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ECOSYSTEMS

Exotic species are perceived more than native ones in a megadiverse country as brazil

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Abstract: Research on environmental perception is essential for the understanding of individuals' relations and expectations towards natural environments. Here, we evaluated the perception of high school students on exotic and native species in Brazil. We interviewed 371 students from two high schools located in the state of Goiás, one with and one without a protected area within its premises. Students needed to identify native and exotic species and to indicate species origin. We used a t-test to evaluate differences between students' scores regarding the correctness of species origin and also ANOVA to assess whether these scores varied among taxonomic groups. Students identified exotic species better than native ones. Students better identified exotic mammals, fishes, and birds than native ones. We found there were no significant relationships of students' knowledge of species' origins with socioecological factors. Students' perceptions of exotic and native species were low and focused on charismatic large-bodied species. We suggest that students are encouraged to expand their knowledge of local biodiversity. Teachers, local schools, and policymakers are essential to achieve this aim. A more diverse methodology for teaching, including new technologies and citizen-science projects, can help establish a genuine interest of local biodiversity students.

Key words: conservation, environmental education, charismatic species, protected areas,; biological invasions.

INTRODUCTION

Exotic species are recognized as one of the main drivers of environmental changes and biodiversity losses (Bellard et al. 2016, Carruthers 2004, Walker & Steffen 1997). These species may cause considerable ecological problems as they establish, dominate, and effectively alter the natural ecosystem's functioning (Blackburn et al. 2011). Moreover, exotic species cause changes in ecological interactions, local productivity rates, nutrient cycling, and community and habitat structuring, thereby leading to a reduction in native species' populations, which in turn can drive regional and global species extinction (Pejchar & Mooney2009, Simberloff 2005). The severe consequences that the biological invasions cause to biodiversity, human health, and well-being, along with their undeniable economic impacts (Pimentel et al. 2001, 2005) are increasing public awareness of the effects of exotic species (Pejchar & Mooney 2009).

After introducing exotic invasive species, both management and control actions can be considered expensive (Mack et al. 2000, Pimentel et al. 2005). The prevention of new invasions by making people aware of the harmful effects is one of the least costly ways to mitigate their effects (Wittenberg & Cock 2001). Therefore, implementing educational actions against biological invasions may avoid impacts upon natural and managed ecosystems as well

as impairments to human health (Pimentel et al. 2005). Such activities also allow citizens to reflect on the use of exotic species (Ziller & Zalba 2007), which can help raise public awareness regarding the importance of native fauna and flora (Proença et al. 2014).

Scientific/environmental education represents an interactive link between science and people, arousing concern, enabling awareness, and directing viable and more effective conservation strategies concerning invasive species (Benites & Mamede 2008). Environmental education (EE hereafter) must allow space for society to rethink and debate environmental problems, increase awareness and value more environmentally responsible practices, and construct more sustainable human societies (Jacobi 2003).

Environmental perception surveys help clarify how people perceive and relate to the environment and their expectations and behaviors (Rebouças et al. 2015). Such surveys can reveal relationships between man and nature and help effectively elaborate, plan, and implement EE activities within conservation unit facilities (CUFs hereafter), potentially causing better conservation results (Hernes & Metzger 2016, Torres & Oliveira 2008). Therefore, allied with EE, environmental perception research contributes to the determination of populational needs and proposes methodological improvements to stimulate people's awareness of ecological problems (Palma 2005).

Thus, previous environmental perception surveys demonstrate low public awareness regarding native biodiversity, especially when comparing the knowledge involving exotic invasive species (Amaral et al. 2017, Bizerril & Andrade 1999, Genovart et al. 2013, Lindemann-Matthies & Bose 2008). Students show recurrent biases towards protecting exotic and/or iconic/charismatic species, whilst native ones are neglected (Ballouard et al. 2011, Bizerril 2004, Diniz & Tomazello 2005, Genovart et al. 2013, Snaddon et al. 2008). Such a trend is perceived in schools where students show a low capacity to identify native species and a high preference for domesticated/exotic species (Bizerril 2004). Ergo, applying more efforts to raise awareness and arouse the public interest regarding the importance of biodiversity and environmental problems are imperative (Lindemann-Matthies & Bose 2008).

Therefore, we aimed to measure the perception of exotic and Brazilian native fauna by final year high school students and to evaluate the determinants of their biological perceptions. We assessed the knowledge level of the students with regards to both exotic and native fauna and related them to the following variables: the presence or absence of CUFs in the municipality's surroundings, the knowledge on species origins of rural vs. urban students; frequency of contact with nature; participation in field classes; and preference to protect any taxonomic group.

MATERIALS AND METHODS

Data sampling

We built two questionnaires for data collection. The first one was descriptive (Supplementary Material - Descriptive Questionnaire S1) with eight subjective questions. In our second questionnaire (Quantitative Questionnaires S1 to S4), a cardboard game with images of exotic and Brazilian native animals, the students could identify the species presented to them. We chose images of 40 fauna species, downloaded from Google's search engine (http://www.google.com.br), homogeneously covering mammals, fishes, birds, amphibians/reptiles, and invertebrates (Quantitative Questionnaires S1 to S4). We asked for specialists' opinions from

each zoological group to evaluate and indicate the species more likely to be recognized by the students before including the images in the questionnaire. We limited our dataset to native species that occur in the Brazilian Cerrado savanna, the biome in which the two cities where we conducted our survey can be found. We assumed that by constraining our species pool to those we used, we would be verifying the student's recognition of the native species from the local fauna. We considered as exotic those species with distributions that were not found in any of the Brazilian biomes. We built four different questionnaire cards, which we distributed randomly in the classrooms. Each questionnaire card had 11 images: two from each group indicated above, one native and one exotic, and a domesticated animal (a dog or a cat). We included the domestic animal to detect potentially careless and purposely wrong answers from the students, allowing for removing his/her answers from our sampling pool. Of the four alternative answers each image had, one was correct, and the other three were incorrect. We also asked the students whether that species was native or not. Our specific questions were: 1) Are exotic species more accurately recognized than native Brazilian species? 2) Do students differentiate the species' place of origin? 3) Do students who live in a municipality close to a CUF know more about native species than about exotic ones? 4) Do students living in rural areas know more about native species than students living in urban areas? 5) Do students who visit the CUFs know more about native species than students who do not visit them? 6) Do students know and intend to protect charismatic zoological groups (e.g., mammals) and exotic fauna more often than other taxonomic groups and native fauna? 7) Do students who have more contact with native species know more about native species? 8) Do students who participate in practical field classes (park visits, ecological trails, farm visits, etc.) know more about native species than students without such field classes?

We performed a pilot research study with six high school classes totaling 32 students in September 2017 to evaluate our questionnaires. Based on this pilot project, we first applied the subjective questionnaire and, then, the questionnaire cards to avoid interference of the content and images from the second questionnaire upon students' answers in the subjective questionnaire.

We sampled our data in two municipalities in the state of Goiás, Brazil: with a CUF, Silvânia (National Forest of Silvânia - FLONA), and without a CUF, Bela Vista de Goiás. Both of them were located in the same state region and share similar socioeconomic conditions. We investigated the capacity to identify exotic and Brazilian native species of 371 students of the last year of high school, being 182 students in the municipality with a CUF and 189 students in the municipality without a CUF. In the city with a CUF, we conducted surveys in three schools (one public, one private, and one public/private), while in the city without a CUF (one public and one private), we conducted two other samples. On average, each class evaluated in both of the cities had 21 students. We invited all students in the classes to our research, but only those whose parents or legal guardians authorized their participation after signing a consent form took part. Students answered the questionnaires without any prior intervention or clarification by those who applied the test regarding definitions and concepts of an exotic or a Brazilian native species. We submitted the questionnaires to the research ethics committee of *Universidade Estadual de Goiás* related to the Brazilian Health Ministry, which approved our procedures (process number at CAAE: 77679717.2.0000.8113). All the sampled data

is available at https://github.com/hersonpc/mestrado-exoticas-nativas.

Data treatment and analyses

We evaluated and classified each question from our descriptive questionnaire into five categories: Great (complete answer, with a clear and precise concept); Good (answer with a satisfactory concept); Regular (incomplete answer); Bad (incorrect answer); and Blank (the student left the question without any answer). We quantified the students' answers from the cardboard image questionnaire and assigned them a numeric value. Then, we defined and calculated three metrics: A) the proportion of correct species identifications – the average proportion of correct species' name identification; B) proportion of origin identifications – the average proportion of correct identification of each species' origin; C) recognition rate – the correct association between the proportion of species' names identification and origin identifications, which we only calculated when the evaluated student correctly marked both species' name and origin answers. We calculated the recognition rate to verify the accuracy of students' scores between both previous metrics and compared each of the interviewees' responses in relation to the correct answers between exotic and native species.

We processed and analyzed our data in R 3.4.3 (R Development Core Team 2018) using the packages *dplyr*, *stringr*, *reshape2*, *ggplot2*, *gridExtra*, *knitr*, *kableExtra*, *nortest*, and *stats*. We used dependent t-tests to evaluate whether the 1) Students reached higher scores while identifying the name of exotic species than Brazilian native species; 2) Students reached higher scores while identifying the origins of exotic species than that of Brazilian native species; 3) Students living in the city close to a CUF attained higher scores while identifying Brazilian native species than when identifying exotic species compared to students living in a city without a CUF; 4) Students residing in rural areas reach higher scores while identifying Brazilian native species than exotic species compared to students residing in urban areas; 5) Students visiting the CUFs attained higher identification scores of Brazilian native species than students that do not visit the CUFs. We used a hierarchical ANOVA to test if 6) Students have higher scores and intend to protect large-bodied and exotic fauna components than smaller or less emblematic Brazilian native species; 7) Students that have a higher frequency of contact with nature would attain higher scores related to native species than to exotic ones; and 8) Students who participate in practical field classes would reach higher scores related to native species than those students without such classes. We used a *post-hoc* Tukey test with α=0.05 to determine the differences among the tested groups.

RESULTS

Descriptive results of our sampling pool

Female students constituted 54% of the interviewees and the students' ages ranged from 15 to 20 years, with most of them being 17 (n=148; 40% of the total), 16 (n=133; 36%), more than 18 years (n=46; 12%) and, 15 years (n=19; 5%). Some did not disclose their ages (n=21; 6%). Among the students, 80.6% (n=299) lived in urban areas (19.4%; n=72 lived in rural areas) and had an average of 13 years of residency in each of the studied municipalities [most of the students (n=228; 62%) lived more than ten years in their municipalities.

Results from the descriptive/subjective questionnaire

Considering the question "What is an exotic species for you?", 64% of the students' answers were considered as wrong. The most cited concepts in this question were "it is a species that is difficult to find" and "a species that is becoming extinct", "a rare species", "a strange/different species", "a lesser-known/seen species", or "a species that lives in the woods" (Table I). In the second question, 37.6% of all students did not cite any correct example of an exotic species. In total, the students ranked 188 exotic species, with at least three Brazilian native species (the hyacinth macaw, the jaguar, and the giant anteater) being cited as exotic in the top-ten species rank. The top-twenty species cited as exotic (with some native species cited as being exotic, as well) are listed in Figure 1a.

For the question "Do you think exotic species cause any benefit/harm to the environment?", 68.3% of the answers were classified as "bad". Some of these answers were: "they neither cause benefits nor problems", "all species are beneficial to the environments", "species regulate the food chain", "species maintain the biome in equilibrium", "any species can cause harm to the environment", or only "yes/no" answers. In the fourth question, "For you, what is a native species?", we classified the answers as either "good" (47.6%; n=174) or "great" (31.5%; n=115; Table I).

Regarding the cited examples of Brazilian native species by the students, only 18.5% (n=67) of them incorrectly cited examples as being domestic species. In total, 152 species were cited as Brazilian natives (Figure 1b), with the most commonly cited ones being the giant anteater, the maned wolf, the hyacinth macaw, the jaguar, the *pequi* fruit (*Caryocar brasiliensis* Camb. Caryocaraceae), the armadillo, the capybara, the golden lion tamarin, "dog" (a domesticated exotic species in Brazil), and snake.

Considering the question "Cite three animal species in need for priority protection", a total of 118 species were ranked and the top-ten species were the hyacinth macaw, the jaguar, the giant anteater, the maned wolf, the golden lion tamarin, "monkeys", the giant panda bear, the Amazon River dolphin, the armadillo, and "dog" (Figure 1c). Among the top-10 species cited to be primarily conserved, there were 9 mammals and only one bird.

We classified the frequency of the students' contact with nature into five categories: "never had contact", "rarely had contact (just a few times)", "sometimes had contact (sometimes per year)", "often had contact (monthly contact)", "always had contact (daily contact)". Most of the students answered that they were "often

Table I. Classification of the students' answers regarding the concept described in questions 1, 3, and 4 of the subjective questionnaire. The results from the other questions were discussed in the text.

Assigned quality of the answers	Question 1 Exotic species	Question 3 Native species	Question 4 Benefits/ problems
Great	5.4%	31.5%	0.8%
Good	17.5%	47.6%	10.5%
Regular	10.2%	13.7%	11.3%
Bad	64.5%	3.8%	68.4%
Null	2.4%	3.5%	9.1%

in contact with nature" (38.7%; n=144), followed by "sometimes had contact with nature" (32.3%; n=120), "always had contact with nature" (19.9%; n=74), "rarely had contact with nature" (8.9%; n=33), and "never had contact with nature" (0.2%; n=1). Nonetheless, the municipality with a CUF stands out with a higher number of interviewees that are "often in contact with nature", while the municipality without a CUF had a higher proportion of students claiming they are "rarely in touch with nature" (Figure S1a). Sixty-one percent (n=228) of the students answered that they participated in field classes (in parks, field trails, farms, or CUF). In the municipality without a CUF, most students did not attend any field classes (47%; n=91 students), while this proportion was much smaller in the municipality with a CUF (29%; n= 52), with many students from this municipality reporting that they attended field classes at the CUFs or other ecological trails (54%; =97).

On the other hand, students from the municipality without a CUF reported that the main kind of field classes were performed at an Ecological Museum in the state capital, in Goiânia (Cerrado Memorial Museum; Figure S1b). Finally, 71% of the students (n=130) from the municipality with a CUF, answered positively when asked "have you already visited the CUF?". Among the 130 students that visited the CUFs, 40.7% had visited it only once (n=53), 24.6% visited it twice (n=32), 16% visited it three times (n=21), 5% visited it four times (n=7) and 13.7% visited it five or more times (n=17).

Results from the objective questionnaire

Students better identified exotic species when compared to native ones (t=27.00; d.f.= 370; p<0.050; Figure 2a). Nonetheless, considering the exotic and native species' origins, the students better identified the native species' origin in a higher proportion than the origins of exotic species (t= -16.00; d.f.= 370; p<0.050; Figure 2b). Students correctly associated the species' identification and origin of exotic species in higher proportions than those for native species (t=7.60; d.f.= 370; p<0.050; Figure 2c).

We did not observe any effect of the students' municipality (t=0.650, d.f.= 360, p=0.50), place of residence (rural vs. urban areas; t= -2.00, d.f.= 110, p=0.05), or having visited the CUFs or not (t=-1,60; d.f. 86; p=0.10) in the students' perception scores of exotic and Brazilian native species.

Students reached higher scores when identifying the origins of the exotic species than when identifying native ones for all five zoological groups (F=21.7; d.f.=4; p<0.05). We observed the highest proportion of correct answers for mammals and exotic fishes, while the native fishes and invertebrates reached the lowest proportion of correct answers (Figure 3). We did not observe any effect of the frequency of contact with nature (F=0.460; d.f.=4; p=0.760) and participation in field classes (F=0.730; d.f.=6; p=0.630) upon the students' perception of the species' origin. The exotic species that gained the highest scores were the platypus (*Ornithorhynchus anatinus*), the clown-fish (*Amphiprion ocellaris*), and the boar (*Sus scrofa*), all with more than 90% of correct answers (n=96, n=96 e n=87, respectively). The native species with the highest scores by the students were the giant anteater (*Myrmecophaga tridactyla*), the burrowing owl (*Athene cuniculaaria*), and the red-legged seriema (*Cariama cristata*), all with more than 85% of answers being correct (n=97, n=87 and n=84, respectively).

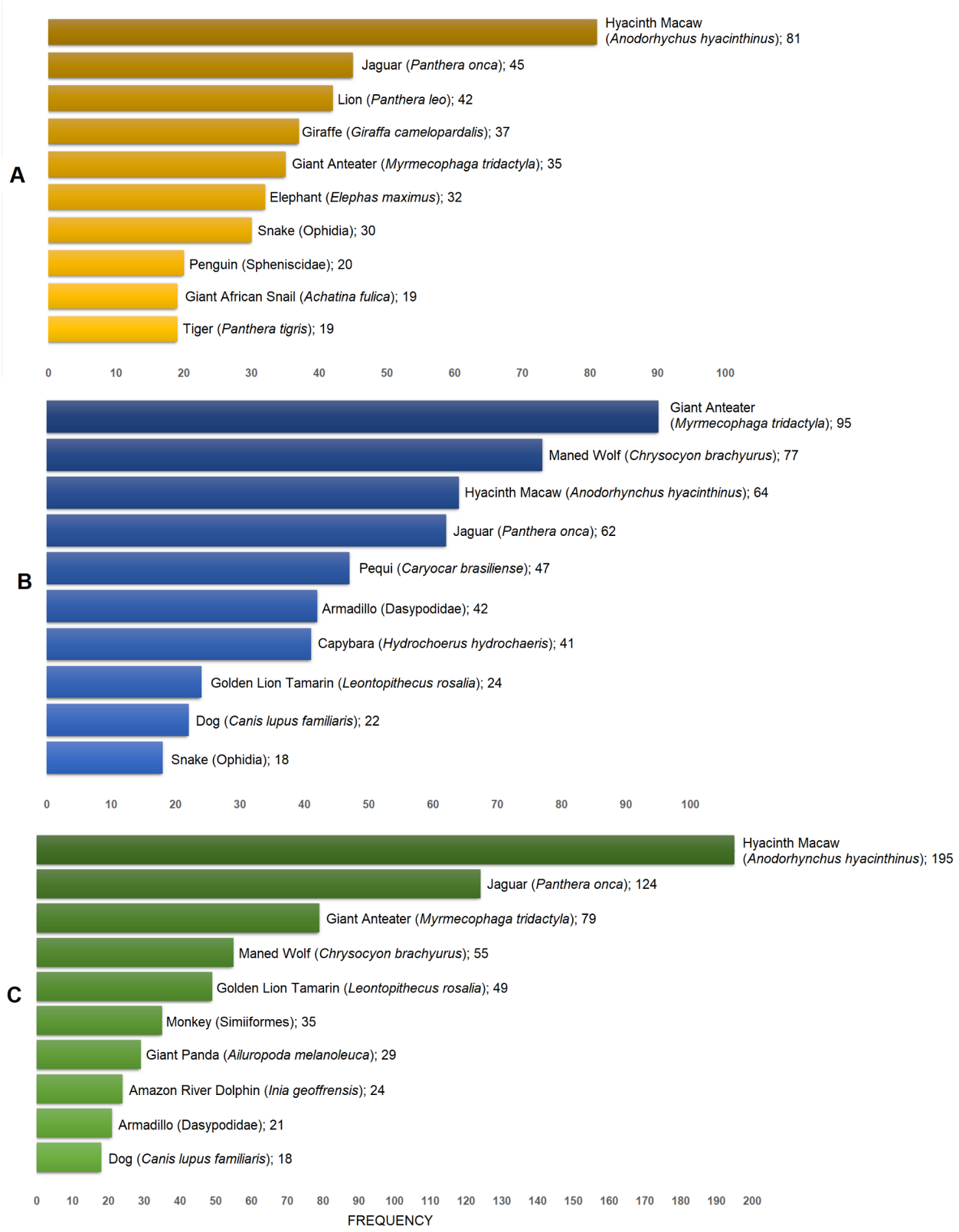

Figure 1. Ranking of species cited by the students as examples of a) exotic species, b) Brazilian native species, and c) species that should be primarily conserved.

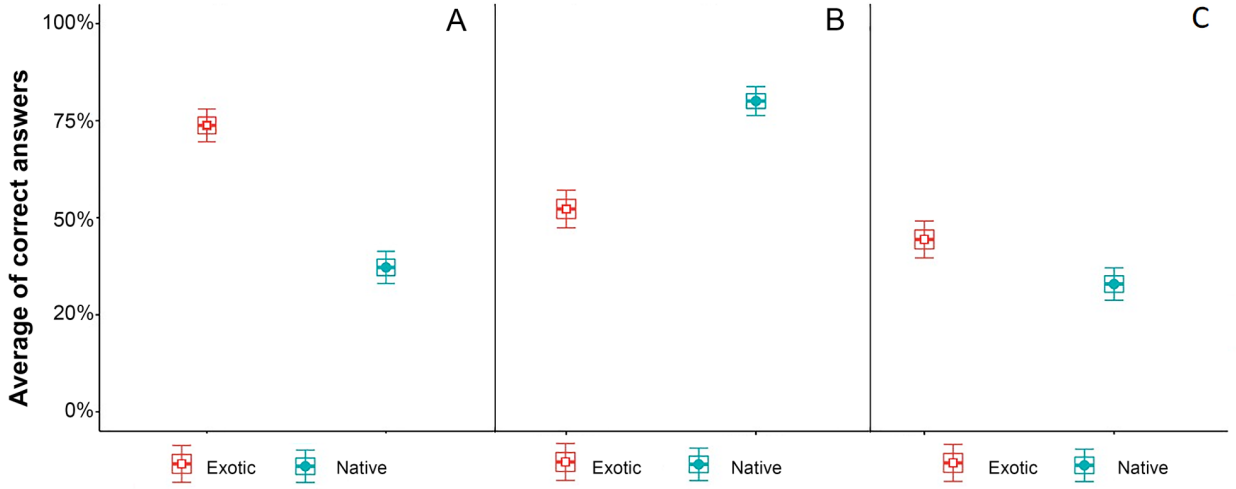

Figure 2. Percentual average of recognition level of a) species' name identification, b) species' origin identification, c) recognition rate. The central point corresponds to the means, the boxes correspond to the standard error and the bars correspond to the confidence intervals at 95%.

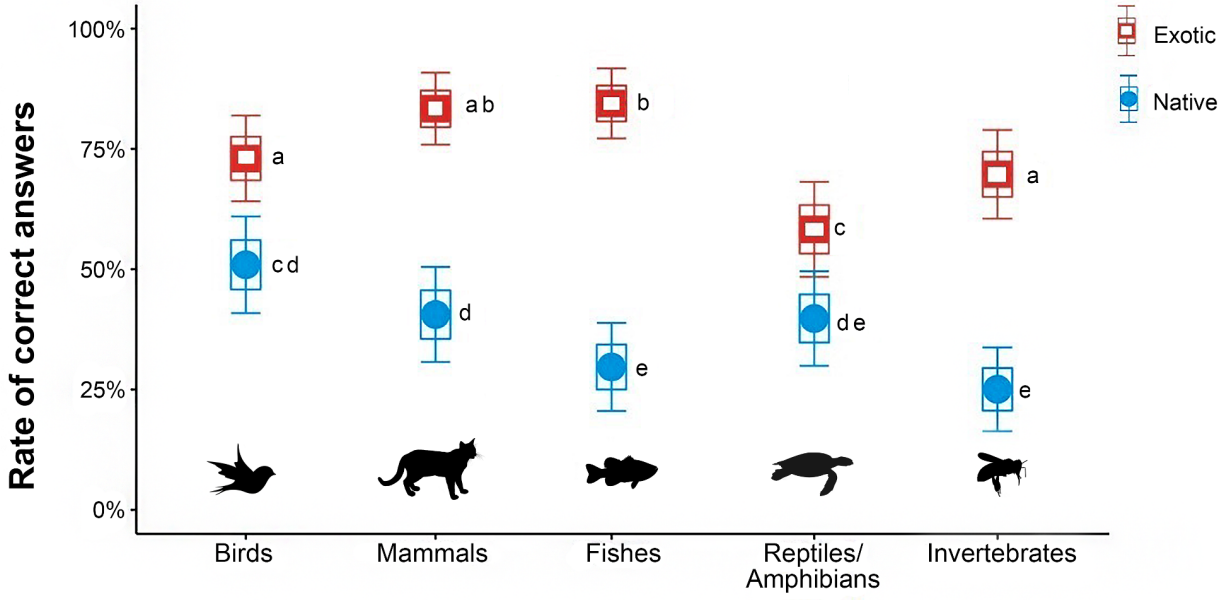

Figure 3. Mean correct identification rate by the students, between exotic and native Brazilian species, among the five zoological groups we considered in the study. The central point corresponds to the means, the boxes correspond to the standard error and the bars correspond to the 95% confidence intervals. Different letters indicate statistical differences among the means, at a 5% probability.

DISCUSSION

Students better identified exotic species than Brazilian native ones, indicating that their perceptions of the exotic species are more robust than those for the species from their own country. Nonetheless, we observed that a significant share of students could not conceptualize and exemplify what exactly an exotic species is, given the incomplete and mistaken concepts and knowledge of benefits and problems caused by them. We highlight that the two species most cited by students as examples of exotic species were the Brazilian native hyacinth macaw and the jaguar. Students identified the origin of the native species with greater success than the exotic ones, although they did not differentiate exotic species from native ones. Thus, although they could visually identify exotic species, they have little knowledge about the concept of what defines an exotic species. We also observed no effect of municipality, place of residence, frequency of contact with nature, participating in field classes, and visiting a CUF upon the students' perception of species. However, students better identified exotic species than their native counterparts, with exotic mammals and fishes reaching the highest scores and native fishes and invertebrates attaining the lowest ones.

A strong media appeal in television, cartoons, and movies may have influenced the higher rates of correct answers regarding exotic species (Bizerril 2004, Diniz & Tomazello 2005). Such higher appeal may also be observed in textbooks that teach basic zoology to students using examples of exotic animals rather than native ones. Consequently, for many students, their first contact with the specimens from these zoological groups occur with exotic species like giraffes, elephants, and lions, species that would be exotic in Brazil, rather than studying and getting to understand some of the country's native species (Bezerra & Suess 2013, Silva et al. 2008). Another factor that may explain the higher recognition of exotic species is the naturalization process of these species when species were introduced a long time ago and are so present in everyday life that people begin to view them as native species (Lima et al. 2010, Vitule 2009). Therefore, naturalized species are easily recognized by the population even though they are not native to that region.

Students also incorrectly exemplified several native species as exotic, not distinguishing them from rare and/or emblematic ones. This result demonstrates that there is a lack of information regarding what an exotic species is. Therefore, both schools and different media types better must inform students and the public in general about the potential impacts and problems related to biological invasions. School teaching programs and curriculums do not usually cover such topics concerning biological invasions in Brazil's elementary schools (Lima et al. 2010). Lack of knowledge about exotic species raises concerning results given the relevance of this topic and the diversity of pervasive ecological (Pejchar & Mooney 2009) and economic effects (Pimentel et al. 2001, 2005) caused by exotic species. Therefore, it is crucial to inform the public and government institutions that the prevention of exotic species is simpler and cheaper than controlling and remediating their invasions (Gardener et al. 2012).

There was no variation in the students' knowledge from both municipalities regarding exotic species and, consequently, no effect concerning the presence of the CUF upon such knowledge. Such a scenario may be related to the fact that there were no environmental education projects occurring in that conservation unit before or even when we performed our research. Therefore, only the presence of the

CUF is not enough to influence the students' knowledge regarding the topic we studied. We also observed that there were no educational projects in both municipalities concerning biological invasions. In light of this, we suggest developing environmental educational projects relating to biological invasions that effectively educate schools, and the local community are developed.

Students living in rural or urban areas share similar knowledge of exotic species. This is related to the small difference between the urbanization degree of rural and urban areas in both municipalities, which corresponded to small-sized cities located in the state's countryside. Additionally, the students' knowledge was similar, despite different frequencies of contact with nature, which may be related to the anthropization and environmental degradation present in the surroundings of both municipalities. Such features may be making it difficult for the students to visualize and have contact with native species. Finally, we also observed that practical classes and visitation to the CUF did not influence the students' knowledge, which may be related to the low quality and/or frequency of such activities in the school visits from both municipalities.

Students' limited capacity to identify native species from exotic species shows their limited knowledge of Brazilian fauna's common and local representatives and that they are distant/disconnected from their surrounding natural environments (Beatley 2011). Lately, the experiences people have with nature are considerably low when compared to older generations (Louv 2005), with children spending much more time inside their homes in front of different types of screens (e.g., television, computers, smartphones, tablets). In the long term, children's reduced knowledge of their surrounding biodiversity may start a cycle of disaffection, degradation, and distancing these individuals towards nature that may cause more biodiversity losses without being perceived as prejudicial (Pyle 2003). Such disconnection across generations makes people apathetic to a depauperated and eroded biodiversity, a vague reference of natural environments that can negatively affect establishing practical conservation goals by stakeholders (Miller 2005, Pauly 2004). These results agree with those observed by Bizerril (2004), who showed that individuals that attained low identification rates of exotic species also had unfamiliarity with native biodiversity from the Brazilian Cerrado Savanna. Considering this Brazilian biome, it is found that in both municipalities of this research, it is one of the world's to 25 biodiversity hotspots (Myers et al. 2000), such unfamiliarity with local biodiversity is even more worrisome. An approach aiming for better dissemination and understanding of the Cerrado's biodiversity for primary-school and high school students may result in students identifying more with its native species, creating and enforcing their connection with nature and, eventually, contributing to its conservation (Bizerril 2004).

The majority of the species cited to be primarily conserved were large-bodied species, mainly mammals, which shows the students' attachment and preference for some taxa, mostly charismatic animals, as shown before (Ballouard et al. 2011, Genovart et al. 2013, Snaddon et al. 2008). More extensive media coverage about these species may be one reason for such a tendency to choose more prominent and popular ones. Such excessive preference for some species is likely to contribute to neglect and decreased conservation efforts for small-bodied and less emblematic taxa, such as invertebrates, reptiles, amphibians, fishes, and plants (Clucas et al. 2008, Randler et al. 2012).

Although the students were able to rank 118 native species to be primarily conserved, this number only represents 3% of all animal species threatened to extinction and listed in the Red List of Threatened Species from the International Union for the Conservation of Nature. The low number of endangered species cited and identified as threatened by the students is in stark contrast to the students' capacity of learning and recognition of up to 493 Pokemon species, along with their "ecological" and "functional" attributes, as shown previously (e.g., Balmford et al. 2002). Therefore, if children and teenagers are appropriately encouraged and stimulated, educational conservation actions towards better control, remediation, and exotic species management may be significantly improved, mostly if this is done in more interesting ways (Balmford et al. 2002).

According to Wilson's (1984) biophilia theory, interactions with nature satisfy human beings' innate impulses to connect with nature. Other studies already verified that contact with nature increases human well-being, resulting in better psychological and physiological benefits (Mayer et al. 2009, Zelenski et al. 2015). Different methodologies may be developed within schools to involve students with natural environments and, consequently, native species. For instance, making use of recreational and outdoor education, ecological trails, parks, CUF visitations, or even green spaces in urban areas that are available for visitation may improve and reinforce the connection of the students with nature (Huckauf 2005). These methods contradict the traditional and formal school environments, usually characterized by an exhaustive and non-interactive learning environment (Abreu et al. 2017). Consequently, if applied, these other perspectives may allow the students a better understanding of biological and ecological elements and components (Echeverría 2015).

Citizen science is an alternative for improving students' perception of native species in addition to involving the active participation of the community to produce scientific data and stimulate interest in the conservation of species (Bonney et al. 2009, Cohn 2008, Dickinson et al. 2012, Lewandowski & Oberhauser 2015, Sullivan et al. 2009). Combining ecological research with environmental education through citizen science may cause positive learning results in the students' and the public's general biological and environmental education and improve exotic species' management (Dickinson et al. 2012).

Still, implementing better teaching practices in Brazil is challenging, given the country's current education system. The scant educational resources, allied with the expected budget cuts that Brazilian science is currently facing (Dobrovolski et al. 2018, Escobar 2015, Fearnside 2016, Wade 2016) constitute an imminent increase to the already deficient educational, cultural, and scientific differences across the different regions of the country. Nonetheless, considering the availability of several methodologies mentioned above, we believe that even in a low availability of resources, it is still possible to improve students' education and learning to popularize topics related to exotic and native species.

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SUPPLEMENTARY MATERIAL

Figure S1. Answers given by students from municipality with a CU facility and municipality without a CU facility to the questions a) 6 and b) 7 of the subjective/ descriptive questionnaire. Question 6 referred to the frequency of the students' contact with nature, and question 7 referred to locations where the students have field classes in both municipalities.
Table SI. The species utilized in our questionnaires considering their scientific names, popular names, taxonomic group, and status (native or exotic) in Brazil.
Quantitative Questionnaire S1-S4.

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