, close to 90 percent of the children reported that they had spent time in class discussing wildlife, which can indicate the importance of ecological literacy, improved

in science and environmental education, in the earlier manifestation of this kind of knowledge.

In the present study, the frequency of ecological reasons was not high, even in the older students, and personal reasons, based on empathy for the animals, were much more frequent. And this result can be relevant for teachers because it indicates that, at least, in the case of the students inquired, there was a small influence of the ideas approached in the science curriculum of the 8th year of schooling. The reasons for this situation should be object of research and we do not intend to proceed with mere speculative reasons. Even so, it seems to us that the role of top predators must be something that should be discussed more often, precisely in Portugal where the boar is becoming a pest, and several cases of crop damage due to these animals are reported with some regularity.

These results can also be worrisome because some reintroductions may involve less appealing animals, which we think was not the case with the wild goat, the bear and the Iberian Lynx, all mammals that are usually more popular between humans because they are phylogenetically related to us (Herzog 2010). Some misconceptions about the dangerousness of the animals or their utility were also revealed. All the results suggest that school should give more attention to this subject, discussing the ecological benefits and negative impacts of reintroductions, because the growing importance of this issue in society requires a better informed population.

REFERENCES

- Albéniz, J. (2006). *El lince ibérico. Una batalla por la supervivencia* [The Iberian lynx. A battle for survival]. Barcelona: Lynx.
- Almeida, A., Strecht-Ribeiro, O. & Vasconcelos, C. (2012). Biocentric reasoning in children: Implications in Science and Environmental Education. C. Bruguère et al. (Ed.) *EBook proceedings of the ESERA 2011 conference: science learning and citizenship. Part 8: Environmental, Health and Informal Outdoor Science Education* (pp. 121-126). Lyon: ESERA.
- Almeida, A., Vasconcelos, C., Strecht-Ribeiro, O. & Torres, J. (2013). Non-anthropocentric reasoning in children: its incidence when they are confronted with ecological dilemmas. *International Journal of Science Education*, 35 (2), 312-334.
- Alvares, F. & Domingues, J. (2010). Presença histórica do urso em Portugal e testemunhos da sua relação com as comunidades rurais. [Historical presence of the bear in Portugal and testimonies of its relationship with rural communities]. *Açafa*, 3, 1-22.
- Beitenmoser, U. (1998). Large Predators in the Alps: The Fall and Rise of Man's Competitors. *Biological Conservation*, 83 (3), 279-289.
- Bjerke, T., Reitan, O. & Kellert, S. (1998). Attitudes toward wolves in southeastern Norway'. *Society & Natural Resources*, 11 (2), 169-178.
- Caetano, P. & Ferreira, J. P. (2003). *Ibéria Selvagem* [Wild Iberian]. Lisboa: Má Criação.
- Castro, L. R. & Palma, L. (1996). The Current status, distribution and conservation of Iberian Lynx in Portugal. *J. Wildl. Res.*, 2 (1), 179-181.

- Eagles, P. and Muffitt, S. (1990). An Analysis of Children's Attitudes toward Animals. *Journal of Environmental Education*, 21(3), 41-44.
- Gama, M. D. (2008). *A cabra-montês do Gerês. Da extinção à reintrodução – um novo desafio* [The wild goat from Gerês. From its extinction to its reintroduction]. Porto: FAPAS.
- Herzog, H. (2010). *Some we love, some we hate, some we eat*. New York: Harper Collins.
- Kellert, S. R. (1996). *The Value of Life. Biological Diversity and Human Society*. Washington: Island Press.
- Martin, P. (2005). *Twilight of the Mammoths*: Berkeley: University of California Press.
- Nilsen, E. B., Milner-Gulland, E. J., Schofield, L., Mysterud, A., Stenseth, N. C. & Coulson, T. (2007). Wolf reintroduction to Scotland: public attitudes and consequences for red deer management. *Proceedings of the Royal Society B: Biological Sciences*, 274, 995-1002.
- Santos-Reis, M. & Mathias, M. (1996). The historical and recent distribution and status of mammals in Portugal. *Hystrix*, 8 (1-2), 75-89.