

## RESEARCH ARTICLE



# Using photo editing to understand the impact of species aesthetics on support for conservation

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## Abstract

1. Many threatened species suffer from a lack of conservation attention compared to others. Prioritisation of funding, research and conservation efforts seem to be driven by reasons beyond conservation need. This could be due to a 'beauty bias', whereby aesthetically pleasing species receive more attention.
2. We examined how editing an image to increase a species' aesthetic appeal may impact donation choices and public attitude towards that species. We posed two research questions; first, 'do people make different donation choices when they see original images of a species compared to when they see images of the same species that have been edited to match aesthetic preferences?' Using hypothetical donation experiments, we asked respondents to allocate funds to the conservation of three pictured species, one 'aesthetically appealing', one 'aesthetically unappealing', and one whose image was either edited to reflect common aesthetic preferences or left unedited. Our findings suggest that images edited to make an animal more visually appealing tend to receive higher hypothetical donation amounts than original images.
3. We also posed a second research question; 'How do people of varying conservation expertise respond to original versus edited images of wildlife?' To investigate this, we ran three focus groups with individuals unfamiliar with our test species, those familiar with two or more of our test species, and with conservation professionals, which showed mixed reactions both within and between groups. Focus group participants with less conservation expertise noted that edited images often seemed 'cuter' than unedited images, and were more likely to compare them to cartoon characters. Participants with more conservation expertise and species familiarity reported greater empathy towards unedited images, and noted that the edited images prompted an 'uncanny valley' response, highlighting the need for further scrutiny in how photo editing might be used in conservation messaging.
4. Our findings support the beauty bias hypothesis and highlight that decisions on conservation support should acknowledge that less aesthetically pleasing species

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are disadvantaged in public attention and funding. In addition, the findings highlight the role of conservation expertise in impacting viewer reactions, as well as the ethical implications of editing images of wildlife.

#### KEYWORDS

aesthetic bias, conservation marketing, flagship species, photo editing, species preferences

## 1 | INTRODUCTION

Conservation efforts currently rely on public support, social licence and financial donations to maintain worldwide biodiversity, halt extinction rates and encourage a range of pro-environmental behaviours (Adams, 2013; Halpenny, 2003; Veríssimo et al., 2018). Although extinction is an impending threat for a wide range of species, some are given more attention than others (Donaldson et al., 2016; Fleming & Bateman, 2016; Murray et al., 2015). Just as in human societies, where those who are perceived as more beautiful may receive greater attention, sexual partners, employment chances and other such advantages (Rhode, 2010), people's support of animal species and their protection seem to follow similar biases (Brambilla et al., 2013; Lišková, 2013). However, the exact nature of this bias is complex.

Previous research has highlighted a historical and systemic 'taxonomic bias' whereby mammals and birds in particular often receive greater legislative protection, research attention and donations, which in turn mean they are more likely to be protected from extinction (Macdonald et al., 2015) than other taxon. For example although mammals make up less than 10% of all known vertebrate species, they are the focus of over 40% of articles in leading conservation journals (Clark & May, 2002). In addition, mammals and birds are far more likely to be the subjects of conservation campaigns (McGowan et al., 2020), shown on social media (Forster et al., 2023; Shaw et al., 2022), and thus are more likely to be known and recognised. Mammals and birds also tend to receive more funding for their protection, despite not always being the most threatened (Davies et al., 2018). This bias also extends further into on-the-ground conservation efforts, with mammals in particular strongly overrepresented in reintroduction programmes, irrespective of their threat status (Seddon et al., 2005).

However, these biases also exist within taxa, suggesting it is not just the taxon of the animal that spurs this bias. For example, the more internet attention an insect species receives, the less likely it is to be endangered (Wang et al., 2021). In addition, visual characteristics seem to play a role, with larger bodied mammals and amphibians more likely to receive research attention and funding (Davies et al., 2018; Silva et al., 2020) than smaller bodied species. Public support and engagement are often stronger for species that people find aesthetically pleasing (Colléony et al., 2017; Lišková, 2013). Indeed, in many contexts, the visual appeal of a species is seemingly more influential on species preferences than, for example, knowledge of threat status (Colléony

et al., 2017; Knight, 2008; Liordos et al., 2017). Thus, we suggest that instead of a 'taxonomic bias', conservation suffers from a 'beauty bias', or a preference and prioritisation of species we find aesthetically appealing over those we do not.

Aesthetically, viewers from Western, educated, industrialised, rich and democratic (WEIRD) countries tend to prefer species that are large, colourful and similar to humans in appearance (Labao et al., 2008; Smith et al., 2012; Stokes, 2007). Brightly coloured animals are often favoured, particularly when they are multicoloured (Curtin & Papworth, 2020; Schlegel et al., 2015). Animals that display some form of neoteny (humanlike juvenile features) are also preferred (Lišková & Frynta, 2013), often eliciting feelings of connection and protection (Serpell, 2003). In particular, a pair of large forward-facing eyes are favoured in many non-human species (Jarić et al., 2020; Lorenz, 1971; Stokes, 2007). Findings from previous research have suggested that species with visual similarity to humans may elicit increased empathy in viewers in comparison to their less anthropomorphic counterparts, as viewers can draw similarities between the animal and themselves (Grasso et al., 2020; Root-Bernstein et al., 2013). Anthropomorphism, the attribution of human traits to non-human entities, is also said to be a strong factor in a species' perceived appeal, with more appealing species eliciting stronger emotional and financial support (Chan, 2012; Thomas-Walters et al., 2020). In comparison, viewers are likely to feel fear and disgust when viewing animal traits associated with disease or 'uncleanliness', such as shaggy fur and feather patterns, which may limit their ability to emotionally connect with the animal (Davey, 2011; Davey et al., 1998; Johansson et al., 2012; Merckelbach et al., 1987; Prokop & Fančovičová, 2017).

The majority of studies investigating preferred species aesthetics on donation behaviours have used photographs of real animals (e.g. Lišková et al., 2015; Lišková & Frynta, 2013; Veríssimo et al., 2011). However, discerning the impact of a single feature within a photograph (in comparison to other photographs) can be confounded by the many different physical characteristics a species possesses, as well as the background features of the image such as variations in lighting and photo quality. To address this, previous studies have used illustrations of imaginary animals to understand respondents' preferences for different aesthetic features (Curtin & Papworth, 2020). However, these illustrations may not be representative of the real-world, and thus we cannot confidently extend these findings to real-life animals without further investigation.

We aimed to explore the effects of altering a species' physical traits as a means of investigating the 'beauty bias' for threatened

species using a mixed methods approach. The findings from this research can provide a deeper insight into the role of physical characteristics in public support for species conservation. Additionally, evidence that viewers prefer 'beautiful' animals to 'real' animals may provide an opportunity for campaigns to address and target these biases, allowing 'uglier' or less appreciated species to gain more conservation support.

Research on species preference using imaginary species conducted by Curtin and Papworth (2020) was able to uniquely remove the impacts of species familiarity, ecological value and rarity as factors that determine public support for a species, and instead focused solely on species' aesthetics. Nevertheless, we argue that using illustrations of species, as well as animals that do not exist, may remove a sense of 'realism' for respondents, as the majority of conservation outreach and marketing efforts tend to use photographs of the wildlife they are focusing on. Thus, we used our study as a way to bridge the gap between Curtin and Papworth (2020) and previous studies using photographs of real animals (Barua et al., 2012; Prokop & Fančovičová, 2013; Schlegel et al., 2015).

In particular, we pose the following research question:

1. Do people make different donation choices when they see original images of a species compared to when they see images of the same species that have been edited to match aesthetic preferences?

In addition, recent conservation marketing research has discovered the role of demographics in impacting how people respond to wildlife donation calls. For example, when investigating preferences for flagship species, Lundberg et al. (2020) discovered that potential donors were segmented in their donation choices by their sensitivity to and knowledge of a species' extinction threat, endemism, or the donor's cost sensitivity. In addition, the prioritisation of aesthetics as a decision factor in species preferences seems to differ by audience age and experience with the focal species (Lišková, 2013), with those living local to focal species less likely to value aesthetics of a bird species over its threat status.

Thus, with experience and knowledge of a species seemingly impacting the degree to which species aesthetics influence donation choices, we also pose the question:

2. How do people of varying conservation expertise respond to original versus edited images of wildlife?

This question allows us not only to evaluate how those with varying levels of conservation knowledge and expertise are influenced by species aesthetics, but also to examine how expertise may influence reactions to the practice of photo editing in conservation campaigns. Insights from this study will help to further the current understanding of how previous knowledge of species conservation interplays with aesthetic preference for a species. Our findings can thus guide decision making on species and image choices in conservation donation campaigns, highlighting the relative strength of

species aesthetics in eliciting donations and the various reactions and responses that audiences may have to using photo editing to reflect the public's aesthetic preferences.

## 2 | METHODS

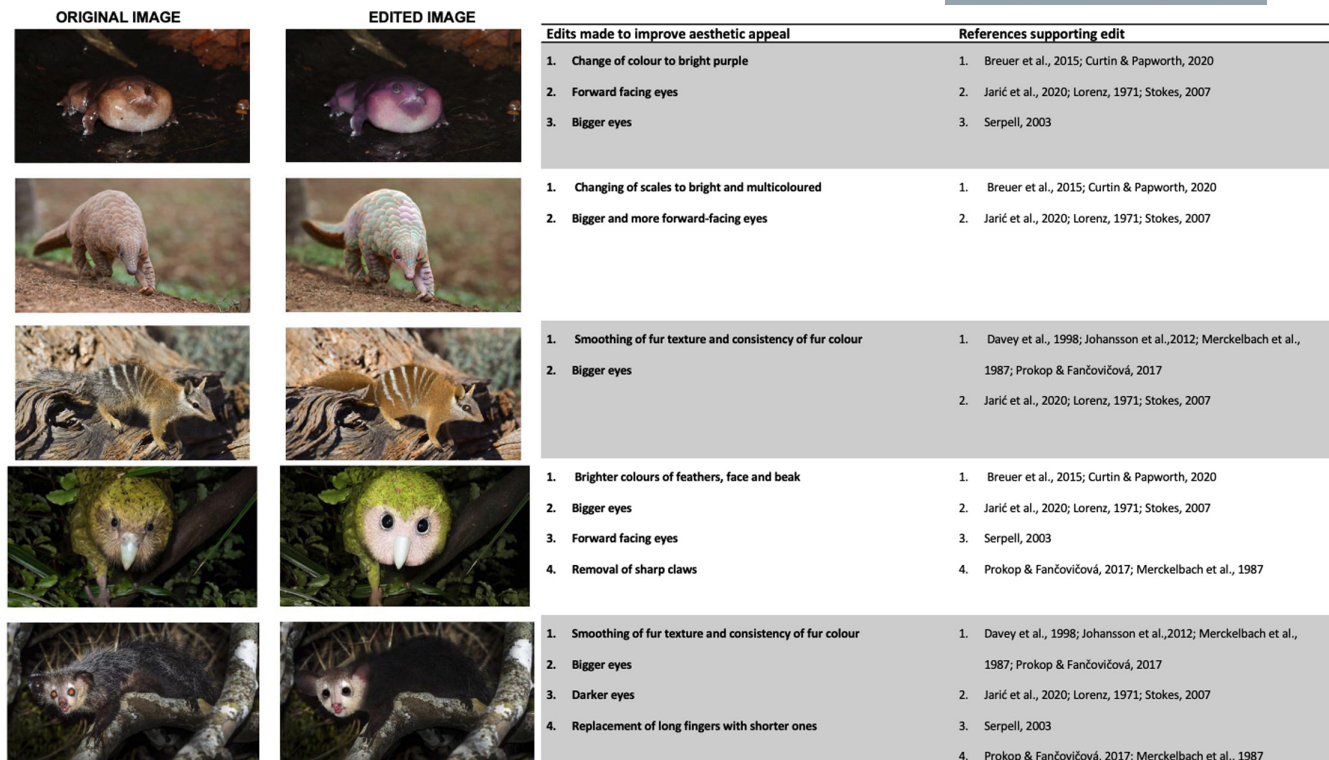
All data collection, analysis and communication followed the Association of Anthropologists of the UK and the Commonwealth Code of Ethics (Association of Anthropologists of the UK and the Commonwealth, 2021), the American Psychological Association Code of Human Ethics (American Psychological Association, 2016) and the National Statement on Ethical Conduct in Human Research (NHMRC, 2018).

### 2.1 | Do people make different donation choices when they see original versus edited images?

To answer this research question, we conducted an online survey using the platform 'SmartSurvey' ([www.smartsurvey.co.uk](http://www.smartsurvey.co.uk)) in March 2020. Survey respondents were collected through the online recruitment agency 'Prolific Academic' ([www.prolific.co](http://www.prolific.co)), which aimed to obtain a representative sample of the UK population by gender, age and ethnicity (S2). Each participant was compensated £1.50 for completing the 10-min survey (the equivalent of £9.00/h).

The survey was used to compare the hypothetical donation choices of respondents between the original images of a species, and the same images edited to reflect known aesthetic preferences (Figure 1). These images focused on five endangered species: the Numbat (*Myrmecobius fasciatus*), Kakapo (*Strigops habroptilus*), Purple Frog (*Nasikabatrachus sahyadrensis*), Indian Pangolin (*Manis crassicaudata*) and Aye-Aye (*Daubentonia madagascariensis*). We chose each of these species as they were of interest to the charity funding the research, had unique phenotypes, and were taxonomically diverse.

For most species, there were limited images available in high definition, availability, quality and convenience, at the price that a charity could afford, so images were chosen online from stock websites for cost and convenience. A professional image editing organisation provided the editing of these images adding or enhancing the characteristics that had been considered 'appealing' throughout the literature, after a consultation session. All edited images included increasing the eye size of the featured animal (Stokes, 2007). Images of the Pangolin, Purple Frog and Kakapo were edited to either add colour or brighten the already apparent colours of the animal in the original (Curtin & Papworth, 2020). Further editing also aimed to reduce the irregularity of fur or feather patterns of the featured species (Batt, 2009). Finally, the photo editing aimed to increase the amount of anthropomorphism displayed by the featured animals, by adding not only neotenic features such as forward-facing, large eyes but also adding facial expression and the lessening of some animalistic features such as the claws of the Pangolin and the large fingers of the Aye-Aye (Serpell, 2003).



**FIGURE 1** Original and edited versions of the images used in the study, featuring (in vertical order): the Purple Frog (*Nasikabatrachus sahyadrensis*), Indian Pangolin (*Manis crassicaudata*), Numbat (*Myrmecobius fasciatus*), Kakapo (*Strigops habroptilus*) and Aye-Aye (*Daubentonia madagascariensis*), along with a list of the edits made and supporting references to justify these edits. Original image photographers are Sandeep Daas (Purple Frog), Ajit Huilgol (Indian Pangolin), Wayne Lawler (Numbat), Andrew Digby (Kakapo) and Nick Garbutt (Aye-Aye).

In addition, we also selected images of 'benchmark' species with which to compare donation choices. The benchmark species were selected based on the findings of Veríssimo et al. (2017) (S1). In this previous study, participants (UK residents) were asked to rank a list of species from the most to least appealing, a term that encompassed both aesthetic and cultural aspects of species preferences. All benchmark species were included in the 2017 study, with the 'appealing' species ranking in the top 10 and the 'unappealing' species ranking in the bottom 10 of that study. By including benchmark species, we could then determine the extent that donation choices are impacted by image editing, with reference to species we know are 'appealing' or 'unappealing' to the public.

The survey itself was based on a contingent valuation approach, asking respondents to make decisions about how a conservation charity should allocate funds. Respondents were given a £5000 budget for each choice, to allocate in any way between three species. Each choice consisted of either an edited or unedited image of our focal species, in addition to an image of one benchmark 'appealing' and one benchmark 'unappealing' endangered species (Figure 2).

Each respondent answered 10 choice tasks, once for each edited and unedited image of the species, which they saw in a random order. By giving a choice to divide the donation amount between the test image, as well as the 'appealing' and 'unappealing' species, we were able to replicate the real life context in which many donations

How would you allocate the £5000 between these 3 animals? \*

	£ <input type="text"/>
	£ <input type="text"/>
	£ <input type="text"/>

**FIGURE 2** Sample choice task. In this example, the first option of the African elephant (*Loxodonta africana*) is the appealing benchmark species, the second option of the Hispaniolan solenodon (*Solenodon paradoxus*) is the unappealing benchmark species and the third option of the Aye-Aye (*Daubentonia madagascariensis*) is the edited image. Elephant photo by Solenodon photo by Miguel A. Landestoy, Aye-Aye photo by Nick Garbutt.



are made, where there is the choice of many species to donate to (Veríssimo et al., 2017).

However due to survey constraints, each edited and unedited image was always paired with the same benchmark species. This limits the specific conclusions we can draw about individual images, as we cannot separate whether a difference in donation amount given to an edited image over an unedited image could be due instead to the specific benchmark species they were paired with, not the image editing. Instead, all donation amounts for edited and all donation amounts for original images were summed to create a total edited image donation amount, and a total original image donation amount for each participant. A Shapiro–Wilk test for normality of the differences between the paired total edited and edited image donation amounts was significant ( $W=0.93$ ,  $p<0.05$ ), indicating that it is not normally distributed. Thus, paired Wilcoxon signed ranks tests were conducted to determine if there was a significant difference in donation amounts between edited and original images. The online survey data was analysed using R 4.2.2.

## 2.2 | How do people of varying conservation expertise respond to original versus edited images of wildlife?

To gather a more detailed understanding of how levels of conservation expertise could affect the response to these images, we also ran three focus groups: conservation professionals, engaged public and lay public. The focus group approach was chosen to reflect the process commonly used in testing marketing campaigns; whereby live reactions and responses to content can be captured and analysed (Calder, 1977; Thomas et al., 2005). The focus group sample for the engaged public and lay public groups were recruited through the agency 'FieldWork Hub'. Screening occurred to determine which focus group participants were allocated to. To be included in the engaged public group, participants were required to exhibit recognition of at least two of the focus species by name. Otherwise, they were placed in the lay public group. The conservation professionals were recruited from members of the University of Oxford Interdisciplinary Centre of Conservation Science group and included students, academics, researchers, policymakers and those with in-field conservation experiences. Participants in each focus group were first shown the edited and then the original image of each species in the order: Aye-Aye, Kakapo, Numbat, Indian Pangolin and Purple Frog. A focus group guide was developed to lead each discussion. Questions centred around (1) the words participants would use to describe each image, (2) the reason/s they felt that way and (3) what similarities/differences they observed between the edited and original species photos (S4). Discussions were conducted in an open format and participants were encouraged to speak openly about their knowledge, views and experiences. Each group was audio recorded for the duration of the interview and recordings were subsequently transcribed and anonymised. Prior informed consent was obtained through signed consent forms outlining: the intention to record, how the data will be used, the withdrawal and complaints

processes, and a commitment to anonymity. These procedures are in line with the British Psychological Society Code of human research ethics (Oates et al., 2021).

The recordings of the three focus group discussions were transcribed and analysed in NVivo (version 1.2) by a single coder following a thematic analysis framework approach (Braun & Clarke, 2012). This approach first required initial familiarisation with the dataset in the form of reading through all the transcripts, in which preliminary trends in content (themes) were identified, a coding matrix was developed, and each line within the transcription was assigned to a theme within that coding matrix. The text within these themes was then revisited, and the preliminary themes further refined during a second read through. The coder also considered how each of the different themes may be related to each other. After a third review of the transcription text, each of the key themes and the relationships between them were finalised. The results section below details: (1) the key themes and sub-themes identified, (2) the variation in themes discussed between focus groups, (3) the content of these themes across edited and original images and (4) the content of these themes for each species.

## 3 | RESULTS

### 3.1 | Online survey

We collected 404 survey responses between 11 and 13 March 2020. Our sample was 51% female, 74% white, with 31% over 57 years old (S2 and S3). This is somewhat similar to the UK population described in the 2011 census, with 51% of residents being female and 28.5% of residents over 55 years old, The Office for National Statistics (Hayes et al., 2017) also stated that the UK population in 2017 was 85.4% Caucasian, however, ethnicity was underreported and this figure is now out-of-date.

There was a large variation in the median donation amounts allocated between species, with the African elephant receiving a median amount of £3000 while the Purple Frog received a median amount of £1000 when considering the photos depicting the species' actual appearance (Figure 3).

The minimum donation was £0 for all species while the maximum donation was at least £3000 across all species. Appealing species clearly received the most donations, with unappealing species occupying three of the bottom five places (Figure 3).

Results from the paired Wilcoxon signed ranks test indicated a small, yet significant difference in total donation amounts between the Edited and Original images ( $Z=-2.933$ ,  $p=0.003$ ,  $r=0.146$ ), with edited images receiving higher donation amounts overall, however, the median donation amounts for each species varied (Figure 4).

### 3.2 | Focus groups

In total, 21 participants were recruited to take part in the focus groups: seven in the conservation professionals' group (CP), eight in

FIGURE 3 Median donation in GBP (with 95% CI) per species.

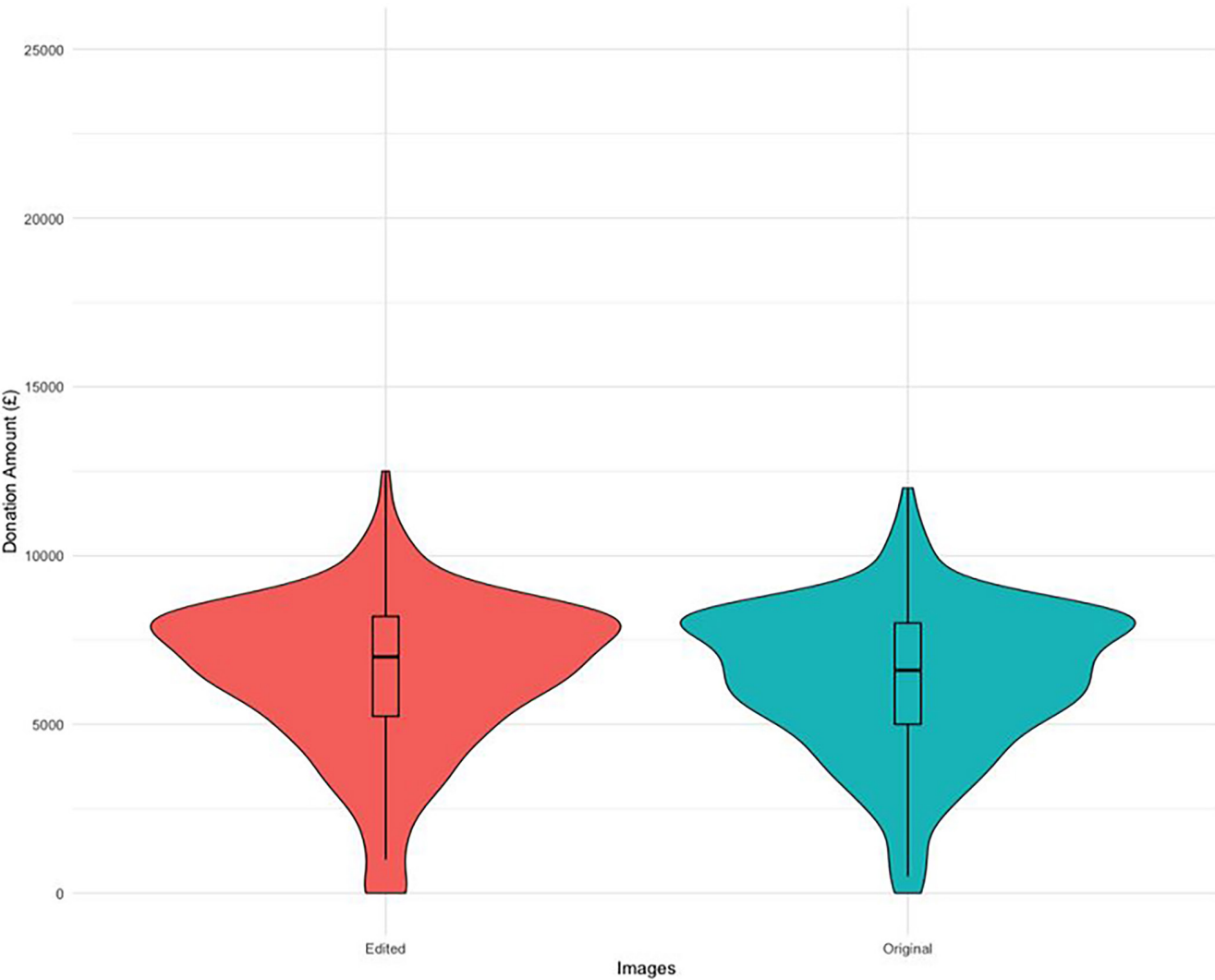
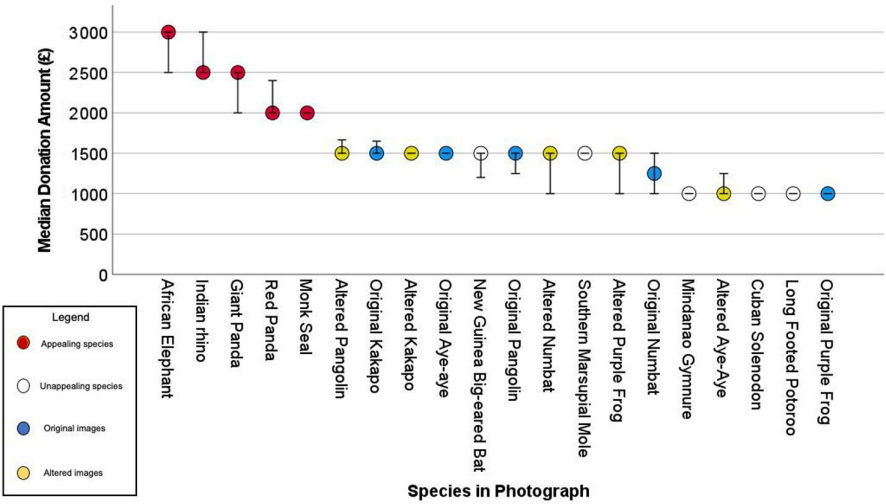


FIGURE 4 A violin plot of the total spread in donations (GBP) allocated to all edited (orange) versus all original (blue) images. Median donation amounts and IQR are displayed by the boxplot superimposed on each violin.

TABLE 1 Outline of the key themes and subthemes identified including the representative quotes from focus group participants.

Theme	Sub-theme	Example
Visual Appeal	Un-appeal	'dirty', 'slimy', 'horrible'
	Appeal	'I think it's cute because its eyes are big and round'
Comparison to Characters	Endearing reminders	'It's fantastical. It looks like ... one of JK Rowling's books or something'
	Animals as objects	'I think the fact that it looks like something that's not an animal makes you judge it by the standards of an object'
Authenticity	Believability of editing	'to me it just doesn't look real'
	Recognition of animal	'I'm confused because I don't know what it is'
	Frustration	'it makes me a bit angry'
	Trust	'I think it looks deceitful'
Empathy	Emotional connection	'I feel more kinship towards it'
	Want to help	'It makes me want to take care of it'

the engaged public group (EP) and six in the lay public group (LP). The overall sample was 62% female and 38% 18–27 year-olds (S3). From the thematic analysis of the focus group conversations, three key themes and a further six sub-themes were identified in the conversations that occurred across the three focus groups (Table 1).

Details from the conversations around each of these themes from each of the three focus groups are outlined in the subsequent sections.

### 3.2.1 | Visual appeal

Across the three focus groups, participants often pointed out specific aesthetic features of the animals and used these to comment on the visual appeal (or un-appeal) of the species. Interestingly, all focus groups commented on their dislike of the visual appearance of the animals in the original, unedited images, describing them as: freaky and weird (associated with the Aye-Aye), skinny and coarse (associated with the Numbat), dirty (associated with the Kakapo) and slimy and horrible (associated with the Purple Frog). However, unlike the other groups, the conservation professionals did not use any negative wording for the original image of the Pangolin. In fact, this group seemed to prefer this image over the edited version, noting, 'despite the smaller eyes and no ears and the less pink nose...I don't feel like it's less cute'. Part of this appeared to be due to the visual interest of the image, with more textural detail shown in the original compared to the edited version. A conservation professional commented on this difference, highlighting, 'I feel like I can actually appreciate more of its features, like for example, only now I can appreciate the claws on its front legs [...] Like it looks like a cool animal'.

Nevertheless, participants across all groups agreed that certain editing choices did make the animals in the edited images more visually appealing. For example, when commenting on the edited image of the Kakapo, participants described it as 'cute', and focused on its large eyes and round face. This was the case for all focus groups regardless of expertise, with a conservation professional noting, 'I think it's cute because its eyes are big and round', an engaged public

participant describing 'I think it's just like kind of the big eyes, it coming out of the bush and looking quite sweet... it makes you want to ... not cuddle it but you know what I mean, it's just really cute'. And a lay public participant clarifying, 'I said cute because I think it's just the features. It has kind of, you know, big eyes and a round face'.

### 3.2.2 | Comparison to characters

In the engaged and lay public groups, some editing choices, such as big eyes and bright colouring, reminded participants of characters in cartoons and films. In the lay public group, the comparison of edited images to popular characters was generally positive. One participant noted that the brighter colouring of the edited Pangolin gave it a magical quality that made it more entertaining to look at; 'It's fantastical. It looks like something, you know, one of JK Rowling's books or something'. In addition, the larger eyes and brighter colouring of the purple frog image was a positive reminder to another participant of a Japanese cartoon, 'Well I think it looks quite endearing. I think it's like something out of a Japanese anime or something'.

A similar theme was noted by participants in the engaged public group, who found the 'cartoonish' exaggeration of facial features in the edited Purple Frog image added a sense of humour and personality to the animal, 'Yeah the cartoonish features and the clear facial expression looks like a child throwing a strop'. The engaged public group also highlighted that the big eyes, smooth fur, and brighter colouring of the animals in the edited images made them relate the images to cartoons and children's toys, rather than believable images of an actual animal. This was particularly the case for the edited images of the Pangolin, Kakapo and Numbat, with one participant commenting on the edited image of the Pangolin, 'I think it looks a bit like a Pokémon...It just looks like a toy'. However, these comparisons were not always as positive as for the lay public, with another participant commenting that the portrayal of the Pangolin in the edited image seemed more like an object than a living creature, 'I think the fact that it looks like something that's not an animal makes you judge it by the standards of an object so it's faded and garish and off-putting as a result'.

### 3.2.3 | Authenticity

Across all focus groups, the authenticity of the edited images was a common discussion theme. This was likely facilitated by the order in which we presented images to participants. For each focal species (e.g. the Kakapo), the focus groups were shown the edited image, directly followed by the original image of that same species. Naturally, focus group participants were aware they had viewed an edited and then unedited version of the same image, and thus all three groups compared their reactions not only to each image, but to the difference between viewing an 'authentic' (original) representation of an animal, in comparison to an inauthentic, edited version.

The lay public's discussions on image authenticity focused on the fact that some of the editing was noticeable against the unedited background, and that this made some edited images feel 'fake'. For example, when commenting on the edited image of the Kakapo, one participant said, *'...because you haven't got those details in the photo [due to the blending editing] to me it just doesn't look real'*. Another commented on the noticeable editing of the Numbat image, *'The eyes look really enhanced, that reflection in the eye looks a bit fake'*. However, some lay public participants thought the edited images were authentic, with one noting of the edited Numbat image, *'I think a lot of creatures like that are unrealistic looking when you see them in real life [...] so to me that could be real'*. However, other lay public participants highlighted that they thought the edited images were authentic, and just an age variation of the original images; on the edited versus original images of the Aye-Aye another participant commented, *'They look like they're about the same size, the same shape. I think [...] it might be the same animal but a few years apart'*.

Amongst conservation professionals, the discussion was mainly centred on their lack of recognition of a species when viewing the edited image of it. For example, when viewing the edited image of the Aye-Aye, one conservation professional commented, *'Well, I'm confused because I don't know what it is'*. In addition, another conservation professional noted, *'They [the edited images] are too distractingly inaccurate'*. Where a species was recognised in an edited image, participants noted feelings of annoyance or offence towards the inauthentic nature of the edited images. Mainly, they noted frustration that an animal they had already considered beautiful or appreciated had undergone a transformation to change its appearance. One conservation professional noted of the edited pangolin image, *'I think it bothers me maybe like a little bit. It makes me a bit angry, like I know Pangolins and they are so beautiful, and this is just weird'*.

Indeed, much of the emotive language used by conservation professionals focused on their preference for authentic (original) representations of wildlife over inauthentic (edited) images. For conservation professionals, there was an immediate reaction of recognition and relief when the image slides changed from an edited to an original image. One participant noted of the original numbat image, *'That looks so much better'*, when it was shown after the edited version. When clarifying their preference for authentic (original) images over the edited versions, another participant cited that

their feelings of connection with the animals in the original images stemmed from the greater believability and trustworthiness of these images compared to the edited versions, [About the original image of the Numbat] *'It's relatable. [...] Yeah like I could trust it. I couldn't really trust the other one'*.

Similarly, the engaged public group focused on the idea of authenticity and the edited images being less believable representations of a real animal. When participants of the engaged public group were asked to describe their reactions to viewing wildlife images that were inauthentic and edited, they noted feeling 'detached' and 'depersonalised' to the featured animal and the donation call. However, these conversations centered more on their reaction to specific edits in the images, rather than their reactions to the practice of photo editing as a whole. In particular, engaged public conversations largely stemmed from the idea that the edited features of a featured species made them look too perfect to be accurate representations of an animal. For example when viewing the edited Kakapo image, one engaged public participant commented, *'It just doesn't look real at all. And yeah again the shape of the face was just too perfect'*. This sentiment was reflected by another participant when comparing the edited Numbat image to the original, *'If it's too perfect then I just don't think it's real'*. Indeed, the engaged public's discussion of the edited images tended to focus more on describing the animals' physical appearance rather than participants' emotional responses to the image. When describing why, one participant suggested: *'I think in the last few pictures the photoshopped ones were so weird I don't really have any feelings towards it'*, highlighting that an emotional connection to an animal in an image may be impacted by how believable a representation the viewer perceives it to be.

The lower emotional connection or empathy reported towards animals in the edited images also seemed to be influenced by trust, with participants viewing the edited images as a manipulative technique to get viewers to care about the animal. One participant stated of the edited image of the Kakapo, *'Now that the big eyes are looking into the camera asking for help, I think it looks deceitful. Like 'please help me' and you're going 'no, you don't exist'.'* Another participant from this group highlighted that it is difficult to feel empathy for an animal you know doesn't exist, *'Like its not something that needs saving, it's not a thing'*.

### 3.2.4 | Empathy

Discussions of empathy focused mainly on participants' emotional connection towards the featured animals, and their willingness to help them. Interestingly, these discussions also seemed to be impacted somewhat by conservation expertise, with the lay public tending to focus less on their emotional connection towards the animals in either the edited or original images in comparison to the engaged public and conservation professionals. In addition, this group did not report any willingness to help the pictured animals, in fact the concept of conservation action or inaction was barely mentioned by the lay public group. The only time an action was mentioned was



when a participant talked about avoiding the Purple Frog if they saw it in the wild, noting *'It looks like something you'd avoid'*.

In comparison, the topic of conservation action was discussed by the conservation professionals group, although it was only highlighted for two of the species: the Kakapo and the Pangolin. The edited Kakapo image was seen as more vulnerable and helpless than the original image with participants commenting of the edited image, *'It looks vulnerable but not in like a desperate way. More in a like 'Oh I'm so cute, obviously you would want to help me' kind of way'* and of the original, *'I mean it is still a vulnerable picture but it feel less so than the previous version'*.

Conversely for the pangolin images, participants felt a greater vulnerability in the original photograph of the pangolin, which matched their positive emotional reactions to this image over the edited version. One participant highlighted of the original Pangolin image, *'I find this one more endearing and I feel more worried about it in a way. I feel like it's more vulnerable'*. Another conservation professional expanded that they felt more connection to animals in the original images compared to the edited versions, noting of the Kakapo original, *'I like this one a lot more. I feel more kinship with it actually than the other one'*.

Similarly, according to the participants in the Engaged Public group, the editing of the Aye-Aye and Pangolin images made the animals look more vulnerable and cuter than the original images, which evoked a reactional response of wanting to help them. Of the edited Aye-Aye image one participant highlighted that the cuteness of the image *'makes me want to take care of it'*. The engaged public participants also suggested that the less visually appealing features of animals in the original images could make it hard for people to empathise with and want to help them, with one participant noting of the original Aye-Aye, *'It could be quite difficult to empathise with an animal that looks that way'*.

## 4 | DISCUSSION

The idea that much of our species preferences and conservation support may be biased towards species that are more aesthetically pleasing is concerning, particularly as it is often the less known and less 'beautiful' species which are more at risk of extinction (dos Santos et al., 2020; Lišková, 2013; Seddon et al., 2005). The impact of overall photo-editing on hypothetical donation choices highlights that there likely is an element of 'beauty bias' within species preferences and that this bias exists across real and edited versions of the same animal. It further suggests that aesthetic appeal could have an impact on other aspects of human-wildlife relationships, such as empathy for and willingness to protect featured species, and on a more systemic level, governmental, research and financial support (Gunnthorsdottir, 2001; Knight, 2008; Liordos et al., 2017; Thomas-Walters et al., 2020).

However, reactions to image editing shows that the impact of an animal's aesthetics on viewers is more complex than originally anticipated. The feedback from the focus groups provides some

explanation as to what is driving this complexity, particularly in terms of participants' reactions to the practice of photo editing, as well as participant trust and image believability. How visuals will be perceived and received by target audiences is not necessarily predictable from person to person, and indeed differed in our study between participants of different levels of conservation expertise. Our overall findings emphasise the need for marketing of species support to be drawn away from relying on aesthetic appeal and towards other measures of conservation need.

### 4.1 | Unpacking aesthetic appeal

Although there is evidence that aesthetics can impact donation choices there is little research that has been able to separate specific elements of 'aesthetics' and examine their role on species support, which appears to be complex (Labao et al., 2008; Lundberg et al., 2019; Smith et al., 2012; Stokes, 2007). Our results indicate that the impact of photo editing may have varied by species, something we encourage future research to investigate further. Although edited endangered species images did receive higher hypothetical donation amounts overall, S1 highlights that the results seemed to vary with the specific species shown. Due to survey and sampling constraints, we cannot extrapolate species-specific differences, but we can hypothesise as to the cause of these findings. For example, what is an appealing trait in one species may be unappealing in another, as suggested by Macdonald et al. (2022) and Smith et al. (2012). We are unable to assess if the chosen edits to images in this study were appropriate for each specific species, and indeed in some cases could have decreased the visual appeal of the featured animal.

However, our survey findings suggest that overall, respondents tended to donate more money to edited versions of real animals, than the originals; providing evidence that visual preference bias does likely exist. That said, it should also be noticed that this difference is likely to be relevant in practice in larger scale fundraising efforts.

Comments from our focus groups informed these findings, by supporting the historical literature on species aesthetic preferences, particularly a preference for neotenic features. Neoteny (or the 'cute effect') is a principle that suggests that we prefer species that look similar to human infants, in particular, preferring species with large eyes and rounded facial features (Estren, 2012; Steinnes et al., 2019). As a result, we are primed to feel similar levels of empathy for 'cuter' animals as we do for human infants (Steinnes et al., 2019). In our study, participants across all levels of conservation expertise tended to label the animals in the edited images as 'cute', particularly when the images were edited to increase the size and roundness of the animal's eyes.

Some focus group participants also noted that the neotenic features shown in edited images spurred a sense that the pictured animal was vulnerable and needed to be helped. Such empathy for wildlife has been shown to have mixed impacts conservation and animal welfare.

Encouragingly, it can inspire individuals and organisations to take action to protect them. This can lead to the creation of conservation programs, the establishment of protected areas, and the development of policies that promote the survival of vulnerable species (Myers Jr et al., 2009). The fact that these views were mostly shared by conservation professionals and those with greater species familiarity also suggests that these audiences may be more susceptible to this way of thinking, and thus that promoting a species' vulnerability may have success in spurring conservation action and donations from these communities. However, thinking of wildlife as vulnerable can also lead to a sense of helplessness and apathy amongst people who feel that the problem is too large and complex to solve (Baek & Yoon, 2020). Additionally, it can promote behaviours from well-meaning people that could instead lead to issues with an animal's welfare, such as feeding species the wrong diet (Howard & Jones, 2004) and rescue and ownership without proper licensing and training (Shine & Koenig, 2001).

Just as the preference for species with neotenic traits could be described as almost 'evolutionary', a biological predisposition to protect human infants which has transferred to 'cute' looking animals (Steinnes et al., 2019), there is also an argument that the aesthetic traits we dislike also stem from an evolutionary mechanism of avoidance (Batt, 2009; Davey, 2011). Across all levels of conservation expertise, focus group participants tended to focus on the unappealing visual features of animals in the original images, dubbing them freaky and weird (the Aye-Aye), skinny and coarse (the Numbat), dirty (the Kakapo) and slimy and horrible (the Purple Frog). Many of these descriptions reflect traits that humans see as signs of disease, and thus may evoke feelings of repulsion or avoidance (Batt, 2009; Borgi & Cirulli, 2015; Yao et al., 2009). Furthermore, engaged public participants suggested that the 'uglier' appearance of the original animals may limit the empathy people may feel for them, which in turn could suggest why these animals received lower hypothetical donation amounts than their edited versions. Therefore, although species aesthetics research has mainly focused on what viewers find appealing, focus group discussions suggest that what viewers find unappealing may be just as important to unpack when aiming to guide empathy towards lesser-known species.

However, for the pangolin, conservation professionals preferred the original image to the edited version, and commented positively on the texture and detail of the original image. Studies of photography have highlighted that viewers prefer more complex, textural and higher resolution images, so the less 'airbrushed' depiction of the pangolin might have drawn deeper engagement and visual attention for this group (DiPaola et al., 2013). Currently there is little research in wildlife imagery that explore the role of detail and complexity in visual attention and emotional connection, and we suggest this is a worthwhile avenue for future research.

## 4.2 | Species familiarity

However, as the preference for the unedited Pangolin image was only shown by the conservation professionals, we must also consider

the role of conservation expertise and species familiarity in guiding species preferences. Although currently understudied, there is some evidence to suggest those with more experience and familiarity towards a species are more likely to value a species for traits other than just its appearance (Lišková, 2013; Lundberg et al., 2019), such as its conservation status. We suggest that the pangolin in particular might have been a familiar and valued species to our conservation professionals' focus group, and thus the original image received a more positive reaction from them.

In addition, the conservation professionals group tended to have more negative reactions to the practice of editing photographs of underrepresented species and reported feeling 'relief' when shown the original images. In particular, the issue with the editing of these images was stated to be the lack of familiarity or recognisability of a species in the edited images. It is interesting to note that the conservation professionals' group were more likely to report a lack of recognition of the edited species, even though this group was more likely to have the most knowledge of each of the featured animals. However, with this expertise comes a knowledge of the 'real' representations of the edited species, so our edits may have changed the appearance of the featured animals to such a degree that they were no longer recognisable. Concerns about familiarity were not as apparent as in the other two groups, suggesting that the reaction to edited images of wildlife may depend on a person's knowledge of and prior experience with the featured animals.

The lay and engaged public groups, did not comment that they either recognised or did not recognise the species in the edited images. However, the lack of discussion surrounding recognisability may suggest that it is not just familiarity that impacts how viewers respond to edited images of wildlife, but that that it is instead a deeper level of understanding of a species through expertise or experience, or as suggested by other literature, personal values towards wildlife (Lundberg et al., 2019).

Although we cannot comment on the familiarity the survey sample held towards each test species as we did not measure this, there is a chance this may also have had a role in which images received higher donation allocations. It is worth noting, however, that familiarity with a species does not necessarily lead to that species receiving higher donations than their less well known counterparts (Veríssimo et al., 2018). In addition, historically preferred traits (such as large, forward facing eyes) are given to 'imaginary animals' with no familiarity to respondents, these traits are not found to be effective in eliciting donations (Curtin & Papworth, 2020), further suggesting that species appeal is likely due to an interaction of a range of qualities rather than solely aesthetics.

## 4.3 | Image authenticity

The idea that editing of wildlife images can in some cases make the species unrecognisable is concerning, however even where species are recognised there is still a worrying impact. In some cases, our focus groups' discussions highlighted that specific editing choices

could instead reduce conservation campaign's success, particularly if the image editing is seen as unrealistic.

In particular, the lay and engaged public groups tended to compare the edited images to characters in cartoons, films and even toys. In particular, these groups commented on the additions of bright colouring and large, forward-facing eyes as being reminiscent more of their favourite characters than of real wild animals. Although some comparisons were positive, one engaged public participant highlighted that these editing techniques caused them to judge these animals as objects, not as wild animals, and that this limited their empathy towards them. Previous studies have highlighted the dangers of viewing wild animals as objects, with such viewpoints leading to a greater demand for unethical wildlife tourism practices (Burns, 2015) and the illegal pet trade (Collard, 2020), as well as driving animal cruelty cases (Garlick et al., 2009, 2011). Thus, it is vital that more creative representations of wildlife avoid portraying them as objects, and we encourage further research into how this can be achieved.

As the digital world has expanded, modern society is now exposed to a wide range of visual and creative representations of animals, from photographs to animations, illustrations, cartoon characters and of course, edited images. The way animals are visually represented can also vary in how accurately they reflect a real animal, from scientifically accurate illustrations of a species in a textbook, to cartoon characters with anthropogenic facial features and even creatures that possess animal-like features but do not exist in real life, such as Pokémon. The question then becomes: how realistic or accurate does a visual representation of an animal need to be to convey appeal and invoke empathy? What influences positive and negative reactions to different types of visual representations? Furthermore, what are the ethical implications of providing images of animals that do not closely reflect reality?

We suggest that various forms of imagery may be able to 'push the boundaries' more than others, and indeed, we may have a higher tolerance for inaccuracy in illustrations over photographs. For example, in a study by Osinski et al. (2019), the inclusion of anthropomorphic features in illustrations of native animals increased the donations all species received, but when using photographs, our study saw more heterogeneity in results. In addition, Schwind et al. (2018) found that viewers reacted negatively to computer-generated animal images, as did Löffler et al. (2020) with zoomorphic robots. We suggest that illustrations or cartoons are acknowledged by their audiences as creative representations and thus do not need to be highly accurate depictions of wildlife. However, less realistic or accurate representations of animals in other forms (such as edited images) may be less well-received as by eliciting feelings of unease, or of being deceived.

This hypothesis is reflected by respondents in all focus groups, who reported that some of the edited images appeared 'too perfect' and 'not real' enough to be believable. In some cases, participants also reported feeling less empathy towards and willingness to protect the animals in the edited images, finding them 'garish' and 'offputting'. This could be explained by the concept of the

'uncanny valley', which stipulates that viewers will often feel discomfort or unease when looking at representations of humans that seem slightly inaccurate, such as in robotics and androids (Mori et al., 2012). The hypothesis suggests that less realistic representations of humans (or animals) do not generate feelings of discomfort, but that as these representations become more and more of an accurate likeness, viewers become less and less comfortable. However, at higher levels of accuracy, viewers begin to feel comfortable with the image again. In Figure 5, we suggest how the uncanny valley effect could be applied to different creative representations of an owl, with less accurate likenesses such as cartoons being better accepted than the 'almost realistic' edited owl image.

Further adding to the 'uncanny valley' concept, that the lack of realism in the edited images made conservation professionals feel the edited images were 'depersonalised' and 'detached' highlights the unease participants may feel when viewing edited photographs of animals, and the possible ethical implications associated with image editing, particularly for well-known species. However, there is some evidence to suggest that viewers' tolerance for realism in wildlife images may vary according to their familiarity with the species and their conservation expertise; with lay public participants responding positively to the edited images and being less likely to recognise them as 'fake'. If our survey participants did not have high levels of species familiarity (something we did not measure), this could also explain why the edited photos elicited slightly higher donations, as they may have felt less discomfort than a more 'informed' sample. Further studies could explore these positive sentiments to determine what representations of species across varying levels of realism (as shown in Figure 5) elicit support for underrepresented species, to what degree, and how this varies across different audiences.

#### 4.4 | Ethical concerns

When discussing the practice of photo editing amongst focus groups, the underlying concerns of deception and trust were highlighted, with conservation professionals and engaged public participants both reporting feelings of distrust and feeling manipulated by the edited photographs. Studies into digital ethics have highlighted when viewers are made aware of deception in an advertisement, they often completely disengage from a campaign, and sometimes from the whole organisation (Darke & Ritchie, 2007; Waller, 2015). Therefore, in a conservation campaign where engagement is relied upon, using 'deceptive' or 'manipulative' images could cause potential donors to avoid donating towards that organisation again. This issue is not just seen in the conservation space; in the advertising realm, the issue of digitally retouching models has gained the attention of the public and become a controversial issue. However, in an age where anybody can 'touch themselves up' using Instagram filters, it is predicted that upcoming generations may have a much higher threshold for acceptable levels of digital enhancement (Ota

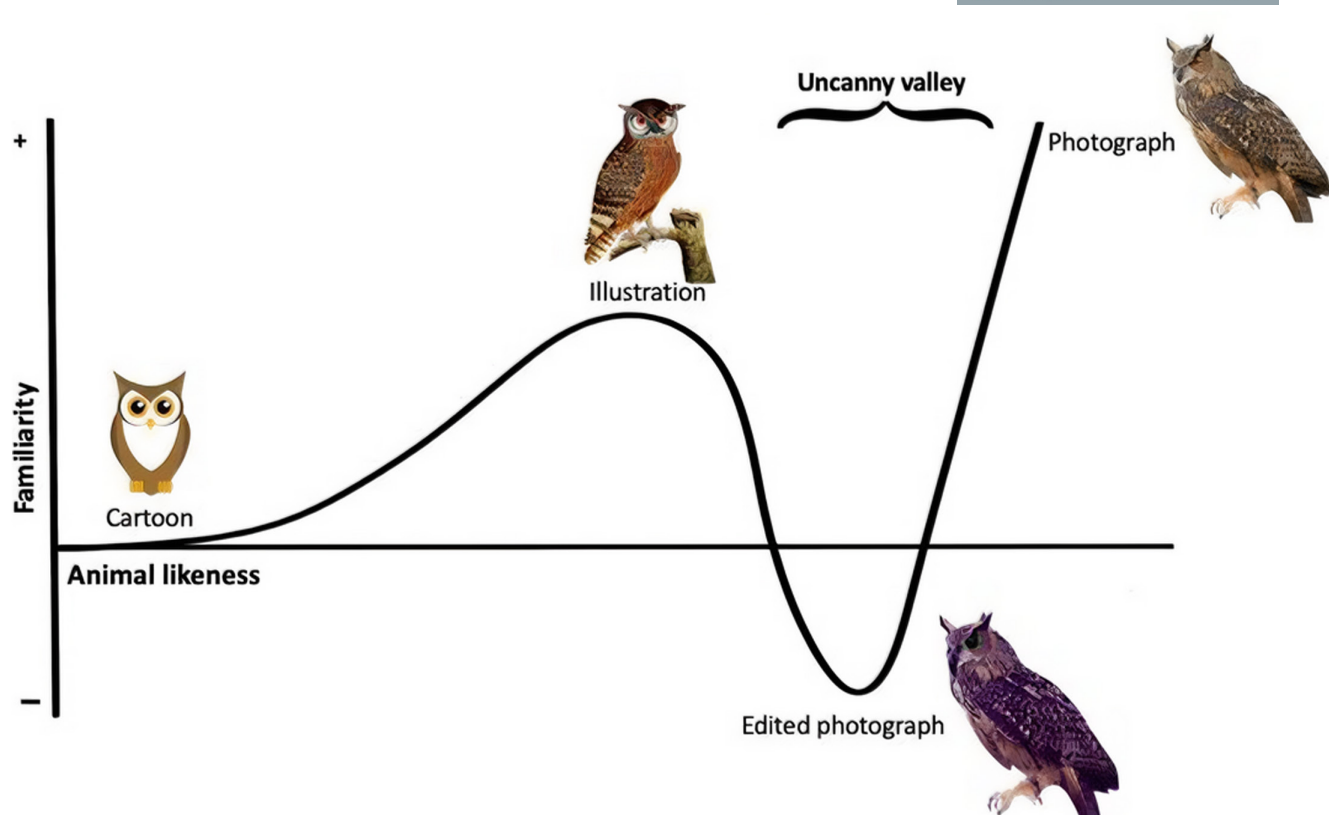


FIGURE 5 A suggested application of the uncanny valley concept (Mori et al., 2012) to different visual representations of the Eurasian Eagle Owl (*Bubo bubo*).

& Nakano, 2021; Rowland, 2022), something which we recommend exploring in future studies.

Accepting that our results were mixed and not amenable to simple interpretations, one might say there is an argument that 'enhancement' of digital photos for conservation marketing should be standard practice—if the uncanny valley can be avoided. However, incidents of digital fakery in portrayals of wildlife have long been the subject of intense scrutiny and disapproval—for example, Disney's film depicting 'lemming suicides' created a strong misconception that lemmings would follow each other off a cliff to their death. This was later revealed to be a stunt manufactured by Disney in which lemmings were pushed off the cliff by film staff, leading to community uproar over the deceit and the disregard of animal ethics (Johnson, 2018). In addition, 'The night raider', a prize-winning Wildlife Photographer of the Year Photograph by Marcio Cabral caused a scandal when it was found that the featured anteater was a taxidermy, with the community again scornful of the deceit (Mitchell, 2019). In addition, although not directly mentioned by our participants, untruthful visual representations of animals could provide unrealistic expectations of how the species looks, acts or behaves. For example, Dydzinski and Mäekivi (2021) highlight how the representations of animals as cartoons can create idealistic perceptions of the species that can cause disappointment when the animal is encountered in real life.

Additionally, when photo editing is not clear to a viewer, it can have the effect of increasing a person's engagement with and

positive attitudes towards a brand (Lazard et al., 2018, 2020) and thus complaints have been made that the technique is often misleading or untruthful (Darke & Ritchie, 2007). Regulators for advertising standards now exist in multiple parts of the world, with some countries considering legislation or even passing restrictions, including requiring disclosures on retouched ads (Schirmer et al., 2018). Over 50% of newspapers analysed by Coleman (2007) have developed ethical standards for photo editing, which have the potential to be expanded to wildlife photographs.

#### 4.5 | Limitations

It is worthwhile noting that this study serves as an initial exploration into the impact of photo editing of species aesthetics. Due to time constraints, we used certain methodological practices that could be improved upon in future studies. As we did not edit all photographs in the same way, nor did we only edit one feature for each photograph, we cannot draw clear conclusions as to the impact of each edited feature on public support for a species. Additionally, due to only having one photo per treatment for each species, we cannot draw conclusions as to the direct impacts photo editing had on the donations for each species in isolation. We also did not measure which traits were and were not seen as 'appropriate' for each different species, but suggest that studies focusing on these mechanisms may be useful for a deeper understanding of specific aesthetic

preferences for a range of lesser-known species. We suggest that this study could be furthered by using a range of images from species across a gradient of attractiveness (from ugly to beautiful based on participants' opinions) to uncover how donations and responses to photo editing vary from species with different benchmark levels of attractiveness.

Demographically, participants were not screened for ethnicity or cultural background, so we posit that these findings may not apply to populations outside of the UK. Our varied findings highlight the importance of using mixed methods approaches to further explore which species traits may inspire support. Previous research in this area (Curtin & Papworth, 2020; Root-Bernstein et al., 2013; Verissimo et al., 2017) has been mostly quantitative, and so the nuances of how species traits may impact viewer emotions, thought processes and behaviours have not yet been entirely explored. Furthermore, our study highlights the value of qualitative research in providing deeper insight into the underlying positive and negative impacts of different conservation campaign choices, many of which in our study would not have been discovered by our survey alone. In addition, our focus group findings highlight the role of conservation expertise in impacting how viewers responded to edited and unedited images of wildlife. We suggest that future conservation campaigns may also wish to consider the impacts on different segments of the population, to determine which messages, images and perhaps even focal species, are most suited to different audiences.

Finally, although respondents may seem to prefer to donate to species that are more aesthetically pleasing, the fact that editing alone seems to impact their donation preferences highlights our general bias towards visually appealing wildlife. We suggest that clear communication of the beauty bias to audiences may raise awareness of conservation inequalities across different species, prompting audiences to question their species preferences and donation choices (Adams-Quackenbush et al., 2019; Monteith & Mark, 2005). Furthermore, to alleviate the systemic biases in research, government and industry, species support should be promoted and evaluated for criterion other than aesthetics alone (Brambilla et al., 2013; Lundberg et al., 2019; Macdonald et al., 2015). For example, in previous studies, participants tended to prefer to donate towards endangered species, species with important environmental roles (such as keystone species), and those with strong cultural meanings (such as species with strong meanings in indigenous storytelling) (Bowen-Jones & Entwistle, 2002). Thus, we should highlight merit not only in a species' aesthetics but also in their value to the environment and society, factors which may prove better focuses for future conservation campaigns and messaging.

## 5 | CONCLUSION

The plight of threatened species is of serious concern, particularly for those which are unfamiliar to non-specialist audiences and thus may receive less conservation support. This study highlights that a bias may exist whereby more 'physically appealing' species are likely to receive more conservation support than others. However,

our findings suggest that just editing images of less appealing species to increase their 'beauty' may not be the answer, and indeed comes with a range of ethical implications. Instead, we suggest that wildlife conservation efforts may benefit from directing attention away from species aesthetics and towards more practical measures of conservation need, such as threat status, cultural value and environmental roles.

## AUTHOR CONTRIBUTIONS

Meghan Shaw was involved in formal analysis and writing—original draft preparation; Matilda Dunn was involved in methodology, formal analysis and writing—review and editing; Sarah Crowley was involved in writing—review and editing; Nisha Owen was involved in conceptualization, methodology and writing—review and editing; and Diogo Verissimo was involved in conceptualisation, methodology and writing—review and editing.

## CONFLICT OF INTEREST STATEMENT

Sarah Crowley is an associate editor for *People and Nature* but was not involved in the peer review and decision making process.

## DATA AVAILABILITY STATEMENT

All data are available at <https://doi.org/10.6084/m9.figshare.24747501>.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**Table S1:** Appeal scores for different species selected as benchmarks in the online survey, taken from Veríssimo et al. (2017).

**Table S2:** Demographic composition of survey respondents ( $n = 404$ ).

**Table S3:** Demographic composition of focus group participants ( $n = 21$ ).

**Survey S4:** Survey given to respondents.

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