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# What's the draw?: illustrating the impacts of cartoons versus photographs on attitudes and behavioral intentions for wildlife conservation

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## ABSTRACT

Changing attitudes and behaviors of a targeted audience are common ambitions of outreach campaigns. Anthropomorphized images are used to promote and facilitate conservation and environmental messaging. To evaluate their effectiveness as a messaging tactic, Indiana adults were surveyed to examine if attitudes and behavioral intentions (BIs) differed due to image type (cartoon vs. photograph) for three non-charismatic wildlife species. Wildlife management professionals (WMPs) were also interviewed to evaluate their perspectives. Unexpectedly, the surveyed population's increase in attitudes and BIs was species dependent and the cartoon was not unanimously better received. Only one cartoon species was able to elicit a significantly more positive measure than its photograph. WMPs highlighted the cartoon's need for mass appeal, accuracy, and clear messaging. The ability of cartoons to selectively impact attitudes, in conjunction with the support of WMPs, demonstrates that with thoughtful application, cartoons can sometimes be an effective messaging tool for non-charismatic species conservation.

## KEYWORDS

Anthropomorphism; messaging; non-charismatic; behavioral intention; wildlife values

## Introduction

The number of species facing extinction continues to rise, which is largely attributed to anthropogenic actions (Dirzo et al., 2014; International Union for Conservation of Nature (IUCN), 2009). Conservation efforts are biased toward species the public finds appealing, aesthetically or behaviorally (henceforth defined as “charismatic”), often to the detriment of their non-charismatic counterparts (Clark & May, 2002; Simberloff, 1998; Small, 2011, 2012). Non-charismatic species are less likely to be listed for federal protection, receive federal funding, or be the focus of conservation research (Clark & May, 2002; Metrick & Weitzman, 1996). Funding and management decisions are often based substantially on beauty, economic value, individual size, and if the species is considered a higher lifeform (Cryder, Botti, & Simonyan, 2016; Metrick & Weitzman, 1996; Scott & Seigel, 1992; Small, 2011, 2012). Non-charismatic species are also underrepresented in scientific research (Clark & May, 2002; Small, 2011; Trimble & VanAarde, 2010). Invertebrate papers comprised only 11% of reviewed conservation literature, despite constituting roughly 79% of known species (Clark & May, 2002). With little funding for research and

education, public knowledge and interest for the cause of non-charismatic species conservation remains low. Further research is needed on methods for developing conservation messages that increase public awareness of and support for species of conservation concern, especially species that are traditionally considered non-charismatic. Given the observed preference for species that possess more relatable human-like features, presenting non-charismatic species in a form that possesses those desired characteristics may improve attitudes and behaviors toward those species.

Cartoon representation of a targeted non-charismatic species is a messaging technique employed in conservation campaigns, but the efficacy of these cartoons remains unclear. Ahn, Kim, and Aggarwal (2014) went so far as to anthropomorphize a trashcan and found that donations were significantly greater for the anthropomorphic image than for the non-anthropomorphic image, but this finding could not be replicated with similar messaging with lightbulbs (Williams, Masser, & Sun, 2015). The public image change toward bats in 1980s England, from harbingers of horror to fun animals worthy of protection, was partially attributed to anthropomorphized, friendly imagery used on mugs, Christmas cards, and car stickers (e.g., “Bat Protection Squad”). The success of this bat campaign resulted in the development of another for reptiles (“Be kind to Snakes”) (Morris, 1987). However, not all of these campaigns are effective in the same manner, and using anthropomorphic images can backfire if the audience has no desire for a social connection or need to influence one’s environment (Tam, 2015).

### **Conceptual Foundation**

Building on the cognitive hierarchy behavior model, wildlife value orientations (WVOs) were developed to measure patterns among an individual’s basic beliefs and views specifically toward wildlife (Fulton, Manfredi, & Lipscomb, 1996). Bright, Manfredi, and Fulton (2000) posit that value orientations can predict how a person may act upon values given that orientations are shaped by an individual’s beliefs and ideologies, and are more specific than values. Teel, Dayer, Manfredi, and Bright (2005) describe four primary WVOs: utilitarian, mutualist, pluralist, and distanced. Utilitarians value wildlife for the services they provide to people and often support consumptive wildlife activities (e.g., hunting, fishing). Mutualists support non-consumptive activities and instead value wildlife similarly to humans. This can lead to a tendency to advocate for animal rights, treat animals as part of an extended family, and attribute human-like features to animals (Teel & Manfredi, 2010). Pluralists hold both utilitarian and mutualist sentiments, but which orientation they act upon is context-dependent. For example, these individuals may not hunt, but would support the ability of others to do so. Distanced individuals have no strong relations to wildlife, which may be attributed to disinterest or fear (Teel et al., 2005).

Attitudes and behavioral intentions (BIs) provide the link between value orientations and behaviors (Fulton et al., 1996). Attitudes are a person’s evaluation of an object or situation as favorable or unfavorable, and they vary in specificity and strength (Chaiken, 2001; Fulton et al., 1996). BIs are how individuals believe they will act in a particular situation. BIs are based on an individual’s attitude toward a specific behavior, the perceived social pressure to behave in that way, and how much control the individual feels they have over the behavior (Ajzen, 2012; Bagozzi, 1981; Manfredi, Vaske, & Decker,

1995). BIs can be predictors of behavior provided that an individual feels confident they can successfully perform the behavior (Ajzen, 2012).

Visceral factors play a large role in public attitudes and actions toward animals. In multiple studies, larger mammals were significantly preferred over smaller mammals and non-mammalian species (Gunnthorsdottir, 2001; Knight, 2008; Tisdell, Wilson, & Nantha, 2006). Moreover, humans demonstrate a preference toward animals and objects with juvenile features such as large eyes, chubby limbs, and a rounded forehead (Estren, 2012; Small, 2012). Anthropomorphizing species is one method to make them more relatable to the general public (Chan, 2012). Tam, Lee, and Chao (2013) found that anthropomorphizing nature was a way of increasing connectedness to and protectiveness of nature. Anthropomorphism can also convey serious messages in a way that entertains and educates while being easy to consume (Small, 2016). The use of anthropomorphized animals as tools to change environmental behaviors has shown success (Butler, Fooks, Messer, & Palm-Forster, 2018; The Advertising Council, 1976). Over the 30-year span of the original Smokey Bear campaign, a 50% reduction in forest fires was measured. In a University of Delaware study (Butler et al., 2018), participants making decisions that affected hypothetical water quality and monetary profit were eight times more likely to reach the study's target clean water standard if they received feedback from a mascot (e.g., cheers for choices that increased water quality) compared to participants who did not have mascot interaction. These studies illustrate that anthropomorphic animal mascots can elicit less environmentally deprecative behaviors.

Despite the positive outcome of these studies, anthropomorphization is not without controversy. One criticism is that anthropomorphism diminishes wildlife's intrinsic value and the seriousness of the causes they represent (Lawrence, 1989; Russow, 1989; Spears, Mowen, & Chakraborty, 1996). Another potential by-product of anthropomorphism is the "Bambi effect," where people conflate wildlife with their anthropomorphized counterparts (Lutts, 1992; Slobig, 2007). This phenomenon can lead to public backlash against wildlife management efforts, even if these species are invasive or overabundant (Lutts, 1992; Root-Bernstein, Douglas, Smith, & Verissimo, 2013; Slobig, 2007). The Smokey Bear campaign ushered in an era where fires were suppressed, which resulted in unanticipated ecological alteration (Donovan & Brown, 2007). On Australia's Kangaroo Island, introduced koalas became a pest, stripping vegetation and degrading habitat for indigenous species (Wilks, 2008). Management suggestions to reduce population growth, however, were blocked by koala activists; koalas had been marketed as "cute, cuddly, and harmless" (Wilks, 2008). While unfortunate, these examples highlight the ability of anthropomorphism to garner public support, making it a potentially powerful tool for conservation campaigns.

This study sought to evaluate the potential of anthropomorphism to influence positive environmental outcomes. Due to the unintended consequences stemming from cartoon images in the past, the authors deemed it imperative to confirm if cartoon images would elicit more positive attitudes and BIs than their photographs. Confirming this hypothesis would suggest that cartoons are a viable tool to garner public support for non-charismatic wildlife.

## Methods

To test the efficacy of cartoons, an experiment in the form of a survey was conducted to assess image impact on adult attitudes and BIs toward three non-charismatic species of conservation concern: (a) the fanshell mussel (*Cyprogenia stegaria*), (b) the eastern

hellbender salamander (*Cryptobranchus a. alleganiensis*), and (c) the northern long-eared bat (*Myotis septentrionalis*). These species often lack public awareness and support, reducing the impact of conservation interventions for these species (Jacobson & McDuff, 1998). Indiana was selected for the study because all three species are native. Additionally, interviews with Indiana wildlife management professionals (WMPs) were conducted to assess the current role cartoons have in their work and to ascertain if they perceived cartoons as effective messaging tools for increasing public awareness and support for non-charismatic species conservation.

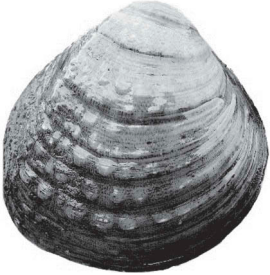





### **Survey of the Public**

A questionnaire was developed to assess the: (a) outdoor involvement (OI) and WVO determination, (b) attitudes and BIs (repeated for each species), and (c) demographics of residents. The conservation status of each species was noted in the description of the study and before respondents started the attitude section of the questionnaire. Respondents viewed one species image at a time in a random order and received either all photographs or all cartoons (Figure 1). The two questionnaires were identical except for image type (photographs, cartoons). The cartoon images were developed in line with recommendations from Root-Bernstein et al. (2013), which included: (a) emphasizing the features that the species already has that people engage with, and (b) giving the species just enough to make it recognizably human-like. The questionnaire was pretested with a class of university undergraduates ( $n = 13$  photograph,  $n = 15$  cartoon; these test results were not included in this analysis).

A survey panel of at least 600 Indiana adults was purchased from Survey Sample International (SSI). SSI distributed the questionnaire electronically (online) to a large panel of participants within their system and closed it as soon as the minimum number of responses were obtained. SSI does not measure response rate. A total of 633 questionnaires were completed by the SSI panel from February 10–14, 2017 prior to closing the instrument. The authors acknowledge the limitations of representativeness and generalizability of online survey panels, but for the purposes of experimentally testing the impact of different types of images, this method was deemed to be superior to randomly mailing surveys. The online panel ensured that at least 300 people completed each version of the questionnaire.

OI and WVOs were measured prior to participants viewing any images. Additionally, it was not possible for participants to go back once viewing the images. Based on Mullendore et al. (2014), OI questions used a four-point scale from “Not at all” to “More than 5 times” to assess participant involvement in activities such as camping, hiking, and fishing in the last 12 months. The WVOs of the participants were determined by administering Manfredo, Teel, and Henry’s (2009) 19 WVO questions. These belief statements (e.g., “Wildlife are like my family and I want to protect them”) were measured on a seven-point scale from “Strongly Disagree” to “Strongly Agree” (Manfredo et al., 2009; Teel & Manfredo, 2010).

Attitudes toward images of the non-charismatic species were measured using a modified seven-point semantic differential scale consisting of adjective pairs related to the image of the species (e.g., Cute-Ugly, Strong-Weak; Poresky, Hendrix, Mosier, & Samuelson, 1988). Respondents selected the number indicating the adjective they

<p>Fanshell Mussel (<i>Cyprogenia stegaria</i>)</p>	 <p>Photo by: Indiana DNR</p>	 <p>Cartoons by: Tony Pawli</p>
<p>Hellbender Salamander (<i>Cryptobranchus a. alleganiensis</i>)</p>	 <p>Photo by: David Herasimtschuk</p>	
<p>Northern Long-eared Bat (<i>Myotis septentrionalis</i>)</p>	 <p>Photo by: Dr. Joe Scott Altenbach</p>	

**Figure 1.** Images featured in the online questionnaires. Participants received a questionnaire with either all photographs (left) or all cartoons (right). All images were presented in color and without the credits in the questionnaires.

thought best described the depicted species. The consistency of the modified attitude scale was confirmed with a principle component factor analysis with Varimax rotation, with all resulting factors having a Cronbach's alpha ( $\alpha$ ) reliability score of  $> .70$ . Two major factors were used, "Likeability" and "Worth." "Likeability" contained adjective pairs related to the approachability or attractiveness of a species (i.e., Unfriendly – Friendly, Frightening – Calming, Ugly – Cute, and Dangerous – Harmless). The second attitude, "Worth," consisted of adjectives describing the species' utility for purposes



such as labor or entertainment (i.e., Unimportant – Important, Weak – Strong, Worthless – Valuable, and Boring – Interesting). BIs toward the species were quantified using a five-point scale from “Strongly Disagree” to “Strongly Agree,” indicating participants’ perceived likelihood of performing a hypothetical action for that species (e.g., “I would make a monetary donation to protect this species;” Skibins, Powell, & Hallo, 2013).

The scale for WVOs consisted of four components using the scale described by Teel and Manfredi (2010). The fit and reliability of these four components within the sample were also confirmed with a factor analysis. WVOs were calculated using the full question set following the procedure in Teel and Manfredi (2010). Prior familiarity with the species and basic demographic information were also measured.

For each species, a series of two-stage least squares regression models was computed. In the first stage, image type was used to predict attitude; separate regressions were conducted for each attitude type. In the second model, to predict BIs, the attitude variables were used as an instrument to remove the impact of violating the general linear model assumptions regarding homoskedasticity. To assess if the efficacy of the image depended upon one’s WVO, a similar two-step hierarchical linear regression was conducted, adding an interaction variable between the image type and WVO. If the interaction variables were not significant for a model, they were removed and the original linear regression model results were reported. Independent samples *t*-tests were used to determine if attitude and BI scores for the different WVOs differed significantly between image types. Finally, means from the semantic differential attitude measures were compared using post-hoc tests to reveal which characteristics differed between images and which may be driving observed attitude patterns.

### ***Interviews with Managers***

Semi-structured interviews ( $n = 15$ ) were conducted from February to March 2017 with a purposive sample of Indiana WMPs to supplement and better understand the survey findings (Prokopy, 2011; Sandelowski, 1994). WMPs were broadly defined as individuals whose work involved animal conservation. Interviewees were selected using snowball sampling (Biernacki & Waldorf, 1981) and were generally located in the northern two-thirds of Indiana. WMPs differed in their level of interaction with the public, roles, experience, and organization type. All interviews were conducted face-to-face with the exception of one that was conducted online due to scheduling convenience. Interviews covered: (a) WMP’s experience working with the public, (b) observed public attitudes and BIs toward wildlife, (c) current cartoon usage by their organizations, (d) expected reactions to cartoon wildlife by the public and colleagues, (e) if WMPs thought cartoons could change attitudes and/or BIs, (f) if WMPs thought the species depicted would impact the cartoon’s efficacy, and (g) their personal attitude toward the practice of using cartoons for conservation. The interview transcripts were then coded to identify recurring themes and ideas. There were three rounds of coding between two people in which the codebook was discussed and refined. Intercoder reliability testing resulted in Cohen Kappa coefficients of .70 or higher achieved for each item, indicating consistency and substantial agreement between coders (Landis & Koch, 1977).

## Results

### Survey of the Public

The image type groups (i.e., photograph or cartoon) did not differ significantly in demographics or sample size ( $n = 316$  photograph,  $n = 317$  cartoon). Respondents were more likely to be female (68%), have a 4-year college degree (26%), and live in a suburban community (47%). The average age was 50 and mid-range incomes (\$50,000 – \$74,999) were the most common (24%). The distribution of WVOs was 36% mutualists, 28% pluralists, 23% utilitarians, and 13% distanced individuals.

Participants' OI had a significantly positive relationship with all dependent variables (Table 1). Familiarity with the species was also positively and significantly related to the dependent variables except for the “Likeability” of the bat and BIs toward the mussel (Table 1). Participants were most familiar with the bat (28%), then the salamander (20%), and least familiar with the mussel (16%).

### Attitudes: Likeability and Worth

Image type had significant associations with “Likeability” of mussels and salamanders ( $p < .001$ ), but not for bats ( $p = .139$ ; Figure 2, Table 1). Furthermore, the direction of the relationship differed between species. The cartoons elicited less positive attitudes toward mussels ( $\beta = -.13$ ) and more positive attitudes toward salamanders ( $\beta = .41$ ; Table 1). The mussel cartoon received lower average scores, whereas the salamander cartoon received higher average scores than the photograph for all “Likeability” characteristics. The bat cartoon elicited slightly more positive average means than the

**Table 1.** Standardized  $\beta$  for the independent variables used in a series of models examining the effects of non-charismatic species representation (i.e., photographs versus cartoons) on attitudes and behavioral intentions. (M = Mussel, S = Salamander, B = Bat).

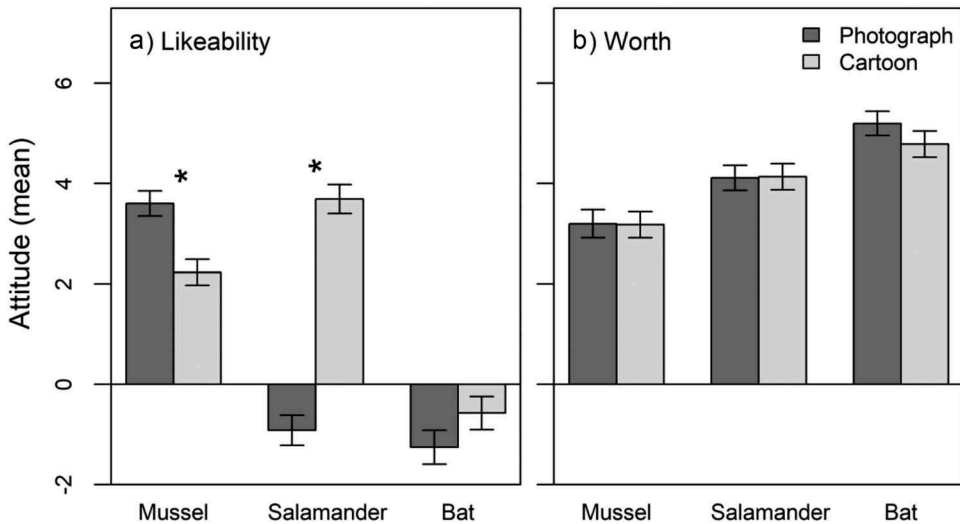
Independent Variable	Likeability			Worth			Behavioral Intentions		
	M	S	B	M	S	B	M	S	B
Cartoon	-.13***	.41***	.06	.13	-.01	.03	-.01	-.05	>.01
Outdoor Involvement	.17***	.14***	.17*	.21***	.19***	.13**	.21***	.22***	.21***
Familiarity	.17***	.09*	.08	.11*	.09*	.11**	.03	.09**	.06*
Mutualist <sup>a</sup>	.13**	.22***	.28*	.17***	.35***	.27***	-.15***	.28***	.22***
Pluralist	.04	.14**	.18*	.16***	.29***	.24***	.15***	.29***	.21***
Distanced	-.13**	-.05	.02	-.15	-.15	-.18	.19***	.11**	.09**
Female	.01	-.09*	-.14*	.01	-.01	-.04	-.01	-.20	.04
Age	-.11**	-.08*	-.13*	.01	.01	-.04	-.14***	-.18***	-.10***
Education	-.02	.01	.05	-.01	-.04	-.02	-.02	-.05	-.06*
Suburban-Past	-.08	.04	.02	-.06	-.05	-.02	-.21	-.03	.01
Rural-Past	-.01	.05	-.04	-.07	-.06	-.04	-.09	-.10*	-.06
Suburban-Current	-.01	<.01	-.03	-.12	.01	.02	-.05	-.03	-.02
Rural-Current	.08	.03	-.02	-.03	.01	.06	-.02	.04	.01
Income	-.07	-.10*	-.16*	-.11*	-.08	-.05	-.05	-.03	-.03
Cartoon_Mutualist	–	–	–	-.06	.04	-.04	–	–	–
Cartoon_Pluralist	–	–	–	-.14	.03	-.05	–	–	–
Cartoon_Distanced	–	–	–	-.11*	.05	-.09	–	–	–
Attitude: Likeability	–	–	–	–	–	–	.09*	.18***	.34***
Attitude: Value	–	–	–	–	–	–	.40***	.32***	.31***

<sup>a</sup>“Utilitarian” and “Cartoon\_Utilitarian” served as the reference variable for WVO variables and Cartoon\_WVO variables, respectively.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$

– Variable not present in regression model





**Figure 2.** Comparison of average “Likeability” (a) and “Worth” (b) attitudes elicited by photographs or cartoons (\*  $p < .05$ ). Standard error bars show the variability around the average attitudes.

photograph, but not significantly different (Figure 3). Age had a significantly negative relationship with “Likeability” across all species where younger respondents had higher values. OI showed a positive significant relationship with “Likeability” for all three species (Table 1).

Image type did not have a significant relationship with “Worth” for any of the depicted species (Figure 1; Figure 3). OI and species familiarity, however, showed a positive significant relationship with “Worth” (Table 1).

### **Behavioral Intentions**

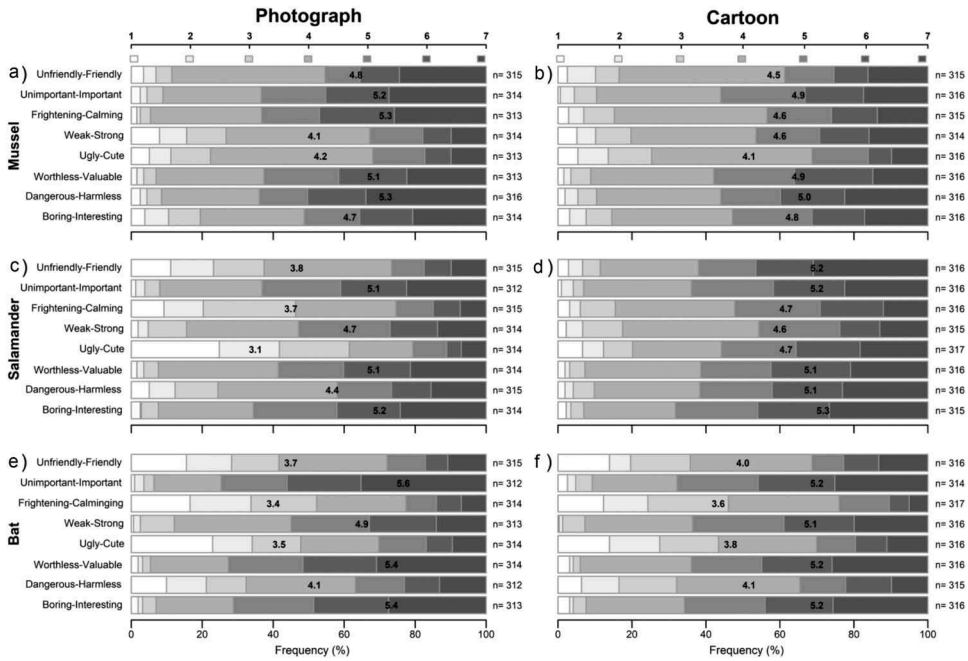
There was no significant relationship between BIs and image type. Both attitudes, however, had a significant, positive relationship to BIs for all species (Table 1). Age had a significant and negative association with BIs (Table 1; Figure 4). OI showed a positive significant relationship with BIs (Table 1).

### **Wildlife Value Orientations**

Except for the “Worth” attitude toward mussels, the cartoons’ effects on attitudes and BIs did not have a significant association with WVOs (Table 1; Tables 2 & 3). In the instance of the mussel, the distanced orientation was negatively associated with the cartoon’s relation to attitude ( $\beta = -.11$ ,  $p = .033$ ; Table 1).

Despite the lack of interaction between image type and WVO, the cartoons, particularly the salamander and mussel, were able to influence “Likeability.” “Likeability” was significantly higher for the salamander cartoon ( $p < .001$ ) for all WVOs and the mussel cartoon was related to significantly more negative “Likeability” for the mutualists ( $p = .004$ ) and distanced individuals ( $p = .021$ ; Table 4).

WVOs were significant predictors of attitudes and BIs. For each measure, except for “Likeability” of mussels, mutualists and pluralists had a more positive score than



**Figure 3.** Comparison of the attitudes elicited by the photograph (a, c, and e) and the cartoon (b, d, and f). Likert means for each semantic differential characteristic are displayed on the bar.

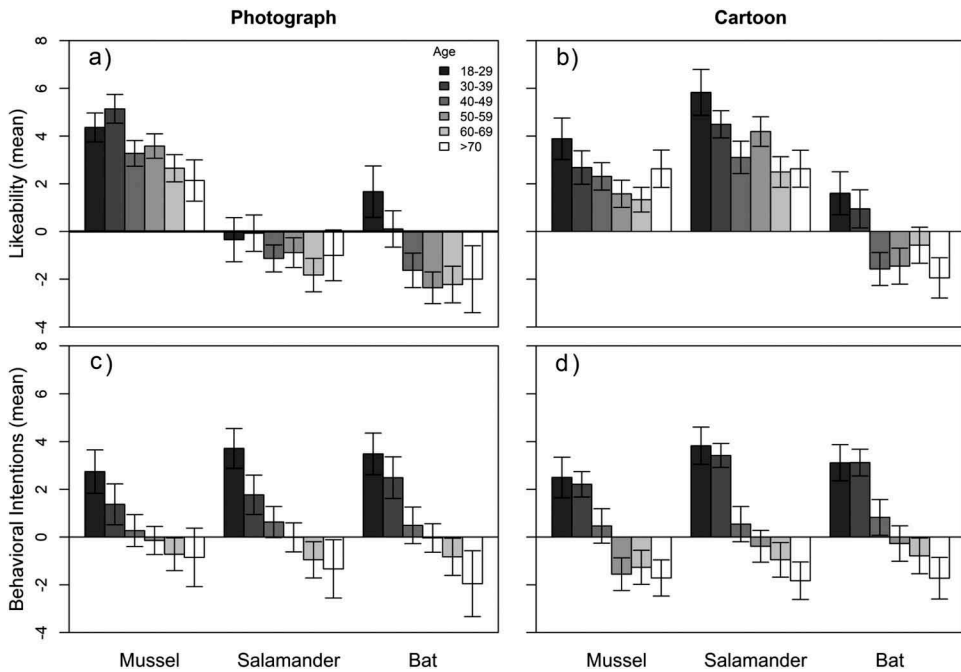
utilitarians (Table 1). Distanced individuals often did not significantly differ from utilitarians except for BIs, where distanced had significantly more positive scores (Table 1).

### Interviews with Managers

Interviewees were predominately female (60%). The WMPs interviewed observed that the general public has positive attitudes toward wildlife, but noted that species type and audience characteristics affect those attitudes. These WMPs said people tend to favor birds and mammals, unless considered a nuisance or dangerous (e.g., raccoons, coyotes). These WMPs also noted that hunters prefer game species and dislike predators, which they see as competition. In the WMPs' experience, children's attitudes toward wildlife are the easiest to change because they hold the fewest preconceptions. These WMPs also noted that public attitudes toward wildlife tend to inform their BIs. In particular, these WMPs said that people are more likely to protect and spend money on the animals they care about, whereas people tend to want to remove or kill wildlife perceived as scary or inconveniencing.

Few of these WMPs currently utilize cartoons in their educational materials or programs. The commonly cited reasons were lack of resources, that they did not think cartoons would appeal to their current target audience (e.g., adults, particularly consumptive recreationists), and/or fear that cartoons might dilute the scientific image of their organization and messages.

These WMPs believed that the general public would be receptive of cartoon conservation campaigns and the campaigns would be capable of changing attitudes. However, they



**Figure 4.** Graphs depicting the negative trend between age and both “Likeability” towards photographs (a) and cartoons (b) of wildlife and behavioral intentions towards photographs (c) and cartoons (d).

**Table 2.** Unstandardized betas ( $\beta$ ) and standard errors (SE) for the “Likeability” linear regression model testing for an interaction effect between image type and WVO. The interaction variables<sup>†</sup> were not significant and were dropped from subsequent analysis.

Independent Variable	Likeability					
	Mussel		Salamander		Bat	
	$\beta$	SE	$\beta$	SE	$\beta$	SE
Cartoon	-.51	0.75	4.69***	0.85	1.20	.96
Outdoor Involvement	5.58***	1.54	5.76***	1.77	7.35***	1.97
Familiarity	1.84***	0.55	1.31*	0.55	.97	.54
Mutualist <sup>a</sup>	1.99**	0.68	2.30**	0.77	3.67***	.88
Pluralist	.41	0.73	2.15**	0.82	2.81**	.92
Distanced	-1.18	0.92	-.59	1.05	.94	1.18
Female	.09	0.40	-1.11*	0.46	-1.80***	.51
Age	-.03**	0.01	-.03*	0.02	-.05**	.02
Education	-.07	0.14	.04	0.16	.22	.18
Suburban-Past	-.64	0.59	.49	0.67	.22	.75
Rural-Past	-.09	0.58	.59	0.66	-.40	.73
Suburban-Current	-.17	0.58	.01	0.65	-.37	.73
Rural-Current	.74	0.60	.41	0.68	-.31	.77
Income	-.20	0.12	-.35*	0.14	-.56***	.16
Cartoon_Mutualist <sup>†</sup>	-1.48	0.97	.58	1.09	-.32	1.23
Cartoon_Pluralist <sup>†</sup>	.02	1.04	-.69	1.17	-.95	1.31
Cartoon_Distanced <sup>†</sup>	-1.21	1.27	-.53	1.43	-1.02	1.61

<sup>a</sup>“Utilitarian” and “Cartoon\_Utilitarian” served as the reference variable for WVO variables and Cartoon\_WVO variables, respectively.

\*p < .05 level. \*\* p < .01 level. \*\*\* p < .001

**Table 3.** Unstandardized betas ( $\beta$ ) and standard errors (SE) for the behavioral intentions linear regression model testing for an interaction effect between image type and WVO. The interaction variables<sup>†</sup> were not significant and were dropped from subsequent analysis.

Independent Variable	Behavioral Intentions					
	<i>Mussel</i>		<i>Salamander</i>		<i>Bat</i>	
	$\beta$	SE	$\beta$	SE	$\beta$	SE
Cartoon	-.60	0.65	-.66	0.67	.08	0.67
Outdoor Involvement	8.78***	1.37	8.68***	1.39	8.97***	1.38
Familiarity	.47	0.49	1.21**	0.43	.79*	0.38
Mutualist <sup>a</sup>	3.02***	0.61	3.06***	0.61	2.81***	0.63
Pluralist	3.83***	0.64	3.62***	0.64	2.44***	0.66
Distanced	1.97*	0.80	1.62*	0.82	2.15**	0.81
Female	-.07	0.35	-.18	0.35	.46	0.36
Age	-.05***	0.01	-.07***	0.01	-.04***	0.01
Education	-.03	0.12	-.21	0.12	-.26*	0.12
Suburban-Past	-.15	0.51	-.33	0.52	.19	0.52
Rural-Past	-.97	0.50	-1.13*	0.51	-.74	0.51
Suburban-Current	-.48	0.50	-.31	0.50	-.27	0.51
Rural-Current	-.25	0.52	.47	0.53	.14	0.54
Income	-.18	0.11	-.08	0.11	-.11	0.11
Cartoon_Mutualist <sup>†</sup>	1.01	0.84	.24	0.84	-.23	0.86
Cartoon_Pluralist <sup>†</sup>	.52	0.90	-.06	0.90	.62	0.91
Cartoon_Distanced <sup>†</sup>	-.14	1.10	.23	1.10	-1.00	1.11
Likeability	.103*	0.041	.176***	0.036	.33***	0.03
Worth	.467***	0.041	.402***	0.045	.41***	0.04

<sup>a</sup>“Utilitarian” and “Cartoon\_Utilitarian” served as the reference variable for WVO variables and Cartoon\_WVO variables, respectively.

\* $p < .05$  level. \*\*  $p < .01$  level. \*\*\*  $p < .001$

**Table 4.** t-test results from comparing each WVOs’ “Likeability” scores by image type (significant at  $p < .05$ ).

Species	WVO	n		mean		$\Delta$ means	SD		SE		df	t	p-value
		P	C	P	C		P	C	P	C			
Mussel	U	72	65	2.69	1.74	0.96	3.86	4.21	0.454	0.52	135	1.39	.168
	M	107	104	4.62	2.78	1.85	4.10	5.02	0.396	0.49	209	2.93	<.004
	P	84	82	3.79	3.02	0.76	4.52	4.70	0.494	0.52	164	1.06	.289
	D	37	41	1.76	-0.32	2.07	4.17	3.57	0.686	0.69	76	2.37	.021
Salamander	U	72	65	-2.47	2.20	-4.67	3.90	4.98	0.460	0.62	121.02	-6.07	< .001 <sup>a</sup>
	M	107	105	0.03	5.28	-5.25	5.45	4.96	0.527	0.48	210	-7.32	< .001
	P	83	83	0.22	4.43	-4.22	5.76	4.80	0.632	0.53	164	-5.12	< .001
	D	37	41	-2.97	1.27	-4.24	4.94	4.52	0.812	0.71	76	-3.96	< .001
Bat	U	72	65	-3.81	-2.68	-1.13	4.22	5.10	0.497	0.63	135	-1.42	.159
	M	104	104	0.30	1.17	-0.88	6.49	5.52	0.636	0.54	206	-1.05	.296
	P	84	83	0.17	0.35	-0.18	6.01	5.88	0.656	0.65	165	-2.20	.843
	D	37	41	-2.70	-2.37	-.034	5.19	5.94	0.853	0.93	76	-.27	.791

<sup>a</sup>Violated Levene’s Test for Equality of Variances, reported SPSS’ adjusted Welch-Satterthwaite values

U = Utilitarian, M = Mutualist, P = Pluralist, D = Distanced; P = Photograph, and C = Cartoon

thought the cartoons’ effects would vary by audience, target attitude, and species. These WMPs were skeptical of cartoons alone being able to change BIs; some suggested an accompanying message about the desired behavior change(s) may make the cartoon more impactful. The WMPs felt their colleagues would fall on a spectrum of attitudes toward cartoons for conservation, erring in the direction of the non-receptive end. They opined that many WMPs would likely view cartoons as unscientific and worried that the cartoon would lead to misconceptions about the animal or the message(s) it represented. However, these WMPs predicted that their colleagues would be open to the idea if there was

evidence of cartoons' efficacy at reaching a broader audience and if the cartoon was accurate. Accuracy includes the cartoons being both anatomically correct (e.g., proper coloration, markings, and number of appendages) and behaving naturally. These WMPs were receptive to cartoons being used as a tool to connect their organizations to a broader audience, especially non-consumptive recreationists and children. They also emphasized the importance of the cartoons being accurate, part of ready-made materials, and tested for efficacy. See Table 5 for representative quotes.

**Table 5.** Example quotes of the major themes and trends from interviews with WMPs about the practice of anthropomorphizing non-charismatic species for conservation efforts.

Themes	Overall Trend	Example Quotes
Experiences Working with the Public	Positive	"I'd say [working with the public is] one of my favorite parts of my job. I view it as being extremely important. If we don't have some awareness in the public of what we're doing, one, there's no support for our mission but more importantly support for the conservation of the species. So just trying to get more awareness and more interest in these species is a big part of us building support for the conservation and a species. Yeah, been very positive."
Public Attitudes towards Wildlife	Positive, varies by: -Species -Audience -Experience -Location	"I think that it varies a lot. I...most of the people that come to us have a love of wildlife, or at least a base line appreciation for wildlife. They're not averse to wildlife...Or at least they're not averse to all wildlife. They're animal lovers. Maybe they love lions and tigers but they don't love opossums and king snakes and some of the more negative things. So we do kind of have that, I guess juxtaposition in attitudes. That's really common here. Particularly since a lot of the folks that we have visiting our zoo and participating in our programs are from the surrounding counties and they may live in more rural communities where they have a little more closer proximity to wildlife. So we do see kind of that mixed attitudes, mixed bag of attitudes quite a lot. That's mostly with the adult audiences. Of course, most of the kids that come here and that we see in camps and classes they just love animals across the board. There are definitely some species and taxa that have stigma attached to them."
Public Behavioral Intentions towards Wildlife	More positive if the public cares about wildlife	"Most directly if they have a positive attitude then they're going to show more of a connection to it and you're more likely to...follow some action that would benefit them than be negative. Everything from giving that animal space to supporting conservation efforts whether they volunteer in kind or financial."
Cartoon Usage	Not common	"I think we have a kid's book. I honestly have not used it in my position. But I think there are little cartoon animals on it. So, yes, I think it is used. But other than that, in our newsletter, on our website, we don't use cartoons... I think we want to show an actual depiction of what we're seeing on an everyday basis. We're a scientific based organization so I think we want to give the public a scientific image to see. I think that's probably it. As far as the kids go, though, to make it a little more fun and interactive. I think having that cartoon image of maybe a bird is just more interactive for the children."
Expected Public Attitude towards Cartoon Wildlife	Positive, varies by: -Audience -Species depicted	"I think it would be very favorable. Just knowing that people connect to things within popular culture. They like things that are cute, not that a cartoon always has to be cute, but many of them are. They're drawn to those things. It is a multi-generational kind of connection I think because kids of course will like that but I think adults do as well. It taps into the kid inside all of us when we see a cartoon representation of something."

(Continued)

**Table 5.** (Continued).

Themes	Overall Trend	Example Quotes
Could Species Impact Cartoon Efficacy	Yes	"I think you'd want to really careful to pick a species to advocate for that frankly doesn't offend people. There are some species now that are so disagreeable and contentious, that you might not want to go with that. I don't know though that's tough to say. Maybe that's exactly what that species would need to change those attitudes. I can't be sure. I just know I wouldn't want to be the one to put my name on it I think if we were going to have a cartoon coyote go out."
<b>Table 5 (cont.)</b>		
Themes	Overall Trend	Example Quotes
Cartoons Capable of Changing Attitudes	Yes, varies by: -Attitude being targeted -Audience -Species -Campaign length	"I think it might. But I think it would require a lot of time and focus and resources to do it. It depends on what your message is and who you're trying to reach. But, I think over time it might be effective."
Cartoons Capable of Changing Behavioral Intention	Skeptical	"Well, I don't know. I've become sort of skeptical about behavior change myself, just with all of the things I've learned over the years and in my own experiences. The thing about behavior change is it's really, really difficult. Again, I hate to say...we all want behavior change, we all want that, I don't know that, I don't how easily that's achieved. And I don't know if this is part of the toolkit to make that happen but...I'll just say I'm skeptical about that."
WMP Attitudes towards Cartoon Wildlife	Spectrum, but more likely to be unreceptive, varies by: -Training -Experience -Job type	"I tend to think that they would not like [cartoon wildlife]. I know that's painting with a broad brush and I'm sure that's not true across the board, but I tend to think that's the audience that would say you're diminishing the value of that animal...by doing that. And I think that's because we're scientists and that's not the way we have been....that doesn't speak to scientists I think first of all, the same way. We don't understand the social cues or what society almost demands and so we're, I'll say purists, almost...I think that would be the very general perception."
Cartoon Usage Likelihood-WMP	Possible	"I think [WMPs might consider implementing a cartoon campaign]. It depends on how it's promoted. What the point is or what the goal is. If it seems worthwhile. If the cartoon material's well done, has a wide focus as far as age groups."
Personal Attitude towards Cartoon Wildlife	Receptive	"We see ourselves in other things. That's what we do as humans. And we care about ourselves more than anything, so why wouldn't we want to evoke that in trying to preserve things? If we're trying to communicate that there are certain things worth saving, why wouldn't we want to tap into that by connecting to those things that we see ourselves in? You know what I'm saying? So I guess anthropomorphism's a tool in our toolbox to help us get people to connect. We have to use it carefully, but I do think there's a place for it."
Cartoon Usage Likelihood-Personal	Likely -Cartoon's ability to reach a broad audience -Experience -Cartoon accuracy -Resource availability	"If someone were to come with me, having [the cartoon campaign] made, and like I said it [was respectful of the animal and had a clear message], absolutely. Yeah, I'd have no problem using it. I'd probably even look forward to it."

## Discussion

Generating public support for species of conservation concern, especially non-charismatic wildlife, is an ongoing challenge. Cartoons impacted affective attitudes, but their effect differed by species. Attitudes were positive predictors of BIs, suggesting that cartoons may



be able to indirectly affect BIs by eliciting more positive attitudes. The effect of the cartoons was not dependent upon WVO, with one exception. Furthermore, the salamander cartoon had the ability to affect the attitudes of a broader audience than was expected.

Cartoons affected “Likeability,” but not “Worth” attitudes. This trend is supported by Serpell (2004) who categorized animal-related attitudes as either “affect” or “utility” (e.g., “Likeability” or “Worth”) where an “affect” attitude was influenced in part by an animal’s aesthetic appeal and an “utility” attitude was informed more so by individuals’ demographics, which was reflected in this study. The images that averaged higher on the “Ugly – Cute” adjective pair (i.e., considered “cute”) were the mussel photograph and the salamander cartoon, and these received the highest overall “Likeability” scores for their image. Conversely, both bat images received low “cute” scores eliciting low “Likeability,” but the highest “Worth” attitudes. This trend suggests that cartoon campaigns may be able to effectively impact affective attitudes.

Positive attitudes predicted significantly more positive BIs, making the ability of cartoons to impact “Likeability” more promising for conservation campaigns. Martín-López, Montes, and Benayas (2007) found that, in general, affective attitudes were a stronger predictor than factual knowledge of people’s willingness to fund biodiversity conservation. People are also willing to give more money to protect the species they prefer (Kellert & Berry, 1979; Martín-López et al., 2007; Small, 2011, 2012). The WMPs who were interviewed believed that people need to be captured on an emotional level before they could be expected to support a cause and make meaningful behavioral changes. Further, while these WMPs felt that cartoons could elicit attitude change, they were skeptical of cartoons to cause behavior change. This study showed that image type did not significantly predict BIs, but, cartoons did impact “Likeability,” which in turn predicted BIs. Thus, cartoon conservation campaigns may want to focus on informing affective attitudes, which inform positive conservation actions.

“Likeability” of the cartoon image was species dependent. Compared with the photograph, the cartoon “Likeability” attitudes were as follows: (a) mussel = significantly less positive, (b) salamander = significantly more positive, and (c) bat = not significantly different. The observed attitude trends may be influenced by public experiences with and perceptions of the species depicted. In the WMPs’ experiences, misconceptions of or misunderstood interactions with wildlife lead to deeply set attitudes that are difficult to change. The WMPs predicted there may be certain species for which a cartoon on its own would not be sufficient to overcome past experiences or preconceptions. Neither bat image was able to produce positive “Likeability” attitudes. Prokop, Fančovičová, and Kubiátko (2009) found that misconceptions about bats are common and can impact attitudes. In their study of university students, 55% believed that bats get tangled in human hair and 20% believed that bats feed predominantly on blood; this belief in myths was strongly correlated with negative attitudes toward bats (Prokop et al., 2009). When selecting a species for a cartoon conservation campaign, possible associations that could impact efficacy should be considered.

Another possible explanation for the observed “Likeability” trends is the physical and behavioral characteristics, or lack thereof, of a species. Multiple studies have shown that people prefer animals similar in size to humans, seemingly intelligent, close to humans in phylogenetic position, and have familiar textures (Burghardt & Herzog, 1989; Carr, 2016; Gunnthorsdottir, 2001; Kellert, 1984; Small, 2012). This was further supported by the

WMPs indicating that people tend to care more about animals that they can see themselves in, either physically or behaviorally. The WMPs predicted that certain animals lacking features to illustrate (e.g., snakes and mussels) would be more difficult to depict as effective cartoons; positing an explanation for the mussel cartoon's negative attitudes relative to the photograph. Although the cartoon mussel had an eye mask and water arms to suggest human-like features, these were props and may not have been sufficient to form a connection with people. Conversely, the salamander cartoon elicited significantly more positive attitudes than the photograph. Hellbender salamanders possess both unique features (e.g., wavy sides and oar-shaped tails) and relatable features (e.g., two eyes, four limbs, fingers and toes) for artists to depict. Further, these salamanders are rare in Indiana, given both their endangered status and cryptic qualities, so few people have ever had interactions with them; within their one remaining watershed in Indiana, only 44% of residents surveyed were familiar with hellbender salamanders (Reimer et al., 2014). Additionally, people did not hold false notions about these animals that could negatively impact their impressions of the species, which was supported by measures of positive attitudes and BIs toward the salamanders in the surveyed group (Mullendore et al., 2014). Although cartoons are capable of enhancing features of non-charismatic species, these data imply that this technique may not be ideal for species lacking any physical or behavioral traits to emphasize.

The impact of cartoons also depended on audience characteristics. Participants' OI and familiarity with the species were significant positive predictors of all measures, as supported by the literature (Dunlap & Heffernan, 1975; Kellert & Berry, 1979; Reimer et al., 2014; Teisl & O'Brien, 2003). In this study, increasing age had a negative impact on "Likeability" and BIs, regardless of image type. Past studies have shown that younger individuals were willing to pay more for biodiversity conservation (Martín-López et al., 2007), more likely than older individuals to support endangered species protection, and be involved in environmental protection organizations (Kellert & Berry, 1979). Thus, younger individuals with high OI and wildlife familiarity may provide an ideal audience for conservation messaging using cartoons.

WVOs were also significant predictors of both attitude types and BIs. Individuals with mutualist sentiments tend to have high affective attitudes toward and support for the protection of individual animals (Kellert & Berry, 1980; Teel & Manfredi, 2010). Conversely, those with utilitarian sentiments think wildlife should be used to benefit humans (Teel & Manfredi, 2010) and are unlikely to be members of animal welfare or humane societies (Kellert & Berry, 1980). These generalities were reflected in this study's findings, with mutualists and pluralists having significantly more positive attitudes overall and all other WVOs having more positive BIs than utilitarians toward these species with no hunting or labor value. WVOs did not, however, significantly affect the impact of image type. In fact, the cartoon salamander was capable of positively impacting attitudes for all WVOs, including utilitarians who the WMPs and the study authors predicted would react indifferently or adversely to cartoon wildlife. The positive impact of the salamander cartoon on all WVOs illustrates the potential of cartoons to reach a diverse audience.

Gaps remain in the understanding of how to best utilize cartoons as a conservation tool for non-charismatic wildlife. Williams et al. (2015) evaluated how the cartoon is drawn and suggested that effect of cartoons in modifying behavior is fragile and influenced by

context and individual preferences. For comparison, results here saw a decrease in “Likeability” for the mussel that included a mask and arms, but a clam mascot with arms and large eyes elicited positive results (Hayden & Dills, 2015). Comparison of the semantic differential scores here highlighted the differences between image types that may have driven the observed attitude trends. Future studies may benefit from more pretesting of the characteristics of questionnaire images (e.g., cute, valuable, friendly). In this way, the images could be more evenly matched in questionnaires, making observed attitude and BI differences more attributable to image type, not features unique to each image. Root-Bernstein et al. (2013) suggested that different types of anthropomorphism would have different uses in conservation. Different images of the same species could be compared to parse out if certain styles of cartoons or photographs elicit different reactions in combination with a message. In this study, all species were anthropomorphized into masked superheroes, but additional studies on the type of anthropomorphism that is the most effective for a given species and type of campaign would be beneficial.

## Conclusion

This study revealed that cartoons can impact attitudes, both negatively and positively, and their effects are influenced by the species, attitude type, and audience characteristics. Therefore, cartoons offer limited potential for wildlife education and marketing efforts. These results suggest that using an anthropomorphized image of a non-charismatic species alone will not guarantee a positive response from the intended audience relative to a photograph of the species as hypothesized. Additional research is needed to determine whether using a cartoon or photograph would be more effective by species and whether it is dependent on message framing and campaign types. From a management standpoint, it is important to emphasize that a cartoon-based marketing effort requires careful pilot testing and consideration of the specific impact of images on the specific target audience. It is recommended that those using this marketing strategy carefully consider: (a) the desired attitude to impact, (b) potential misconceptions and activities associated with the target species, (c) message(s) that the cartoon is intended to convey, and (d) target audience. With careful development, cartoon-based marketing can be an effective tool for conservation messaging associated with non-charismatic species.

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