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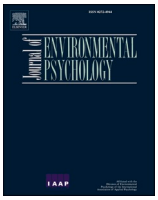

Don't bug me!: The role of names, functions, and feelings in shaping children's and adults' conservation attitudes about unappealing species

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ABSTRACT

Current threats to biodiversity are profound, yet relatively little is systematically known from controlled studies about the factors that promote conservation attitudes, moral concern, and environmentalist behavior in relation to endangered species that are unfamiliar or aversive. In two experiments, we drew on cognitive and developmental research to explore the causal influence of scientific naming, and conceptual information about anthropocentric or biocentric functional effects on US urban adults' (Study 1) and 9- to 11-year-old children's (Study 2) attitudes about conserving recently discovered insects. We also explored whether negative emotional reactions outweigh conceptual information about names and functions when predicting conservation concern. In Study 1, scientific labels largely had no effect on urban adults' baseline ambivalence about the importance of conserving unfamiliar arthropods. However, conservation concern was increased by hearing about the insects' functional behavior, particularly anthropocentric functions that benefit humans. Adults' feelings of disgust about the insects negatively predicted conservation attitudes; however, emotions never outweighed conceptual information in predicting adults' attitudes or behavior. Study 2 found that, as with adults, scientific labeling information either had no, or a negative, impact on urban fourth and fifth graders' baseline ambivalence to preserving unknown insects. However, both biocentric and anthropocentric functional information increased concern: Fourth graders were particularly moved by biocentric functions while fifth graders showed a greater anthropocentric bias. Children's emotional reactions were also predictive. Unlike with adults, children's feelings sometimes outweighed effects of conceptual information in predicting conservationist responses. Together, these findings illuminate developmental trajectories in conservation attitudes, especially biocentrism, in urban US children and adults. They also shed light on factors that can be manipulated (e.g., by communication specialists) to provoke conservation concern. Importantly, they clarify the role of words, functions, and feelings in shaping social and moral attitudes.

> "Doesn't matter what they call you … it's the deeds that make the man."
>
> Clint Eastwood-Spirit of the West in "Rango" (2011): Paramount Pictures.

1. Introduction

It has become a truism to suggest that the value of a person lies in their actions not their title. Does this truism extend to how we evaluate species of non-human living things? If so, what kinds of actions are most likely to prompt people to value and show moral concern for non-human organisms, especially those that are often seen as unappealing or aversive? An answer to these questions is consequential for both current and future generations. While the majority of invertebrates have yet to be scientifically studied or discovered, they constitute about 90% of the world's animal species and are crucial to global biodiversity, which is in a perilous and unprecedented decline: Over 40% of invertebrate species are predicted to become extinct within the next few decades—a circumstance that has significant implications for the health of Earth's ecosystems, for human thriving and, of course, for the animals themselves (Kellert, 1993; Sánchez-Bayo & Wyckhuys, 2019; Wilson, 1992).

Despite the importance of insects and invertebrate species, they are largely unfamiliar, and often provoke phobic rather than compassionate reactions from children and adults (Byrne et al., 1984; Kellert, 1993; Lockwood, 2013). Such a lack of positive feeling is potentially

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heightened among those living in urban contexts with lower direct exposure to nature due to urbanization processes that are increasingly restricting access to green spaces (e.g., Weizhe et al., 2014). The present research therefore takes an experimental developmental approach to systematically explore factors that might cause urban-dwelling U.S. adults (Study 1) and urban 9- to 11-year-old elementary school children (Study 2) to rate invertebrate conservation as important, to judge that allowing invertebrate extinction is morally impermissible, and to engage in behavior that might promote preservation (e.g., charitable giving), that is, variables that impact general environmental attitudes, environmental moral concern and environmentalist behavior respectively. Specifically, we examined whether an act as simple as highlighting the scientific and common category names of unfamiliar invertebrate species might enhance all three conservationist responses relative to baseline levels. We also explored whether emphasizing a species' functionally beneficial actions promotes an even stronger conservationist response relative to labeling—especially when those actions are framed in anthropocentric terms that highlight a species' utility to humans rather than in biocentric terms that emphasize their ecological benefit to other non-human species and the Earth. We manipulated this particular suite of conceptual independent variables because, as elaborated shortly, labels have general capacities to enhance the salience of the categories that they name (e.g., Waxman & Gelman, 2010) and taxonomic names have also been specifically posited as a potential avenue for promoting conservation concern (e.g., New, 2008). Likewise, functions have been identified as central to children's and adults' reasoning about why natural phenomena exist (e.g., Kelemen, 2004) and anthropocentric functions, in particular, have consistently been found to play a role in children's and adults' spontaneous justifications for why they judge certain environmentally damaging acts as immoral (e.g., Kahn, 1999).

In addition to experimentally manipulating conceptual information like labels and function to explore causal influences, in both studies, we also examined the extent to which non-rational considerations—specifically, individual differences in emotional reactions to insects—predict conservationist attitudes, moral judgments, and behaviors. Invertebrates often elicit strong negative reactions (e.g., Lockwood, 2013), and while the specific source of those reactions in adults and children is unclear—they might derive from evolutionary preparedness, social learning, or their combination (e.g., Kahn et al., 2008; Kellert, 1993; Lobue & Rakison, 2013)—they potentially represent a countervailing influence on people's rational positions on insect conservation. Sentimentalist theories that emphasize the role of emotions in moral judgment would certainly suggest that negative emotions might matter as much as, if not more than, conceptual information (e.g., Haidt, 2001; Monin et al., 2007; Young & Koenigs, 2007). Given significant proposals about the influence of an emotion like disgust on adults' moral evaluations (e.g., Olatunji & Puncochar, 2014; Piazza et al., 2018; Pizarro et al., 2011; Rozin et al., 2008), and given that insects often elicit avoidance emotions like disgust and fear (Davey, 1994; Kellert, 1993; Prokop & Fančovičová, 2013), we explored the degree to which these feelings play a special role in predicting children's and adults' conservationist responses to invertebrates. Of course, it remained possible that they might have little or no predictive effect on conservationism: prior research has found that even when children express discomfort about their experience with a mammal species (e.g., bats flying around them in a zoo exhibit), they are still capable of expressing regard for its welfare when interviewed (Kahn et al., 2008).

1.1. The power of a name

Research on factors that promote essentialism—especially research influenced by theorizing in the Whorfian tradition and related work considering communicative pragmatics—yield several reasons to suspect that taxonomically labeling an insect species with a scientific name might lead individuals to value and show moral concern for it (Bloom & Keil, 2001; Gentner & Goldin-Meadow, 2003; Whorf, 1956). First, from early in development, category labeling, in general, has the effect of promoting essentialist inferences about a category's inherent stability, coherence, boundedness, and distinctiveness (e.g., Gelman, 2003; Markman, 1989). Because category names invite the reification of natural kind identities—carving nature at perceived joints—they make labeled categories more potent as a basis for inductive inference (e.g., Gelman & Coley, 1990, 1991; Inagaki & Hatano, 2003; Waxman & Gelman, 2010; Waxman & Markow, 1995). The general capacity of a category label to enhance the sense of a category's salience and distinctiveness is therefore one broad pathway by which information about a species' scientific name might promote concern about it, especially when that species might otherwise be viewed as belonging to a nebulous superordinate class (e.g., "bugs").

However, beyond a general effect of category labeling, a pragmatic dynamic that is more specific to the communicative act of scientific naming might also promote conservation concern. As part of the study of systematics, labeling with a binomial Latin name places an organism within a formal taxonomic scheme and is inherently an act of recognition by a community of experts (Thompson, 1997). Even in the absence of understanding the detailed hierarchical structure of the Linnaean labeling system, or the related biological practice of common naming, scientific labels communicate a stamp of authority, with the designation of a Latin name potentially conveying the sense that a species is significant to science and scientists. That is, the earning of a special name from the scientific community might support the inference that the entity possesses a distinctive cluster of attributes or plays a special causal role in some system, and thus has distinguishing value. The inference that the species has particular value (e.g., to scientific understanding, to an ecosystem, or to some other beneficiary) may in turn support the idea that it is important to preserve the species, as well as the moral judgment that it would be morally wrong to harm it or let it die out.

However, despite the inferential chain that the act of category labeling might support, to our knowledge, there is—perhaps surprisingly—no work at the present time that systematically explores the influence of category naming on social and moral attitudes. This is even as taxonomic naming has been suggested in conservation theorizing as a pathway to promoting conservation concern for less salient or uncharismatic fauna (e.g., New, 2008; Thompson, 1997). Given the various mechanisms through which scientific naming might exert influence on attitudes and behavior, it seemed possible that hearing labeling information would increase conservationist responses relative to baseline among adults and children. Nevertheless, our prediction for children was somewhat equivocal because it is unclear how children in later elementary school evaluate cues that signal scientific authority.

1.2. The power of a function

Helping and hindering actions foster positive and negative sociomoral judgments about the social beings who perform them (Dahl & Killen, 2018; Hamlin et al., 2007). However, outside of the realm of social behavior, little research has explored people's evaluations and moral reasoning about living things based on their various functional actions or "deeds" (Kellert, 1993; Schönfelder & Bogner, 2017). A body of work has certainly found that children and adults construe natural phenomena in functional terms, often viewing them as existing to benefit others (Kelemen & DiYanni, 2005; Kelemen et al., 2013; but see Keil, 1992). Furthermore, recent studies have also revealed a link between adults' tendencies to view living things as existing for biological or relational functions and their propensity to moralize those actions. For example, adults with stronger teleological, purpose-based, beliefs about humans (e.g., that people exist to care for the Earth) are more likely to independently morally condemn others who fail to engage in behaviors that follow from those anthropic teleological beliefs (e.g., people who don't recycle) (Lewry et al., 2021, 2023).

Qualitative research also yields evidence of a connection between

reasoning about functional consequences and environmental attitudes. Specifically, when individuals justify their moral judgments of environmental acts or events, their rationales generally take the form of either an anthropocentric or biocentric justification (e.g., Kahn, 1999). Anthropocentric justifications prioritize human concerns and judge the morality of environmental acts by narrowly considering their functional impacts on people. An example is the justification that deforestation is wrong because it can cause flooding of human settlements. By contrast, biocentric reasoning is more egalitarian, broadly assigning inherent value and moral status to natural phenomena without prioritizing humans or utility to humans. The sub-class of biocentric ideas that can be called biocentric functional justifications therefore reference functional impacts on Earth and its constituent natural phenomena, without any special reference to people. An example is the justification that deforestation is wrong because it destroys animal habitats.

Clinical interview research has found that both adults and children, from a diversity of backgrounds, are anthropocentrically biased, even as they demonstrate capacities for biocentric reasoning in certain contexts (Kahn, 1999). For example, 7- to 8-year-old children showed that they have abilities to think in biocentric terms when asked to imagine a world in which humans do not exist (Severson & Kahn, 2010), and both pre-adolescent children and adults have been found to display higher levels of spontaneous biocentric thinking when reasoning about animals rather than whole ecosystems—with mammals (e.g., wolves) particularly likely to elicit biocentric concern (Kahn & Lourenço, 2002; Ruckert, 2016a, 2016b; see e.g., Hussar & Horvath, 2011; Pizza & Posada, 2020, for early biocentric reasoning).

One explanation that might explain this heightened response to mammals is that they readily lend themselves to being anthropomorphized, with the attribution of human-like mental states therefore potentially underlying increased tendencies to intrinsically value them or their role in the environment (e.g., Ruckert, 2016b; see also Collado & Sorrel, 2019; Pizza et al., 2020; Rottman et al., 2021). Such an explanation provides further motivation for considering organisms like insects, which are not readily anthropomorphized (e.g., Weisman et al., 2017) and as such may be less likely to get ascribed value in general and especially not for biocentric, non-human-focused reasons. We therefore thought it likely that, in both child and adult urban samples, anthropocentric rather than biocentric functions would be more likely to promote conservationist attitudes towards unfamiliar arthropods. It remained an open question whether there would nevertheless be developmental differences across urban fourth and fifth graders with, for example, biocentric functional justifications eliciting different levels of conservationist response at each grade: For example, even if it is present at earlier ages, biocentrism has been found to increase into adolescence –a pattern that has led to speculation that anthropocentrism might be a developmental prerequisite to some aspects of biocentric thought (Kahn, 1999, 2022) and one that could predict slightly stronger effects of biocentrism in fifth graders than fourth graders. On the other hand, it was possible that biocentric functional explanations might have stronger effects on urban fourth graders than fifth graders—an alternative that seemed feasible given that, at younger ages, elementary schoolers have been found to spontaneously invoke non-human beneficiaries when teleologically ascribing purposes to natural phenomena (Kelemen & DiYanni, 2005) and to afford high moral standing to non-human animals, potentially because they are less socialized to human exceptionalist norms (Wilks et al., 2021).

1.3. The power of a feeling

Emotions have long been argued to play a role in adult moral cognition with recent proposals emphasizing their role in producing or predicting moral judgments rather than just being products of them (e.g., Decety & Cowell, 2014; Haidt, 2001; Marsh, 2017; Prinz, 2007). The emotion of disgust has been a particular focus given proposals that it is a pathway for avoiding pathogen contamination (e.g., Curtis & Biran, 2001; Rozin et al., 2008), unnaturalness, or spiritual impurity (e.g., Rottman & Kelemen, 2012), and a mechanism by which phenomena are morally condemned by association (e.g., Haidt, 2001; Pizarro et al., 2011). Consistent with these claims, studies have found that induced disgust amplifies moral condemnation of people and situations (e.g., Piazza et al., 2018; Rottman et al., 2017 for overview). While debate has arisen over the size and contextual limitations of these kinds of induced disgust effects (e.g., Johnson et al., 2016; Landy & Goodwin, 2015), there are still good reasons to expect that entities like insects, which can elicit aversive responses like disgust, might themselves get devalued in ways that impact moral concern or motivations to preserve them (Rottman et al., 2020; but see Kahn et al., 2008). There were no specific predictions here given that aversive feelings about insects vary across individuals but can be present from early in development. They therefore might outweigh rational responses to conceptual information at any developmental point.

1.4. Current study

To explore the influence of conceptual information about scientific names and functional actions on urban-dwelling children's and adults' ideas about conserving insect species, adults (Study 1) and fourth- and fifth-grade elementary school children (Study 2) were randomly assigned to one of four experimental conditions. In each condition, they saw color photographs of "recently discovered" unfamiliar arthropod species and were given a verbal description of each animal's obvious physical traits. In a baseline condition, they received no further information. In the other three conditions, they either heard information about each species' scientific and common names (label condition), its functional benefits to human beings (anthropocentric condition), or its functional benefits to other living things and Earth (biocentric condition). Participants then made three judgments per trial. These probed their conservationist attitudes about the importance of conserving the species, their ideas about the moral permissibility of allowing the species to go extinct, and their desire to engage in charitable giving behavior directed at wildlife conservation (rather than human welfare). These three dependent variables were targeted because they capture a range of reasoning and decision-making with, arguably, subtly different underpinnings: while judgements of conservation importance might tap rational cost-benefit analyses, judgements of moral impermissibility might tap more abstract moral principles (e.g., welfare considerations) with greater emotional ties (e.g., Haidt, 2001). Finally, charitable choice was included to tap into more active decision-making systems and to gauge the effects of our independent variables on something with direct translational relevance, especially to those focused on crafting conservation communications that change behavior.

To explore the degree to which emotional reactions predicted environmentalist responses to unappealing species over and above contributions from any kind of conceptual information, participants were asked to provide ratings of their feelings of disgust and fear for each animal species. Fear was included because, like disgust, it is an avoidance emotion that is often strongly associated with invertebrates (Lockwood, 2013). Exploring both emotions allowed us to explore the emotion-specificity of any disgust effects.

Fourth and fifth graders (9- to-10 versus 10- to-11-year-olds) were selected as the age groups of focus for Study 2 for various reasons. First, prior work suggests that children in younger age groups find it difficult to conceive of individuals or species as permanently dying out (Kelemen et al., 2021; Poling & Evans, 2004). We therefore chose children in older age groups because this conceptual understanding was prerequisite to grasping our questions about the importance and morality of preventing insect extinction. Second, piloting revealed that, when conducting this classroom pencil-and-paper task without one-on-one adult supervision, this age range showed less confusion about the Likert scales and greater capacity to use the full range of those scales. Third, we were curious about children in elementary school grades that are often treated in the

United States as a transitional point within the primary schooling period, that is, they are seen as representing a shift from a true elementary school mentality and preadolescence (fourth grade) to rising junior high school and the independence of adolescence (fifth grade) (e.g., Finnan, 2009). The period of transition to early adolescence was interesting given early work on children's environmental moral reasoning suggesting that biocentrism might emerge or increase with the onset of adolescence (Kahn, 2022).

Power for Studies 1 and 2 was calculated based on precedent from similarly designed research (e.g., Rottman et al., 2017) and G*power online power analysis (Faul et al., 2007). Assuming a medium effect size (0.25) with an alpha = .05 and power = .80, G*Power returned a sample size of 22 adult or child participants per condition. Given Rottman et al. (2017), we decided to oversample slightly and aimed to test 25 participants per condition in Study 1 (and 30 in Study 2 in anticipation of child exclusions). This project was approved under an institutional IRB. We attained adult consent (Study 1) or parental/guardian consent and child assent (Study 2) before participants took part.

2. Study 1

2.1. Method

2.1.1. Participants

The final adult sample consisted of 103 undergraduates (M age = 19.17, SD = 1.13 years, gender: 59 women, 43 men, 1 gender unidentified) dwelling in a large city and attending a large urban university in the northeast of the United States. Participants were tested via a self-paced online survey at a time convenient to them. The task took, on average, about 11 min to complete and participants received course credit for participation. An additional 20 participants were tested but excluded for lack of completion or misunderstanding practice questions (8), or failing to follow instructions by taking excessive time to complete the survey in ways that indicated multitasking or disengagement (12).

The sample self-identified as: White (49%); Asian (33%); Black or African American (11%), multi-racial (8%). As demographic descriptive data in Table 1 indicates, the sample was mildly liberal and had spiritual beliefs but was not highly formally religious in that they did not regularly attend formal religious services. Table 2 shows the number of participants per condition in both studies. Slight inequities in numbers occurred between conditions simply because of unexpected exclusions from the adult sample.

Table 1
Mean ratings (SD) on individual difference measures.

	Baseline Condition			Average Across Conditions		
	Adults	4th	5th	Adults	4th	5th
Empathy (0–2)	1.20 (0.33)	–	–	1.23 (0.33)	–	–
Gaia (1–4)	3.06 (0.63)	–	–	3.14 (0.68)	–	–
Spiritual beliefs (1–4)	2.84 (0.86)	–	–	2.82 (0.80)	–	–
Religious attendance (1–4)	2.03 (0.96)	–	–	1.99 (0.85)	–	–
Political views (1–5)	3.44 (0.97)	–	–	3.50 (0.85)	–	–
Fear (0–6)	3.55 (1.48)	2.76 (1.61)	2.78 (1.84)	3.32 (1.51)	2.81 (1.57)	2.94 (1.58)
Disgust (0–6)	3.39 (1.46)	2.80 (1.26)	3.38 (1.95)	3.39 (1.49)	2.85 (1.41)	3.10 (1.65)
Love science (0–6)	4.11 (1.63)	4.12 (1.67)	3.76 (1.30)	4.03 (1.48)	4.07 (1.63)	3.82 (1.62)
Love nature (0–6)	3.74 (1.29)	4.30 (1.72)	4.21 (1.74)	3.96 (1.38)	4.01 (1.62)	4.23 (1.62)

Note: Higher scores on the political views variable indicate more liberal orientation.

Table 2
Sample size by group and condition.

	Condition			
Group	Baseline	Label	Anthropocentric Function	Biocentric Function
Adults	27	28	25	23
4th Graders	33	29	27	30
5th Graders	29	27	30	29

2.1.2. Materials and design

Participants were randomly assigned to one of four between subject conditions. In each condition, they saw the same color photographs of six insect species (see sample in Fig. 1) that were all presented as "recently discovered," but the information offered about the insects varied. Table 3 summarizes the introductory framing for each condition and samples of the information that were provided. Participants looked at a photo of a member of each species before reading any information about it. Tables with additional information about each condition and photographs of all invertebrates are provided in the supplemental materials at: https://osf.io/z35b4/?view_only=40a2375a64fe45ed8db95f0e5abd9295.

The unfamiliar organisms were physically varied and included species of dobsonfly, digger wasp, mole cricket, millipede, diving beetle, and sawfly–some of which are not technically insects but are likely to be construed as "bugs" given their invertebrate arthropod appearance. Across conditions, information about each species was roughly equivalent in length.

In the baseline condition, participants did not get any information about each insect beyond reading a description of physical characteristics that were already visible from the photograph (e.g., it has a flat body, grooved shell, and two beak-like mouth parts on the sides of its head) plus a behavioral fact that was also obvious based on the insects' physical appearance (e.g., this species swims quickly because of its flipper-like legs). In the label condition, participants read the description of the insects' visible physical characteristics and also read the binomial name that scientists had given the species (e.g., Corydalus cornutus) along with a common name (e.g., dab fly). In the anthropocentric function condition, participants read a description of the insects' visible physical characteristics and an unobservable behavior with functional benefit to humans (e.g., it keeps drinking-water clean for people because it eats animals that have died in the water). In the biocentric function condition, participants read a description of the insects' visible physical characteristics and an unobservable behavior with functional benefit to the Earth, plants, or other animals (e.g., it keeps drinking-water clean for

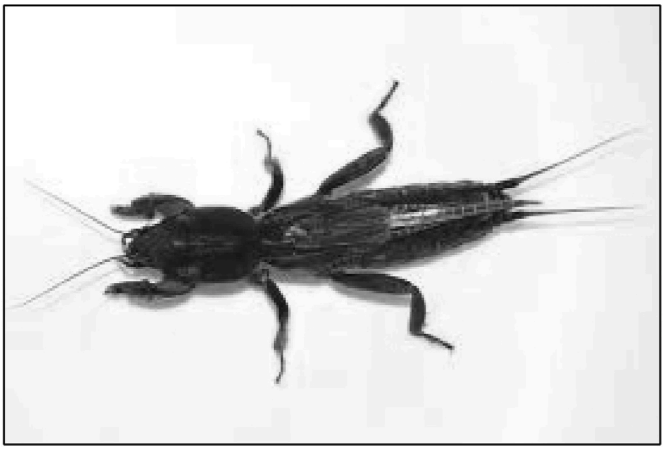

Fig. 1. Sample insect photograph (Scapteriscus vicinus or "dun dipper").

Table 3
Introduction and sample of the section of the description that differed in each condition.

	Introduction to Questions	Sample Description
Baseline	I'm going to tell you something about each species. For example, part of discovering a species is to find out what it is like. I might tell you about that.	Scientists found that this species jumps a long way because of its leg muscles.
Label	I'm going to tell you something about each species. For example, part of discovering a species is to give it a two-part scientific name that tells people what other animals it belongs with, but also how it is different. I might tell you about that.	Scientists have given this species the two-part name, Scapteriscus vicinus, but its everyday name is the dun dipper.
Anthropocentric Function	I'm going to tell you something about each species. For example, part of discovering a species is to find out what it does. I might tell you about that.	Scientists found that this species digs tunnels that put air in the soil–because of that, people's crops grow better.
Biocentric Function	I'm going to tell you something about each species. For example, part of discovering a species is to find out what it does. I might tell you about that.	Scientists found that this species digs tunnels that put air in the soil–because of that, trees in the forest grow better.

other creatures in the environment because it eats animals that have died in the water). The functions stated in the anthropocentric and biocentric function conditions were matched aside from statements that identified humans versus other non-human living things (or the environment) as functional beneficiaries. In all conditions, insects were presented in one of two counterbalanced orders.

After reading about each insect, participants responded to two conservation judgment questions in a fixed order: the conservation importance question and the forced choice moral judgment question. After responding about all six insects, they then answered a more active behavioral question about their charitable giving choice. There were therefore 13 questions.

2.1.2.1. Conservation importance question: For each insect, participants were asked, "How important is it that this animal is protected and saved so it doesn't die out?" They indicated their response on a 7-point Likert scale (0 = not at all important, 3 = sort of important, 6 = extremely important) that also visually represented continuously increasing levels of conservation importance using shaded circles (e.g., 0 = unshaded, 6 = fully shaded).

2.1.2.2. Moral judgment question: Following prior cognitive developmental research with a similar design (e.g., Rottman et al., 2017), participants circled their response to the forced-choice question "Would it be OK or wrong to let this species die out so that there are none left on Earth?" Left or right positioning of "OK" or "wrong" was counterbalanced.

2.1.2.3. Charitable choice behavior: Participants were shown an image of a $5 bill and brand logos for two fictitious charity foundations: the "Protect People Foundation" and the "Wildlife Protection Fund". They circled which of the two charities they would prefer to help with the gift of $5. Left or right positioning of each logo was counterbalanced across participants. Participants were asked to make a charitable-donation choice because giving to private charities is a normative practice in U.S. families and therefore offered an ecologically valid behavioral choice context for children and adults. We asked individuals to make a choice between charities rather than engage in a dichotomous yes/no forced-choice about their willingness to pay each charity because it was expected that demand characteristics would lead to a response bias that would overrepresent willingness to pay to both charities and give us less insight into participants' anthropocentric versus biocentric orientations.

2.1.2.4. Emotion measures: After completing the 13 initial test questions, participants were presented with the photo of each insect once again and rated their emotional reactions to them, specifically, how disgusting and frightening they found each insect ("If you saw this animal in its natural environment, how gross and disgusting (scary and frightening) would you find it?"). Answers were given on a 7-point Likert scale that used shaded circles to represent an increasingly strong emotional reaction (0 = not at all (unshaded), 6 = extremely (fully shaded)).

2.1.2.5. Additional individual difference measures: Participants' empathic tendencies were explored using 10 items representing the cognitive and emotional reactivity subscales of the Empathy Quotient questionnaire (Lawrence et al., 2004; Muncer & Ling, 2006). Sample statements are: "I'm good at predicting how someone will feel" and "I really enjoy caring for other people" (1 = strongly agree, 4 = strongly disagree). They were also asked to rate their personal beliefs (1 = strongly disagree, 4 = strongly agree), including their spiritual-religious beliefs ("I believe in a higher power", "I believe in souls", "I am a spiritual person") and secular spiritual "Gaia" beliefs about intrinsic agency in nature ("I believe that Nature is a powerful being", "I believe that the Earth is alive") (Kelemen et al., 2013). Finally, participants also rated statements about their political views (1 = very conservative, 5 = very liberal), formal religious attendance (1 = never, 4 = more than once a week), and personal interests with a specific focus on their self-rated love of science and love of nature (0 = not at all, 6 = extremely) (see supplementary materials for additional personal data).

2.1.3. Procedure

Participants read that they would be answering questions about several insect species that have only recently been discovered by scientists and that there were no right or wrong answers to these questions. They then completed three practice questions that were unrelated to the focus of the study (e.g., "How important is it for people to make their bed every day?") to familiarize them with the kinds of 7-point Likert scale being used. These questions also functioned to reveal whether participants understood the scales and were engaged and paying attention because the practice items were highly unlikely to elicit the same response. People who answered the same way on all three items were excluded (n = 6).

After completing these practice questions, participants were given an introduction that was specific to their condition (see Table 3). Following this introduction, they were asked for their conservation judgments on a practice trial (woodlouse), which was not included in any analyses but served to familiarize them with the scale labels for the conservation importance rating and forced choice moral judgment. They then proceeded through the remaining questions.

2.2. Study 1 results

Data, analytic syntax and supplementary materials with additional analyses are available at: https://osf.io/z35b4/?view_only=40a2375a64fe45ed8db95f0e5abd9295.

2.2.1. Effects of information on adults' conservation attitudes and behavior

2.2.1.1. Conservation importance scores. A conservation importance score was calculated by averaging each participant's ratings on the six test trials (range: 0–6). In the baseline condition, the averaged ratings were at the midpoint with adults viewing it as "sort of important" that the insects were protected and saved. A one-way ANOVA with conservation importance as the dependent variable and condition as the independent variable revealed a significant effect of condition, $F(3, 99) = 7.34$, $p < .001$, $\eta_p^2 = 0.18$ (see Fig. 2).

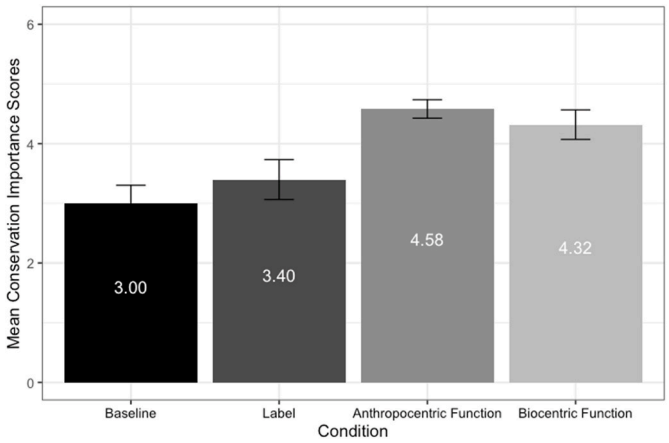

Fig. 2. Mean conservation importance scores by condition. Note: Error bars represent ±1 standard error.

Post hoc analyses with Bonferroni corrections for multiple comparisons found that adults in the label condition behaved no differently than those in the baseline condition. However, those in the anthropocentric function ($p < .001$, 95% C.I. = [0.53, 2.63], $d = 1.27$) and biocentric function ($p = .008$, 95% C.I. = [0.25, 2.39], $d = 0.95$) conditions both rated protecting insects as more important than those in the baseline condition with adults in the anthropocentric function condition also rating the importance of protection more highly than those in the label condition ($p = .017$, 95% C.I. = [0.15, 2.22], $d = 0.86$). No other comparisons were significant.

2.2.1.2. Moral judgments. A composite moral judgment score was created by calculating the proportion of times that participants indicated it would be "wrong" to allow the six insect species to die out (range: 0–1). In the baseline condition, participants responded that it would be wrong to let the insects go extinct more than half of the time (64%). A one-way ANOVA with conservation moral judgments as the dependent variable and condition as the independent variable revealed a significant effect of condition, $F(3, 99) = 4.55$, $p = .005$, $\eta_p^2 = 0.12$ (see Fig. 3). Post hocs with Bonferroni corrections showed that participants in the label condition behaved no differently than those in the baseline condition. However, participants in the anthropocentric function condition gave more "wrong" judgments than those in the baseline condition, $p = .012$, 95% C.I. = [0.05, 0.56], $d = 0.89$. No other comparisons were significant.

2.2.1.3. Charitable choice behavior. In the baseline condition, adults were strongly anthropocentric and inclined to pick the charity that protected humans (74%) over one that protected wildlife. A binary logistic regression with charity as the dependent variable and condition as the independent variable was compared to a model that did not include condition. The comparison showed that including condition significantly improved model fit, $\chi^2(3) = 15.20$, $p < .01$. We therefore conducted all pairwise comparisons between the four conditions with Bonferroni corrections. Participants in the label condition were more likely than those in the baseline condition to choose the wildlife charity, $b = 1.64$, $z = 2.77$, $p = .03$, OR = 5.14, 95% C.I. = [1.68, 17.29], and so were participants in the anthropocentric function, $b = 2.20$, $z = 3.43$, $p < .01$, OR = 9.05, 95% C.I. = [2.72, 34.46] (see Fig. 4). No other comparisons were significant.

2.2.2. The role of emotions in adults' conservation judgments and behavior

To explore the extent to which emotions predict conservationist responses over and above the effects of any kind of conceptually relevant information, we created a mean disgust rating and a mean fear rating for each participant (range: 0–6). We also created an average empathy score by coding responses following Lawrence et al. (2004) and Muncer and Ling (2006). Non-empathic scores (3–4) were given a 0. Empathic scores (1–2) were recoded as either 1 or 2 depending on the strength of response. Table 1 displays descriptives. There were no condition differences in adults' empathy scores or self-reported fear or disgust reactions. Mean coded empathy self-ratings in the baseline condition showed that participants who got no additional information about the insects saw themselves as strongly empathic ($M = 1.20$, $SD = 0.33$).

In the baseline condition, adults' average ratings of their own feelings of disgust and fear about the insect species were past the midpoint of the 0–6 scale such that they evaluated them negatively as more than "sort of gross" or "sort of scary" (disgust: $M = 3.39$, $SD = 1.46$; fear: $M = 3.55$, $SD = 1.48$). Controlling for condition, we conducted a linear regression with mean conservation importance ratings as the dependent variable and mean disgust, fear, and empathy ratings scores as the predictors. This model revealed a significant negative effect of disgust ratings on participants' conservation attitudes: Increased disgust ratings were associated with lower conservation importance scores, $b = -0.41$, $F(1, 96) = 7.20$, $p < .009$, $\eta_p^2 = 0.07$. There was also a positive effect of empathy: Increased empathy scores were associated with higher importance scores, $b = 1.02$, $F(1, 96) = 6.89$, $p = .01$, $\eta_p^2 = 0.07$. Fear scores had no significant effect, $p = .42$. Furthermore, condition remained a highly significant predictor in this model, $F(3, 96) = 9.65$, $p < .001$, $\eta_p^2 = 0.21$, indicating that both conceptual information and emotion contributed to participants' conservation importance ratings.

A linear regression was conducted to examine the effect of empathy, fear, and disgust on participants' forced choice moral judgments, controlling for condition. Patterning with conservation importance ratings,

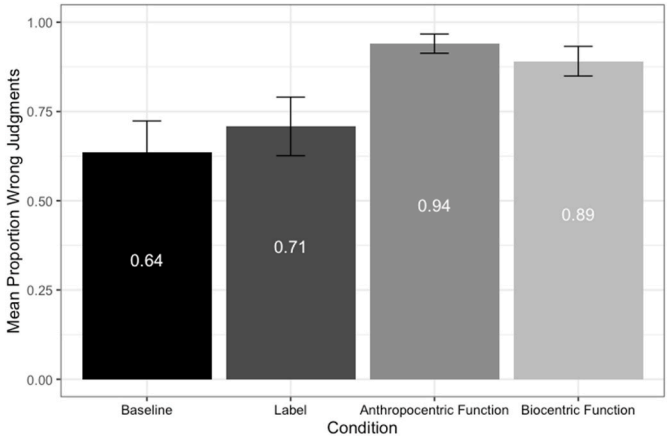

Fig. 3. Mean proportion of times adults morally judged that it would be "wrong to allow the species to die out" by condition. Note: Error bars represent ±1 standard error.

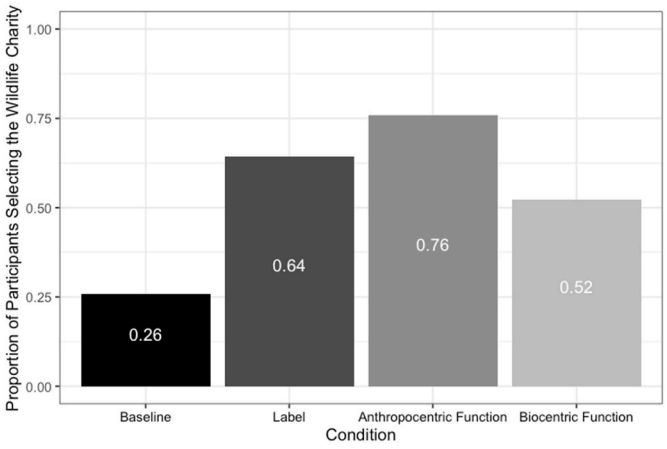

Fig. 4. Proportion of adults giving to the wildlife protection charity rather than the human welfare charity by condition.

it also revealed a significant negative effect of disgust, b = −0.09, F(1, 96) = 6.16, p = .01, η_p^2 = 0.06, and positive effect of empathy, b = 0.33, F(1, 96) = 12.61, p < .001, η_p^2 = 0.12, but no effect of fear ratings, p = .41. Again, condition remained a significant predictor in this model, F (3,96) = 6.09, p < .001, η_p^2 = 0.16, indicating that both emotion and conceptual knowledge contributed to participants' judgments about the immorality of allowing unfamiliar insects to go extinct.

Finally, we used logistic regression to explore the effects of empathy, fear, and disgust on participants' wildlife conservation behavior, controlling for condition. This showed no effects of any of these emotion scores, ps > .05. In this model, condition was the only significant predictor, $\chi^2(3)$ = 15.75, p = .001, indicating that for charitable giving choices, conceptual information rather than emotion was most relevant to decision-making about money.

2.2.3. Influence of personal beliefs

Table 1 summarizes average personal belief scores. Composite Gaia and spiritual belief scores each revealed that adult participants–who tended politically liberal– were well above the midpoint of the scales in actively endorsing Gaia beliefs and spiritual beliefs. Exploratory linear regressions were conducted to examine the effects of Gaia beliefs, spiritual beliefs, and political beliefs on conservation importance scores and moral judgments, controlling for condition. None of these individual differences were related to conservation importance scores, ps > .05. However, political beliefs were related to moral judgments. Participants who reported more liberal political beliefs more frequently judged allowing insects to go extinct as morally wrong, b = 0.09, F(1, 96) = 4.68, p = .033, η_p^2 = 0.05. A logistic regression found no significant relationships between these personal belief measures and charitable choice behavior, ps > .05.

We had collected rating data on participants' personal interests in science and nature given that prior research has suggested that an orientation to nature (e.g., time in nature, connectedness to nature) is relevant to environmental attitudes and behavior (e.g., Nisbet et al., 2009; Yang et al., 2018) and we were curious whether interest in understanding the natural world through a love of science might also have predictive effects. Descriptive data indicated that adult participants tended to report loving science and nature (see Table 1). Linear regressions were conducted to examine the effects of participants' love of science and love of nature on conservation importance scores and moral judgments, controlling for condition. Participants' love of nature was positively related to both outcome measures, but love of science was not. Specifically, participants who reported greater love of nature rated protecting insect species as more important, b = 0.33, F(1, 97) = 11.48, p = .001, η_p^2 = 0.11, and more frequently judged allowing insects to go extinct as morally wrong, b = 0.07, F(1, 97) = 7.59, p = .007, η_p^2 = 0.07. A logistic regression also revealed that participants who reported greater love of nature were more likely to donate to a wildlife charity, b = 0.71, z = 3.53, p < .001, OR = 2.04, 95% C.I. = [1.41, 3.13]. In all of these individual difference analyses, condition remained a significant predictor.

2.3. Discussion

Our results found that, at baseline, U.S. urban-dwelling adults are relatively ambivalent about the conservation of unfamiliar insects, rating conservation as only "sort of important" and judging it morally acceptable to allow unfamiliar insect extinction on 36% of forced choice trials. When deciding on a potential recipient of a small donation, at baseline, adults also strongly privileged a human-focused charity over one focused on wildlife conservation.

However, our findings also show that, despite this ambivalence and distinctly human-centered behavior, information that adults receive about unfamiliar species can influence these inclinations. Specifically, actions speak louder than words and, in particular, human-benefitting deeds consistently carry the most weight in terms of impacting urban adults' care and conservation concern for unappealing species. Such findings patterned with our predictions and are consistent with work suggesting that human concerns can sometimes be leveraged to promote environmentalist convictions and animal conservation (Maibach et al., 2010; Nisbet et al., 2012; Rottman et al., 2015, for review).

By contrast, recognition of a species' essential distinctiveness—as signaled by information communicated by its scientific name—largely had no impact except on one measure, charitable choice behavior, where label information matched the impact of anthropocentric function information in promoting donations to a wildlife conservation charity over a human-focused charity. The reasons for this solitary effect of labeling are unclear. One possibility is that in the more active charitable choice behavior context, the species labeling not only served to highlight the existence of distinctive, novel wildlife species that need protection but also the existence of charities that focus not only on conservation but on scientific discovery and, arguably, human-relevant interests. That is, in the label condition, the information on scientific naming might have prompted participants to consider the wildlife protection charity as having a more multifaceted animal and human-serving mission than the human protection charity and thus deserve more resources. It is possible that enhanced giving to the wildlife charity by those in the anthropocentric condition might have been for related reasons. That is, in context of being encouraged to think about insects as benefiting humans, the wildlife charity might have been seen as benefiting humans in numerous different ways while the human protection charity was only seen as performing one circumscribed function.

Finally, our data confirm that, in addition to being influenced by conceptual information, adults' conservationist responses were also affected by emotional reactions. Disgust trumped fear such that the more disgust that our participants felt about the newly discovered species, the less likely they were to care about them and the more likely they were to feel that it would be morally permissible to let them go extinct. Furthermore, consistent with research suggesting the centrality of empathy to morality (e.g., Marsh, 2017), people who reported greater self-reported care for, and understanding of, others' feelings were more inclined to report conservationist convictions. The exception to this pattern of influence was the lack of any effect of emotion on the more active behavioral measure of charitable giving choice. Specifically, and informatively, in a context involving monetary decisions, conceptual information alone was predictive of adults' responses.

One other individual difference was also, perhaps unsurprisingly, consistently found to predict adults' greater care and concern about living things across all measures: their self-ratings of their love of nature (Clayton et al., 2017). Along with experimental condition, it played a predictive role while exploratory analyses found that other potentially relevant personal characteristics had no influence (e.g., spirituality and Gaia belief) or only inconsistent influence (i.e., liberal political orientation). Confirming the generalizability of these patterns–and, indeed, the generalizability of all these research findings–beyond the relatively young and educated urban-dwelling sample of university students studied here remains an important goal for further research. Nevertheless, the current results raised interesting questions about the substantial predictive influence of emotion as well as cold cognition on urban-dwellers' conservation attitudes and about the status of urban-based adults' marked anthropocentric tendencies in earlier development. In Study 2, we therefore explored whether urban fourth and fifth grade elementary school children showed similar patterns of response.

3. Study 2

3.1. Method

3.1.1. Participants

The final child sample consisted of 119 fourth graders (M age = 10 years, SD = 5 months; range: 9 years–11 years; gender: 43 boys, 75 girls,

1 not reported) and 115 fifth graders (M age = 11 years, 1 month, SD = 4.5 months; range: 10 years–12 years; gender: 51 boys, 63 girls, 1 not reported) who were attending a parochial (43% of sample) or one of two public (57% of sample) schools in the Greater Boston area. One additional classroom was tested but replaced when it was discovered that the teacher had talked to the children about the study before participation. Data from two children were excluded because their practice trial performance revealed that they did not understand the 7-point Likert scale. The three schools drew from a low income urban neighborhood ($47,000 per capita income, 51% adults with bachelors degree), a low-to-medium income urban neighborhood ($53,000 per capita income, 65% adults with bachelors degree) and a high income suburban neighborhood that was nevertheless close to the urban center (per capita income: $73,000, 79% adults with bachelors degree). School demographic data indicated that the three racial-ethnic groups that were most highly represented at each of the three schools were respectively: school in low income urban neighborhood–Black (42%), Hispanic (36%), White (12%); school in low-to-medium income urban neighborhood–White (59%), Asian (13%), Hispanic (8%); school in high income suburban neighborhood–White (71%), Asian (15%), Black (3%).

3.1.2. Materials and design

The materials and design of Study 2 were identical to Study 1 except that, for length reasons, students were not asked to complete the Empathy Quotient, which is a measure that has also not been validated with children. They also did not complete additional measures of their personal beliefs (e.g., politics, religion, spiritual) although, like adults, they did report various aspects of their personal interests including interests in science and nature. Each participating classroom was divided, by random assignment, into four groups corresponding to the four experimental conditions. As Table 2 shows this ultimately led to some differences in the numbers of children assigned to each condition because some classrooms were smaller and had uneven numbers of children. It took approximately 25 min for each child to complete the pencil-and-paper task as experimenters guided and paced each of the small groups of physically-distanced children through the study materials, reading them aloud and asking the questions.

3.2. Results

3.2.1. Effects of information on children's conservation attitudes and behavior

3.2.1.1. Conservation importance scores. An average conservation importance score was calculated (range: 0–6). In their baseline condition ratings of conservation importance, fourth and fifth graders were both above the midpoint of the scale and judged it more than "sort of important" to protect and save the insects. A 4 (condition) x 2 (grade) ANOVA with conservation importance scores as the dependent variable revealed a significant effect of condition, $F(3, 226) = 24.28$, $p < .001$, $\eta_p^2 = 0.08$, and significant condition by grade interaction, $F(3, 226) = 4.06$, $p = .008$, $\eta_p^2 = 0.05$ (see Fig. 5).

To understand the interaction, follow-up one-way ANOVAs by condition were conducted on each grade along with simple effects analyses with Bonferroni corrections for multiple comparisons. These revealed an effect of condition within each grade (fourth graders, $F(3, 115) = 6.58$, $p < .001$, $\eta_p^2 = 0.15$; fifth graders, $F(3, 111) = 21.18$, $p < .001$, $\eta_p^2 = 0.36$). Specifically, fourth graders rated conservation importance more highly in the biocentric function condition than in both the baseline ($p < .001$, 95% C.I. = [0.38, 1.81], $d = 1.04$) and label conditions ($p = .038$, 95% C.I. = [0.03, 1.50], $d = 0.76$), while the anthropocentric function condition differed only from baseline ($p = .023$, 95% C.I. = [0.07, 1.54], $d = 0.73$). By contrast, among fifth graders, both anthropocentric and biocentric function conditions were assigned higher conservation importance ratings than the baseline ($p < .001$, 95% C.I. = [0.73, 2.27], $d = 1.31$, $p < .001$, 95% C.I. = [0.60, 2.15], $d = 1.20$, respectively) and label conditions ($p < .001$, 95% C.I. = [1.07, 2.64], $d = 1.78$, $p < .001$, 95% C.I. = [0.94, 2.52], $d = 1.66$, respectively). Furthermore, fifth graders' ratings in the label conditions tended to be depressed. Analyses of the condition by grade interaction indicated they were lower relative to fourth graders' label condition ratings ($p = .002$, 95% C.I. = [−1.49, −0.36], $d = 0.80$), suggesting that communicating information about the scientific name of a newly discovered living thing can lead some children to devalue it. No other differences were found.

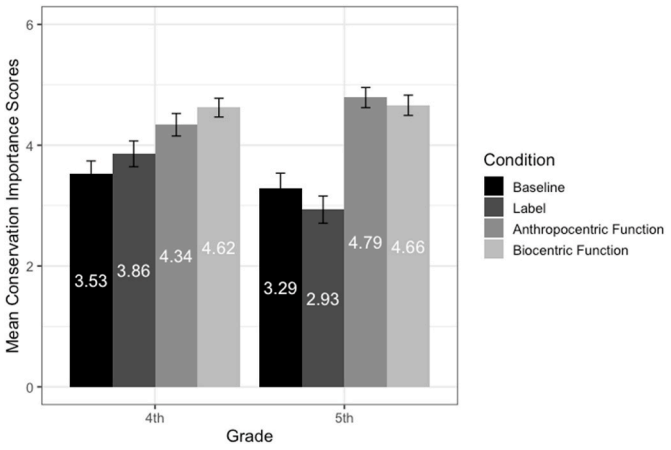

Fig. 5. Mean conservation importance scores by condition and grade Note: Error bars represent ±1 standard error.

3.2.1.2. Moral judgments. A moral judgment score was calculated which reflected the proportion of times that participants in each grade indicated it would be "wrong" to allow the six insect species to die out (range: 0–1). In the baseline condition, both fourth and fifth graders displayed a marked sense that it would be wrong to allow insect extinction (fourth: 84%; fifth: 72%) (See Fig. 6).

A 4 (condition) x 2 (grade) ANOVA with moral judgment scores as the dependent variable revealed a significant effect of condition, $F(3, 226) = 2.68$, $p = .048$, $\eta_p^2 = 0.01$, and a significant grade and condition interaction, $F(3, 226) = 2.91$, $p = .04$, $\eta_p^2 = 0.04$. To explore the interaction, we conducted follow-up one-way ANOVAs as well as post hoc analyses with Bonferroni corrections and found different response patterns in each grade (see Fig. 6). Fourth graders' moral concern for insects did not differ by condition, $F(3, 115) = 1.10$, $p = .35$, but fifth graders did, $F(3, 111) = 4.07$, $p = .009$, $\eta_p^2 = 0.10$. Fifth graders in the

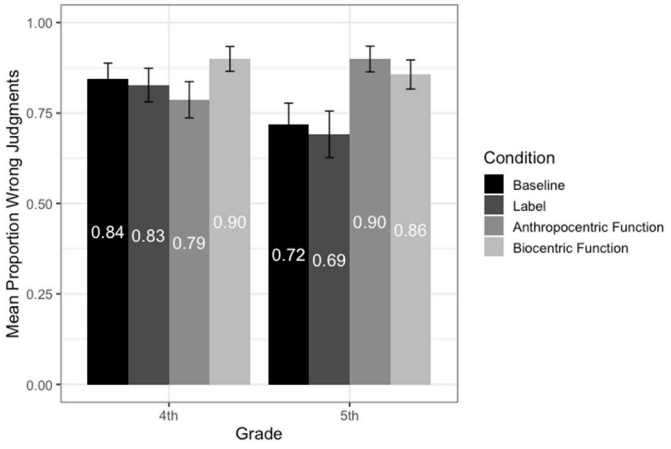

Fig. 6. Mean proportion of times children made the moral judgment that it would be "wrong to allow the species to die out" by condition and grade. Note: Error bars represent ±1 standard error.

anthropocentric function condition showed significantly more moral concern than those in the label condition (p = .027, 95% C.I. = [0.02, 0.40], d = 0.77) with a trending, but statistically non-significant difference from the baseline condition too (p = .07, 95% C.I. = [−0.01, 0.37], d = 0.69). As with conservation importance scores, the grade by condition interaction occurred because the label condition yielded lower concern among fifth than fourth graders (p = .048, 95% C.I. = [−0.27, −0.002], d = 0.46), suggesting again that scientifically-relevant naming information about the newly discovered living things had a devaluing effect.

3.2.1.3. Charitable choice behavior. In contrast to adults' pattern, fourth and fifth graders tended to select the Wildlife Protection Fund more often than the Protect People Foundation for their charitable donation at baseline (fourth: 70%; fifth: 62%). A logistic regression was used to predict conservation behavior from condition, grade, and their interaction. This revealed no significant effect of condition but a significant interaction between condition and grade, $\chi^2(3) = 8.37$, p = .04. Given the significant interaction (see Fig. 7), we explored the effect of condition on conservation behavior at each grade level using logistic regression with Bonferroni corrections. Fourth graders in the biocentric function condition were more likely to choose the Wildlife charity than those in the label condition (b = 2.26, z = 3.18, p < .01, OR = 9.64, 95% C.I. = [2.65, 46.94]). By contrast, fifth graders' tendency to give to the Wildlife charity did not differ by condition.

3.2.2. The role of emotions in children's conservation judgements and behavior

To explore whether children's emotional reactions to the insects predicted their conservation responses over and above the effects of any conceptual information, mean disgust and fear ratings were calculated for each grade (see Table 1). In the baseline condition, fourth and fifth graders' average ratings of disgust and fear for the insect species were slightly less than, or around, the mid-point of the 0–6 scale ("sort of gross or scary"). No differences by grade (including in exploratory analyses with undergraduates) were found in these variables (ps > .05). We conducted two linear regressions, the first predicted conservation importance scores from participants' mean disgust ratings and mean fear ratings. The second predicted moral judgments from the emotion ratings. Both analyses controlled for condition, grade, and the interaction between condition and grade. Comparable to a pattern seen in Study 1 with adults, higher disgust ratings predicted lower conservation importance scores, b = −0.30, F(1, 223) = 16.36, p < .001, $\eta_p^2 = 0.07$. Unlike this adult pattern, children's fear ratings also predicted their responses albeit in an unexpected direction because greater fear predicted higher conservation importance scores, b = 0.15, F(1, 223) = 4.15, p = .043, $\eta_p^2 = 0.02$. Condition remained a significant predictor, F (3, 223) = 22.24, p < .001, $\eta_p^2 = 0.23$, as did the interaction between condition and grade, F(3, 223) = 5.21, p = .002, $\eta_p^2 = 0.07$. Conceptual information and emotion therefore both significantly contributed to participants' conservation importance scores.

Higher disgust ratings also predicted lower moral condemnation for allowing the insects to go extinct, b = −0.06, F(1, 223) = 13.10, p < .001, $\eta_p^2 = 0.06$, but fear did not, p = .13. Condition did not predict moral judgments, F(3, 223) = 2.0011, p = .115, $\eta_p^2 = 0.03$, except as part of a condition by grade interaction F(3, 223) = 3.13, p = .027, $\eta_p^2 = 0.04$: fourth graders' moral judgments were predicted by disgust (b = −0.06, F (1,112) = 6.02, p = .016, $\eta_p^2 = 0.05$) but not conceptual information (p = .115) while both disgust (b = −0.06, F(1,109) = 5.75, p = .018, $\eta_p^2 = 0.05$) and conceptual information (F(3, 109) = 4.06, p = .009, $\eta_p^2 = 0.10$) contributed to fifth graders' moral judgments.

We computed an additional logistic regression to predict children's charitable choice behavior from emotion ratings while controlling for condition, grade, and the interaction between condition and grade. This revealed that for children, disgust ratings predicted charity choice. Children who expressed more disgust were less likely to support the Wildlife Protection Fund, b = −0.49, z = −2.91, p = .004, OR = 0.61 C. I. = [0.43, 0.84]. No other predictors were significant including condition and the interaction between condition and grade. In contrast to the pattern in adults, emotion therefore outweighed conceptual information in children's reasoning about monetary donations.

3.2.3. Influence of personal interests

As Table 1 indicates, children's mean self-rated love of science and nature were all above the midpoint. Analyses found no differences by grade (including in exploratory analyses with undergraduates) in these variables (ps > .05).

Two linear regressions examined the effects of these variables on children's conservation importance attitudes and their moral judgment over and above the effect of condition, grade, and their interaction. Love of nature predicted both dependent measures. Children who reported more love of nature rated protecting insect species as more important, b = 0.18, F(1, 223) = 15.18, p < .001, $\eta_p^2 = 0.06$, and more frequently judged allowing insects to go extinct as morally wrong, b = 0.03, F(1, 223) = 8.11, p = .005, $\eta_p^2 = 0.04$. A logistic regression also revealed that participants who reported greater love of nature were more likely to donate to a wildlife charity, b = 0.44, z = 4.14, p < .001, OR = 1.55, 95% C.I. = [1.27, 1.93]. In these analyses, condition remained a significant predictor of conservation importance scores and moral judgments alongside personal interests. However, condition was no longer a predictor of charitable choice behavior. Personal interests therefore outweighed conceptual information in decisions about monetary donations.

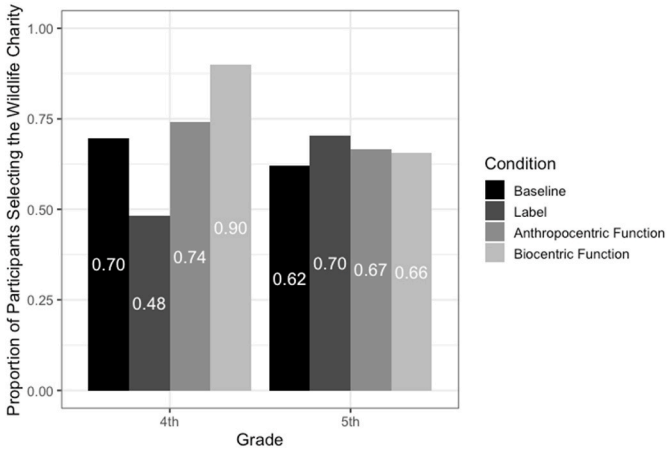

Fig. 7. Proportion of children giving to the wildlife protection charity not the human welfare charity by condition and grade.

3.3. Discussion

Like adults in Study 1, fourth and fifth grade children in Study 2 were generally ambivalent in their mean ratings of the importance of insect conservation at baseline. Nevertheless, exposure to certain kinds of conceptual information promoted concern, and revealed subtly different patterns in children's conservation stances across development.

In general, children of both grades behaved no differently in the label condition compared to the baseline condition. In consequence, our opening quote appears to capture a truth when asserting that "it doesn't matter what they call you". Emphasizing the essential distinctiveness and expert recognition of newly discovered species via scientific labels and common naming does little to promote conservationist inclinations towards unfamiliar insects. Indeed, naming actually depressed care and concern among children. For example, while the sole effect of labeling information among adults was to enhance their behavioral choice to donate to a wildlife charity, there were signs that the same kind of information reduced that desire among fourth graders, despite their consistently more marked conservationist orientation in baseline

conditions. These kinds of devaluing effects also occurred among fifth graders too.

There are several reasons why labels might have had this effect despite the fact that children had been told about the significant function that such names serve. While the information conveyed by classificatory Linnaean binomials is hugely informative to scientists, for fourth and fifth graders—even those who self-report loving science (see Table 1)—the Latin terms may have felt esoteric, arcane and off-putting even as they were accompanied by more accessible common names (Berenbaum, 1995). Furthermore, in the face of the natural curiosity that the children might have had about the "recently discovered" animals, the communication of naming information in lieu of any other facts about function or behavior may have simply been disappointing and, in violating pragmatic expectations (e.g., about receiving functional information (Kelemen, 2012)), created a generally negative attitude towards the insects. This kind of finding is cautionary in light of elementary teachers' tendencies to privilege scientific labeling information over other kinds of explanatory information when teaching young children scientific content (e.g., Betz et al., 2021; Betz & Keil, 2021; Glen & Dotger, 2009; Snow, 2008).

While labels did not facilitate protective responses to insects, functional information or "deeds" did, although patterns in the way the two kinds of functional information impacted fourth and fifth graders differed. Among fifth graders, biocentric function information was far from ineffective but, across all dependent variables, anthropocentric function information showed greater consistency in its power to boost conservation attitudes and moral concern over baseline judgments—indeed, it was the only kind of functional information to markedly increase conservation concern over baseline when fifth graders made moral judgements. The patterns in the present fifth graders are therefore consistent with predictions that these early adolescents would be anthropocentrically biased, despite having clear capacities to think in biocentric ways about nature.

By contrast, fourth graders' overall pattern of response differed slightly from that of fifth graders' and converged with prior research suggesting that young children are particularly likely to be biocentric when considering animals (e.g., Pizza & Posada, 2020; Ruckert, 2016a) and to afford animals moral standing (Wilks et al., 2021). Specifically, while anthropocentric function information enhanced fourth graders' quite marked baseline conservation concern, their ratings of conservation importance, and donations to wildlife causes, were particularly amplified by hearing biocentric function information. This overall pattern of difference within fourth and fifth graders was present even though, across grades, children did not differ in relevant ways such as in their self-reported love of nature. In consequence, a biocentric functional construal therefore seems to be a readily available guide to urban preadolescents' environmental moral reasoning, and this is true even when they are reasoning about relatively unappealing animal kinds that are difficult to individuate and anthropomorphize. Indeed, taken together, the patterns observed within each age group suggest that in an urban sample, the general developmental trend is to move towards a greater weighting of human priorities and concerns with age and experience.

This raises the question of what might account for the shifting patterns between urban school children in fourth and fifth grade. While none of our data can speak directly to this, one speculation concerns a possible increase in human exceptionalist beliefs about the superiority of the human species (Betz & Coley, 2022). Specifically, while urban fourth graders might care about human interests when reasoning about the environment—and view those human interests as somewhat separate from those of other animals—fifth graders might, with the rising demands of early adolescence and their own increased anticipation of high school autonomy, start to place even greater explicit emphasis on their own and others' human interests, with the result that they may begin to reposition humans within their circle of moral concern. They therefore may begin to show patterns seen in urban adults of viewing other species as not only distinct from, but subordinate to, humans. Such an exceptionalist orientation has been found to predict reduced environmental moral concern and reduced biocentrism (Betz & Coley, 2022; Pizza & Kelemen, 2023), and, arguably, there are distinctive aspects to education in fifth grade that might inadvertently foster the perspective. Specifically, U.S. science curriculum guidelines encourage fifth graders to think about the ways in which human communities can apply scientific ideas to protect the Earth's resources. While these guidelines were almost certainly not written with the intent of promoting a dominionist construal of the natural world as a manageable human asset, it is certainly possible to envisage curricular enactments that end up framing it that way (Achieve, 2013). Additional research is, of course, required to plot the developmental emergence of exceptionalism and, in turn, lend any weight to the idea that rising human exceptionalism is at the root of the shifting patterns seen within our urban-dwelling fourth and fifth grade children respectively.

Finally, in addition to showing that conceptual information about function matters, the present results also found that (as with adults) negative emotional feelings matter too–they significantly predicted conservation attitudes and moral beliefs. This was even as children's, specifically fourth graders', aversive feelings about the insects were generally lower than adults' (see Table 1). Across grades, children's feelings of disgust reduced their sense that it is important and morally right to conserve unfamiliar wildlife as well as their desire to give to a wildlife protection cause, outweighing effects of conceptual information in both of the latter cases. Non-rational factors like disgust reactions therefore need to be taken into serious consideration—alongside numerous other factors (e.g., McGowan et al., 2020)—when deciding, for example, which organism to select as a flagship species when designing conservation campaign materials for either urban children or adults: Among younger urban children, in particular, emotional influences on their moral attitudes and decision-making can outweigh any other influence.

Idiosyncratically, we did find one positive outcome of an avoidance emotion in that children's relatively mild fear response to the insects appeared to enhance their ratings of conservation importance. Prior research has found that fear of animals and caring concern for them can co-exist (Kahn et al., 2008)—however, the current directly predictive relationship has not previously been documented. It is difficult to interpret this solitary effect but one possibility is that it is mediated by curiosity. Specifically, finding a kind of animal slightly scary might enhance children's interest in it, in turn increasing their sense that it is important to conserve even if they don't want to personally encounter it.

4. General discussion

As E.O. Wilson (2000) aptly pointed out, conservation biology "is a discipline with a deadline" given the crises that human behaviors are precipitating for Earth's species. In that context, the present findings provide insights into the factors that promote conservation attitudes and moral concern about invertebrate species that are viewed as unappealing and yet are among crucial aspects of biodiversity at greatest threat of extinction within the next few decades.

Several robust patterns emerged in our results: First, attempts to use labeling information to enhance beliefs and moral concern do not generally work. Using names to promote inferences about invertebrate categories' essential distinctiveness as well as their significance to experts had little impact on urban-dwelling adults' baseline ambivalence about invertebrates, aside from one effect in which it enhanced preferences for wildlife charity giving. Among urban children, the labeling information also had no effect or appeared to undermine active conservation concern, for example, reducing fourth graders' quite marked baseline preference for wildlife charitable-giving.

The reasons for the harmful effects of the labels on children's judgment are unclear. As noted earlier, one possibility is that the naming information was treated as actively non-informative and provoked a

generalized negative reaction because it violated communicative pragmatics given children's likely expectations of hearing, for example, functional information, which they find satisfying as a basis for categorization and explanation. However, another possibility is that branding the labels as "scientific" naming was specifically devaluing because U.S. elementary school children have been found to hold negative stereotypes of scientists as loners and geeks and to be developing a growing sense of the scientific domain as elite and unwelcoming (Boston & Cimpian, 2018; DeWitt, Archer, & Osborne, 2013; Haber et al., 2021). It is a goal for future research to explore how accurate such explanations are.

In summary then, attempts to leverage the essentialist bias and use category naming alone to differentiate and enhance valuing of member species within the unfamiliar, nebulous domain of "bugs" are at best redundant and, at worst, harmful in terms of promoting conservation concern. It remains an open question whether combining labeling information with functional information creates a context in which naming information operates differently and with some level of benefit. At base though—and in answer to the question posed at the beginning of this paper—titles don't seem to matter and simply calling out the existence of a recently discovered species by giving it a scientific name appears to be an ineffective strategy for promoting care and moral concern among urban children and adults. This finding, while informative, is unfortunate given prior theorizing and hope that communicating about labels might be a simple but viable pathway for furthering conservation goals and enhancing the success of conservation campaigns (New, 2008; Thompson, 1997).

By contrast, our opening questions over whether "deeds" can enhance an entity's perceived value received a clear affirmative answer: Abbreviated information about the functions of unfamiliar species consistently increased conservation attitudes among all age groups, although patterns differed in Study 1 and Study 2. Relative to baseline, urban adults in Study 1 were particularly influenced by anthropocentric information about an unfamiliar species' utility to humans. In Study 2, this general pattern was also true of older urban elementary school children—however, younger urban elementary school children were particularly moved by biocentric frames and information about ecological roles and non-human beneficiaries. Overall, these findings are therefore consistent with a conclusion that urban-dwellers' anthropocentric utilitarian biases become more, not less, marked with age. This trend is important given that, at least in adults, biocentrism has been found to more reliably relate to environmentalist values and actions potentially because it marks off the value of the natural world, treating it as something relatively independent of human thriving (e.g., Gagnon Thompson & Barton, 1994; Rottman, 2014).

Interesting questions remain then about the experiences that might promote biocentric functional reasoning such that urbanites maintain it in parallel with anthropocentrism as an equally compelling basis for conservation concern into adulthood. Little experimental research has been conducted but correlational studies have found that spending concerted time in nature, or having personally relevant contact with nature (e.g., as is the case of rural dwellers), is associated with variables such as increased love of nature and heightened ecological reasoning tendencies (e.g., DeVille et al., 2021; Medin, ojalehto, Marin, & Bang, 2014; Weizhe et al., 2014). Independently, both of these outcome variables have variously been found (including in the present study) to relate to pro-environmental biocentric attitudes and behavior (e.g., DeVille et al., 2021; Pizza & Kelemen, 2023). Taken together, this cluster of findings therefore suggests that interventions that integrate personally relevant, immersive nature experiences (e.g., Clayton et al., 2017; van de Wetering et al., 2022) with formal and informal ecological learning have the potential to enhance urban-dwellers' biocentric functional reasoning and conservationist behavior. Indeed, it is possible to broadly imagine extended nature engagement programs that might be effective in achieving this kind of integration. Examples are programs that focus beyond the level of the individual to focus instead on personally relevant social units (e.g., families, classmates and church congregations) and which emphasize personally relevant activities that require implicitly and explicitly learned ecological and biocentric functional information for their achievement (e.g., enhancing neighborhood aesthetics through transplanting from natural areas; community food generation through foraging, allotments, or urban farming).

Of course, such interventions involve substantial infrastructure and expense, such that lower cost options with more constrained goals are therefore important to consider too. In that context, it is relevant that preliminary findings suggest that when urban children learn about the history of the Earth's ecosystems from realistic videos, their learning has the secondary effect of increasing moral concern and biocentric reasoning about nature. This is especially true when those videos employ animistic or anthropomorphic language to describe the Earth (Pizza & Kelemen, 2021).

Finally, the present results illuminate relationships between emotional reactions to living things and conservationist orientations. Elementary school children, especially fourth graders, tended to self-report lower levels of negative feelings about invertebrates than adults. Nevertheless, emotions consistently predicted their conservationist reasoning and choices, even outweighing the contribution of conceptual information to children's judgments. The recurrent pattern was that feelings of disgust rather than fear about the invertebrates reduced concern for them, suggesting that early emerging non-rational views of insects as biological contaminants or agents of impurity can significantly undermine conservation efforts and campaigns. Informal natural exposure to insect behavior and formal and informal exposure to education about insects' ecological role (and utility) —in interventions of the kind outlined earlier—might counteract these kinds of effects over time. Exploring whether these kinds of effects even hold in children with more immersive exposure to nature (e.g., rural dwellers) is an interesting target for future research.

In conclusion, many of Earth's invertebrate species are in dire threat. Nevertheless, the current developmental findings should offer some reason for optimism about the outcomes of conservation education efforts especially those directed at younger elementary school children. Urban children are socially and morally concerned about other living things. At baseline, not only do they care more than urban-dwelling adults about somewhat aversive unfamiliar creatures but they are readily induced to increase their valuing and moral concern on the basis of only minimal functional information about them. The finding that biocentric functional information focused on ecological relationships can have these effects suggests that there are therefore likely to be substantial benefits to enriching formal and informal ecological education in early elementary school. Specifically, children's orientation to teleological ideas and functional information can be leveraged (Kelemen, 2012). Rather than limiting formal elementary ecological science foci to their traditional focus—i.e. food web hierarchies—children can be readily motivated to focus on a broader array of functional "deeds" to support system-thinking about the direct and indirect interconnections that can exist between remote or even undiscovered entities (e.g., Grotzer & Basca, 2003). By recognizing younger children as potential agents of change–and using communication strategies tuned to the effective variables highlighted in this research–newer and future generations of urban-dwellers may be motivated to protect biodiversity in ways that, at baseline, current adult urban-dwellers, are not.

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Author contributions

Deb Kelemen: conceptualization, methodology, investigation, analysis, writing–original draft; Sarah Brown: formal analysis and writing–portion of methods and results; Lizette Pizza: formal analysis and writing–portion of methods and results.

Declaration of interest statement

No conflict of interest exists.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2023.101990.

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