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Which species to conserve: evaluating children's species-based conservation priorities

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Abstract We currently have a meager understanding of the species attributes viewed as important for conservation by children, despite the fact that arguments for biodiversity conservation often hinge on the bequest value of species. We conducted a study of children between the ages of 4 and 14 ($N = 183$) on Andros Island, The Bahamas to determine how they prioritized wildlife species for conservation based on five attributes: endemism, use for hunting and fishing, rapid decline in population size, visibility around their home, and ecological significance. Children tended to rank ecological significance as the most important attribute for prioritizing wildlife for protection, followed closely by endemism, with other attributes being less important and not significantly different from one another. However, participants in a local environmental education program ($N = 67$) placed greater prioritization to species experiencing rapid population declines. We also found that boys prioritized use for hunting and fishing as more important for conservation than girls, older children placed greater importance on species with declining numbers and less importance on visibility of animals around their house, and children who had previously fished placed greater importance on endemism. These findings help elucidate how children value biodiversity, and suggest children's conservation priorities may align relatively well with those of conservation biologists, especially after exposure to environmental education. We suggest that better understanding how children prioritize wildlife attributes for conservation can lead to more informed biodiversity conservation decisions and more effective policy implementation, as the perspectives of children can help bridge the gap between public opinion and scientific opinion.

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Introduction

The rapid loss of biodiversity paired with the decline in funding for protecting it makes prioritizing conservation actions more important than ever (Vane-Wright et al. 1991; Marris 2007; Bottrill et al. 2008). Global extinction rates have climbed to 1000 times higher than background levels due to factors including the conversion of habitat to urban areas, agriculture operations, and the use of natural resources to fuel economic expansion (Brooks et al. 2006; Conrad et al. 2006; Cumberlidge et al. 2009; Pimm et al. 2014; McCallum 2015). Many government and non-governmental conservation organizations prioritize species based on their chances of becoming extinct (e.g. U.S.A's Endangered Species Act 1973; Canada's Species at Risk Act 2002; IUCN Red List 2015); however, some scientists suggest that other attributes need to be considered when deciding conservation priority. Experts have used criteria including endemism, economic value, ecological significance, charisma, evolutionary distinctiveness, and social acceptability to determine the conservation priority of species (Avise 2005; Wilson et al. 2006; Forest et al. 2007; Isaac et al. 2007; Naidoo et al. 2008; Redding et al. 2010; Sodhi et al. 2010; Hobday et al. 2015; Curnick et al. 2015).

Comprehending public preferences on prioritizing wildlife species is crucial because protecting wildlife requires human intervention. The public plays a vital role in determining how resources will be divided, which species will receive protection, and the success of conservation management plans (Miller and McGee 2001; Martín-López et al. 2007, 2009). "Willingness-to-pay" studies provide a central strategy for gauging the public's priorities for species conservation (White et al. 2001; Martín-López et al. 2008). These studies are often species specific, and do not offer general principles for prioritizing species. Problems often arise when using named species to determine public preferences for conservation purposes because the public typically places high values on charismatic species for affective reasons, but lacks knowledge regarding the role of species within ecosystems (Jacobsen et al. 2007; Martín-López et al. 2007; Tisdell et al. 2007; Reimer et al. 2014).

Some previous work has used species attributes instead of species names, and uncovered important patterns. For instance, the public generally favors plants, mammals, birds, and fish for conservation over other taxa, such as reptiles, amphibians, invertebrates, and microorganisms (Czech et al. 1998). Women are generally more concerned about species conservation than men, and the public tends to rank ecological function as both the most important effect of biodiversity (Montgomery 2002) and the most important factor in prioritizing species for conservation (Czech et al. 2001). International tourists can prioritize species for avian protection based more on conservation/ecological attributes, such as population size and geographic distribution, than on physical attributes, such as attractiveness and behavioral characteristics (Veríssimo et al. 2009). Finally, a recent study found that adults in British Columbia, Canada ranked endemism as significantly more important than other conservation attributes, such as species whose numbers are in rapid decline and species with economic importance (Meuser et al. 2009).

Previous studies on the topic have focused on the preferences of adults, and few if any have considered the perspectives of children. Yet the most foundational motivation for the conservation of biodiversity is the notion that our environment will be inherited by future generations (Weiss 1990; Meine et al. 2006). A widely accepted goal for humanity is to ensure that future generations have similar environmental opportunities as current and recent generations (Howarth and Norgaard 1992); therefore, children are entitled to some level of consideration in setting priorities for biodiversity conservation (Weiss 1990). Considering the growing disconnect between youth and nature (Kahn and Kellert 2002; Louv 2005), we need both a greater understanding of children's perspective on conservation, as well as the potential for environmental education programs to impact children and influence their prioritization criteria for biodiversity conservation (Larson et al. 2010).

We conducted a survey of children to assess their prioritization of species attributes for conservation on Andros Island, The Bahamas. This island provides a useful case study, situated in the Caribbean biodiversity hotspot (Cincotta et al. 2000; Myers et al. 2000) where prioritization of conservation actions are critical (Waldron et al. 2013) and timely (e.g. 20 new national parks created in 2015 alone) because of threats to terrestrial and aquatic biodiversity from human development and invasive species (Kairo et al. 2003; Sealey 2004). As one of the largest islands in the entire Caribbean region (5957 km^2) with an extremely low human population (7490 people in 2010; Department of Statistics of The Bahamas), and extensive land (1,433,235 ac.) and marine (67,813 ac.) protected areas (ANCAT 2010), Andros could play a central role in regional conservation efforts. Despite these opportunities, overexploitation from Bahamian fishermen have collapsed several key fisheries, and the expansion of tourism places additional pressure on local ecosystems (Hayes et al. 2015). Adult queen conch populations of Andros Island have been decimated by unsustainable fishing practices, with some fisheries requiring decades of protection in order to ensure a full recovery (Stoner et al. 2009; Stoner and Davis 2010). The International Union for Conservation of Nature (IUCN) lists Nassau grouper, the basis of another key fishery (Ehrhardt and Deleveaux 2007; FAO 2009), as endangered (IUCN 2015). Similarly, nearly all Bahamian fishers (95 %) harvest spiny lobster which are either fully or over-exploited throughout the Caribbean (Buchan 2000).

We provide the first evaluation of how children in the Caribbean rank species attributes for conservation, and test three specific hypotheses. First, we hypothesized that children would rank ecological significance and endemism as the most important wildlife attributes for conservation prioritization. We based our hypothesis on recent work showing that adults favor ecological significance and endemism over other attributes in the context of conservation (Czech et al. 1998; Meuser et al. 2009; Veríssimo et al. 2009), combined with Bretherton's (1997) attachment theory that children adopt their parents' values. Second, we hypothesized that participants in the national environmental education program, Discovery Club, would rank declining species, endemism, and ecologically important species as more important than those who have not participated in Discovery Club. This hypothesis emerged from the fact that Discovery Club curricula specifically highlight conservation issues through short lectures, hands-on activities, outdoor field trips, and volunteer experiences (Bahamas National Trust 2015). Discovery club activities and educational materials tend to focus on species with rapidly declining populations (especially due to overharvesting), species found only in The Bahamas, and species that serve important ecological roles or have significant economic impacts. The Bahamas National Trust created and leads the Discovery Club, the only national environmental education program in The Bahamas. The Bahamas National Trust is a non-governmental organization that manages the national park system. Participants in the Discovery Club program range in age from 7

to 25. Third, we hypothesized that boys would rank use in hunting or fishing as a more important criterion for conservation than girls. Multiple studies among adults have shown that males tend to view nature more through an economic, utilitarian, and dominionistic lens (Kellert and Westervelt 1984; Stern et al. 1993), while women are more concerned with the consequences of humans' actions on the environment and are more aware of the relationships found in nature (Stern et al. 1993; Zelezny et al. 2000).

Materials and methods

Andros comprises several islands, and most of the residents live along The Queen's Highway, which runs along the eastern coast (Fig. 1). We conducted the survey on North Andros Island, The Bahamas with the help of the Bahamas National Trust and Forfar Field Station. All of the Bahamian Out Islands, including Andros, contain relatively remote natural habitats, as they remain largely underdeveloped. Until recently, the Out Islands

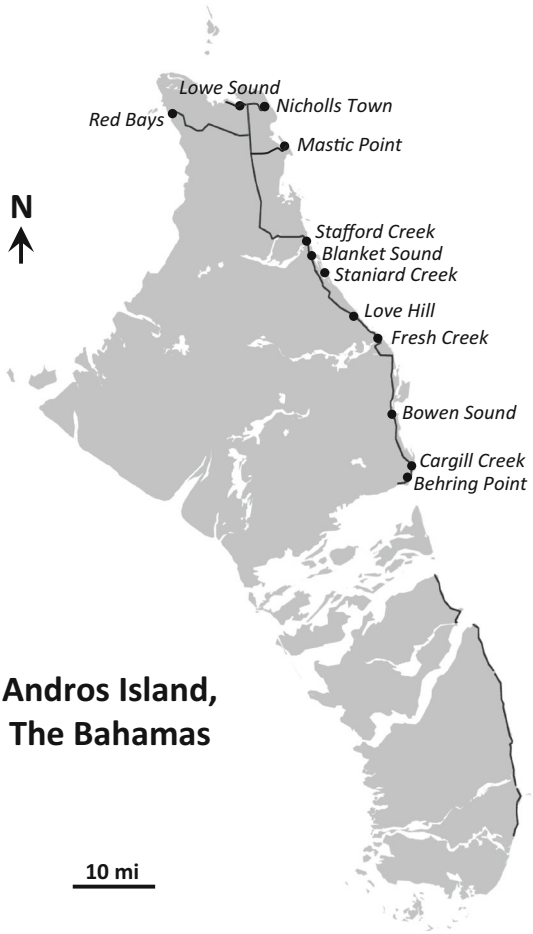


Fig. 1 Map of Andros Island, The Bahamas, illustrating the study region in North Andros, the major roads on the island, and the locations of our surveys

were often excluded from infrastructural enhancements and the benefits of tourism (Baldacchino 2015). In recent years, approximately 7000 international tourists have visited Andros annually for activities such as deep-sea fishing, kayaking, scuba diving, bird-watching, bonefishing, and sailing (Delancy 2011).

The Discovery Club was founded in 1995 and was modeled after the Boy Scouts of America, the Duke of Edinburgh's Award Program, and Outward Bound. Discovery Club relies on nature-based adventures to teach and engage youth, and has a core curriculum that revolves around badges. Every time children complete the materials and field trips associated with a specific topic, they receive the corresponding badge. Activities in Discovery Club largely emphasize natural history and the importance of maintaining a pristine and sustainable environment for native wildlife (National Museum of The Bahamas 2014). The Discovery Club was suspended from 2005 through 2008, so that partnerships could be formed with public schools and curricula could be modified to align better with school-based learning objectives (Bahamas National Trust 2015). The Discovery Club programming emerging from that development period, and used during this study, is not a formal part of school curriculum, but it operates as a voluntary partnership with teachers interested in nature-based programming in a similar manner as Project WET, Project WILD and Project Learning Tree (Stevenson et al. 2013; Eick et al. 2010).

The Discovery Club has central administration in Nassau, and local administrators on Grand Bahama, Exuma, and Abaco, where most students are enrolled (Bahamas National Trust 2015). The program has approximately 60 chapters on 9 islands, with a total of 1000 participants and 100 volunteers. In 2015, there were Discovery Club chapters in the settlements of Nicholls Town, Red Bays, Mastic Point, Fresh Creek, and Behring Point in North Andros. The annual registration cost for Discovery Club was $30–$50 during our study, and sponsors were found for children who wanted to attend but could not afford to do so on their own.

Questionnaire design

We created a questionnaire that asked children to rank species attributes based on their importance in prioritizing species conservation. We adapted this questionnaire from a similar survey by Meuser et al. (2009), and pre-tested it with 3rd and 5th grade students in North Carolina. In pre-testing, the draft instrument was administered to two classes of 5th graders ($N = 32$) who were asked to circle questions that were difficult to understand. The students also made notes on how to improve the questions. A second draft was then given to two classes of 3rd graders ($N = 37$) and the same methods were used to solicit additional feedback. Cognitive interviews (Desimone and Le Floch 2004) were conducted with 12 students to gather general feedback and to identify versions of the questions that were easier to comprehend. For each question students identified as problematic, we asked students, "what does this question mean to you?" If the response did not reflect the intended meaning of the question, we then asked students to respond to different versions of the question until responses supported face validity of each question (Frew et al. 2016). In the final questionnaire, the first question asked, "There are many things to think about when deciding which types of wild animals to protect and help first. Please place your ranking beside **each kind** of wild animal from **1 (should be protected first)** to **5 (should be protected last)**" [bold type included in original]. The five attributes listed below this question were: wild animals that only occur in The Bahamas, wild animals that people can

hunt or fish for, wild animals whose numbers are going down fast, wild animals that I see around my home, and wild animals that are important in nature. The second question asked if the child had participated in Discovery Club this year. The third question asked how many years the child had participated in Discovery Club, including this year. The fourth question asked if the child had ever been fishing. The fifth question asked if the child was a girl or boy. The last question asked for their age.

Sampling

In June 2015, we surveyed 206 children between the ages of 4 and 14, with 183 children fully completing our written survey and included in our analyses. This sample size provides a meaningful representation of the relevant population, as it corresponds to approximately 20 % of all children aged 4–14 on the island (Department of Statistics of The Bahamas). We collected data in primary schools ($N = 91$) and using intercept sampling ($N = 92$; Stedman et al. 2004). With our intercept sampling, we traveled to 10 towns and administered the surveys to children matching our age requirements: Red Bays ($N = 11$), Lowe Sound ($N = 41$), Nicholls Town ($N = 39$), Mastic Point ($N = 16$), Stafford Creek/Blanket Sound ($N = 7$), Staniard Creek ($N = 7$), Love Hill ($N = 8$), Fresh Creek ($N = 27$), Bowen Sound ($N = 12$), and Cargill Creek/Behring Point ($N = 15$) (Fig. 1). Intercept sampling was facilitated by staff at the Forfar Field Station who were familiar with households in study area communities and approached each household with children within the intended age ranges (4–14) to request participation from parents and children. Within our dataset of 183 completed questionnaires, the average age was 9 years old (standard deviation = 1.78), gender was balanced (47 % female), most children had fishing experience (89 %), and 37 % had participated in Discovery Club. All research methods were reviewed and approved by the NC State University Institutional Review Board for the Protection of Human Subjects (Protocol 5941).

Statistical analysis

We used a Kruskal–Wallis test to test for mean differences in rank among the five attributes. We followed this test with post hoc Wilcoxon-signed ranks tests to determine which attributes significantly differed from others in their mean rank (P-values adjusted to control for a false discovery rate of 5 %, following Benjamini and Hochberg 1995). We used a model selection approach to test for effects of gender, age, fishing experience, participation in Discovery Club, and location on ranking of each species attribute. We included a term for location to control for possible geographic variation among settlements. We used a dichotomous variable for Discovery Club participation (yes or no) because most children had either never participated or participated for 1–2 years (93 % of children). For each of the five species attributes, we conducted ordinal logistic (multiple) regression models with possible terms for the five aforementioned independent variables. We selected models for each species attribute based on the Akaike information criterion corrected for small sample sizes (≤ 2 ΔAIC_c units) and Akaike weight (≥ 0.10 Akaike weight). Because environmental education programs are the primary intervention used to influence how children value and understand biodiversity (and because we uncovered significant effects of participation, see below) we examined the overall rankings of all five attributes separately for children that either had or had not participated in Discovery Club.

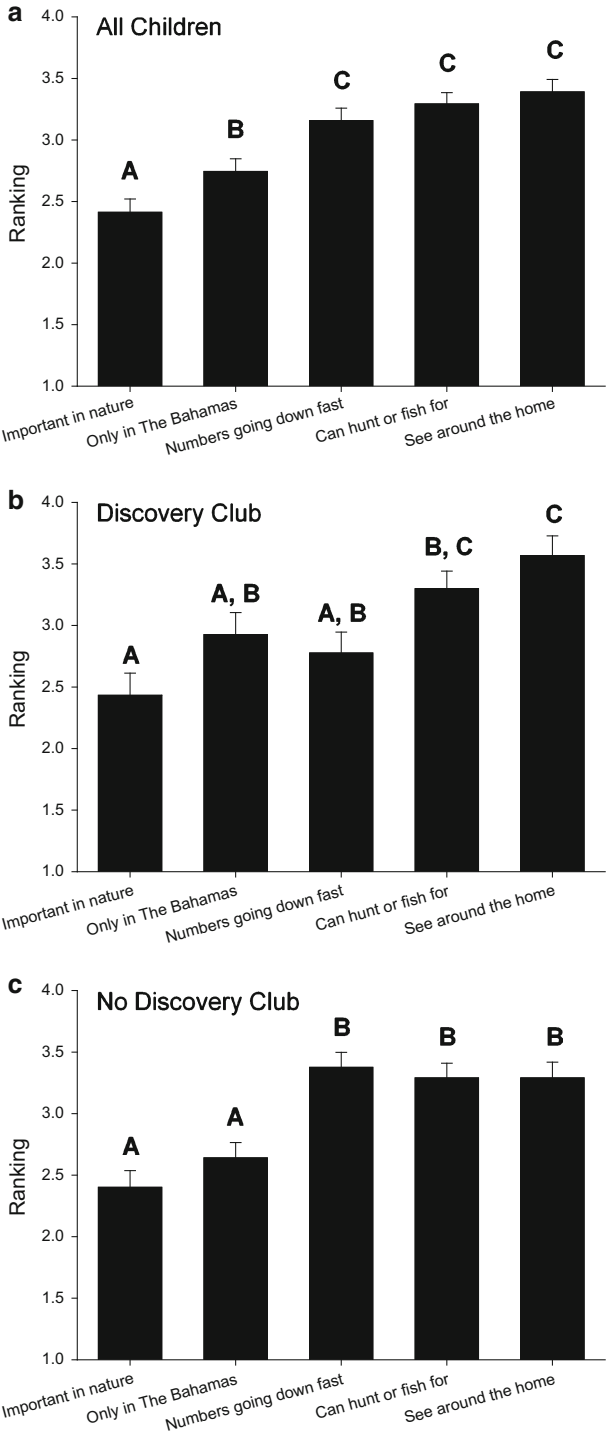
Results

Rankings differed among species attributes ($\chi^2 = 61.93$, df = 4, $P < 0.0001$), with children tending to rank ecological significance as the most important attribute for prioritizing wildlife for protection, endemism as the second-most important, and other attributes as less important and not significantly different from one another (Table 1; Fig. 2a). Within our model selection framework, we uncovered several factors that influenced children's rankings of wildlife species attributes important for conservation (Table 2). Our selected model set included 2–3 models for each species attribute. We focus on statistically significant terms in the top model in each case, as this captured all observed significant associations in the model set. All measured factors except for location significantly influenced the perceived importance of at least one species attribute, and all species attributes except ecological significance exhibited significant association with at least one independent variable.

First, children who had previous fishing experience ranked endemism as more important than children without fishing experience (mean ± standard error; 2.68 ± 0.11 vs. 3.35 ± 0.31). Second, children who had participated in Discovery Club, and older children, placed greater importance on species facing rapid population decline than children who had not participated in the program (2.82 ± 0.16 vs. 3.36 ± 0.12) or younger children (e.g. age 12: 2.72 ± 0.58 vs. age 6: 3.30 ± 0.35). Inspecting the effect of Discovery Club more closely, children who had participated in Discovery Club tended to indicate three attributes as most important for conservation: ecological significance, declining population size, and endemism (Fig. 2b); although the latter two attributes were not statistically different from use in hunting and fishing (Table 1). On the other hand, children who had not participated in Discovery Club only found importance to nature and endemism as especially important, placing little importance on declining population size (Fig. 2c). Third, boys ranked species that you can hunt or fish for as more important for protection than girls did (3.33 ± 0.17 vs. 3.73 ± 0.17). Fourth, younger children placed greater

Table 1 Post-hoc Wilcoxon signed-ranks tests for differences in rankings of species attributes by children on Andros Island, The Bahamas. *P*-values corrected to maintain 5 % false discovery rate (Benjamini and Hochberg 1995)

Paired comparison of species attributes	All children		Discovery Club		No Discovery Club	
	Z	*P*	Z	*P*	Z	*P*
Important in nature versus only in The Bahamas	−2.50	0.0234	−1.92	0.0873	−1.66	0.1437
Important in nature versus numbers going down fast	−5.03	0.0003	−1.54	0.1645	−5.09	0.0003
Important in nature versus can hunt or fish for	−6.07	0.0003	−3.74	0.0005	−4.84	0.0003
Important in nature versus see around the home	−6.33	0.0003	−4.18	0.0003	−4.76	0.0003
Only in The Bahamas versus numbers going down fast	−2.85	0.0088	0.49	0.6967	−3.95	0.0003
Only in The Bahamas versus can hunt or fish for	−3.91	0.0003	−1.53	0.1645	−3.74	0.0005
Only in The Bahamas versus see around the home	−4.38	0.0003	−2.40	0.0286	−3.62	0.0007
Numbers going down fast versus can hunt or fish for	−0.89	0.4310	−1.95	0.0848	0.36	0.7738
Numbers going down fast versus see around the home	−1.64	0.1437	−3.09	0.0043	0.26	0.8200
Can hunt or fish for versus see around the home	−0.92	0.4283	−1.39	0.2053	−0.17	0.8688


a
All Children
Ranking
4.0
3.5
3.0
2.5
2.0
1.5
1.0
A
B
C
C
C
Important in nature
Only in The Bahamas
Numbers going down fast
Can hunt or fish for
See around the home
b
Discovery Club
Ranking
A
A, B
A, B
B, C
C
Important in nature
Only in The Bahamas
Numbers going down fast
Can hunt or fish for
See around the home
c
No Discovery Club
Ranking
A
A
B
B
B
Important in nature
Only in The Bahamas
Numbers going down fast
Can hunt or fish for
See around the home

◀**Fig. 2** Rankings of species attributes across **a** all children **b** children that participated in Discovery Club, and **c** children that had never participated in Discovery Club (ranking of 1 being most important). *Letters* within each panel indicate significant differences among mean attribute ranks based on Wilcoxon signed-ranks tests ($P \leq 0.05$; see Table 1). Mean ± standard error depicted

importance on species they could see around their house (e.g. age 6: 2.90 ± 0.48 vs. age 12: 4.43 ± 0.43).

Discussion

We found that children on Andros Island, The Bahamas, typically viewed ecological significance and endemism as the most important species attributes for prioritizing species for protection. Children that had participated in the Discovery Club environmental education program placed more conservation importance on rapidly declining populations than other children. We additionally found that children's prioritization criteria for conservation was influenced by gender, age, and prior fishing exposure. With respect to our three a priori hypotheses, our results largely, but not perfectly, matched our expectations; however, we also uncovered unanticipated patterns. Overall, these findings provide important insight into the alignment between children and conservation biologists in their prioritization of species for conservation, and strengthen our understanding of the effects of environmental education on children's conservation prioritization criteria.

The general conservation importance attributed to ecological significance and endemism by most children in this study (63 % ranked one of these attributes as most important; 88 % ranked at least one of these attributes within their two most important factors) is consistent with our a priori hypothesis based on previous findings among adults, who tend to emphasize species for conservation that have important ecological functions or highly restricted geographic ranges (Czech et al. 1998; Meuser et al. 2009; Veríssimo et al. 2009). This is only partly consistent with the views of conservation biologists, who generally give greater (or at least similar) priority to species with moderate to high risks of extinction—e.g., evidenced by the weight regularly placed on IUCN Red List status in conservation applications. Still, recent work has stressed the importance of conserving species that will have the greatest impacts on ecological and evolutionary processes (Turpie 1995; Possingham et al. 2002; Isaac et al. 2007; Arponen 2012), consistent with our findings among Bahamian children.

While the desire to protect species which are "important in nature," seems intuitive, the underlying cause for children's prioritization of species that "only occur in The Bahamas" is not as obvious. Arguments for conserving species endemic to small areas typically rely on endemism as an important factor influencing a species' risk of extinction or the evolutionary importance of protecting globally rare lineages. Yet children in our study probably do not view endemism in this manner, and indeed few adults outside the conservation biology community likely do. This finding may instead reflect Bretherton's (1997) attachment theory, where children internalize their parent's beliefs. But we did not measure parental rankings for species attributes, and other explanations are possible. For example, children's preference for protecting endemic species could be attributed to a strong sense of place cultivated by daily interactions with their environment and the endemic species that inhabit it. Previous studies suggest that a sense of place can influence how adults bond with elements of the environment they live in (Hunter 2011; Shellabarger

Table 2 Summary of results from model selection analyses

Species attribute	Top model		Model 2			Model 3		
	Term(s)	Ak Wt	Term(s)	ΔAIC*c*	Ak Wt	Term(s)	ΔAIC*c*	Ak Wt
Important in nature	Gen	0.13	Gen + Age	0.40	0.10			
Only occurs in The Bahamas	Fish*	0.23	Fish + DC	1.18	0.13	Fish* + Gen	1.74	0.10
Numbers going down fast	DC* + Age*	0.29	DC* + Age* + Fish	0.98	0.18	DC**	1.74	0.12
Can hunt or fish for	Gen* + Fish + Age	0.27	Gen* + Fish	1.38	0.14	Gen* + Age	1.43	0.13
See around the home	Age*	0.12	Age* + Fish	0.14	0.11	Age* + Gen	0.38	0.10

Our selected model set included all models with $\Delta AIC_c \leq 2$ and Akaike weight ≥ 0.10

Age child's age, *Gen* child's gender, *Fish* prior fishing experience of child, *DC* child's participation in Discovery Club

* $P \leq 0.05$, ** $P \leq 0.01$

et al. 2012; Krasny and Delia 2014). Similarly, nativist thinking linked to national identity may create negative attitudes toward non-native species among adults (Brown and Sax 2004), and the phenomenon may occur to some degree among children. Future research could clarify these possibilities by evaluating the potential role of place, attachment theory (parental influence), and nativist views in how children value species attributes.

We found some support for our hypothesis that children who had participated in the Discovery Club environmental education program would place greater importance on declining species, endemism, and ecological significance compared to children who had not participated. Discovery Club participants placed greater prioritization on species whose numbers are rapidly decreasing; meanwhile, the universally high baseline prioritization of endemic and ecologically significant attributes made environmental education effects both difficult to produce and detect. The Bahamas National Trust, which oversees the Discovery Club, has always emphasized the importance of conserving species threatened with population decline—their most recent campaign being an attempt to stabilize declining Queen Conch populations (Bahamas National Trust 2015). In the Discovery Club, all badges that children can earn emphasize the importance of preserving the environment for declining species. For example, the "Treasures of the Sea" instructional booklet, used by teachers to educate Discovery Club members, describes a number of factors responsible for species decline, including overfishing, pollution, and habitat loss (National Museum of The Bahamas 2014). Environmental education efforts targeting threatened and endangered species may be the most effective use of scarce resources in areas such as Andros where children universally value ecological significance and endemism, and both young children and children who have no environmental education experience place low priority on conserving species facing rapid population declines. Future research exploring these relationships elsewhere in the Caribbean may help target environmental education efforts where they are the most effective.

Demographics and past experiences with the natural environment can also shape children's conservation priorities. Matching our a priori hypothesis, males placed higher conservation importance on species that can be fished or hunted for compared to females. This may reflect previous findings in other nations where adult males exhibit more dominionistic and utilitarian attitudes towards wildlife (Kellert and Berry 1987; Bjerke et al. 1998; Tarrant and Cordell 2002). Our finding that older children placed more conservation importance on declining wildlife populations may be explained by the previously demonstrated positive correlation between age and environmental knowledge and concern (Kellert and Westervelt 1984; Eagles and Demare 1999; Kahn 1999; Negev et al. 2008; Larson et al. 2010). The fact that younger children ranked wildlife that can be seen around the home as more important for conservation may be explained by the decline in eco-affinity that occurs with age (Larson et al. 2010). As children spend less time directly interacting with nature, because of school or interacting with peers, their environmental orientations change, which may lead them to believe that animals seen around their home are less important than others (Vadala et al. 2007). Alternatively, as children age they may become more knowledgeable about the conservation relevance of other species attributes (Kahn 1999; Negev et al. 2008). The mechanisms underlying the positive relationship we observed between prior fishing experience and prioritization of endemic species requires further research, as little to no research has studied the impact of fishing experience on attitudes toward endemic species or other species attributes. For example, future qualitative research could explore whether Bahamian children view threatened species which are locally abundant (e.g., queen conch) as endemic, despite the species' wider distributions.

We uncovered some clear patterns in how Bahamian children prioritize species attributes for conservation, and pinpointed a distinct effect of environmental education on this prioritization—but this is only the beginning. We need more research into how children prioritize which species we should save. For instance, we need studies in multiple countries, as children from different cultures may value and prioritize both species and their attributes differently. We need examination of effects of factors such as the presence of an adult role model, time spent outdoors, and significant life experiences in nature, which appear to influence a child's knowledge and attitudes toward the environment (Wells and Lekies 2006; Stevenson et al. 2014b). Future research exploring the potential for contagion of species attribute ranking preferences from students in Discovery Club to those outside the club would be valuable.

Direct interactions with peers, as well as descriptive norms ascribed to peers, have been shown to influence perceptions of environmental issues (Ojala 2015a, b; Öhman and Öhman 2013) and participation in sustainable behavior (De Vreede et al. 2014). If such influence occurred in the context of species attribute ranking, it would amplify the overall impacts of environmental education efforts but diminish the ability of researchers to detect impacts by comparing among groups that either have or have not participated in the program; these issues should be considered in future environmental education evaluations studies. Determining the public's conservation priorities can contribute to the debate on how to allocate resources to conservation. Understanding children's preferences may be particularly valuable both because children's preferences may align more closely with conservation biologists, and because environmental education may successfully promote increased prioritization of threatened and endangered species among children (this study), whereas ideological biases among adults can render education efforts ineffective (Stevenson et al. 2014a).

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