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Attitudes toward conservation of different avian species are influenced and can be predicted by multiple aesthetic perception factors

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Abstract
Aesthetic perception attributes of 'beautiful', 'cute', 'afraid' and 'boring' were collected as quantitative rankings in a survey to determine attitudes toward avian conservation among 65 High School Students. Students were asked to rank each bird separately by attribute in an image set of ten birds, shown in random order. At the end of the survey, the students ranked the birds for conservation worthiness. The first 5 ranked birds (rank=1 through 5) were those selected for conservation. The rank order in conservation popularity among attributes placed 'boring' with the greatest (positive) correlation ($r = 0.82$, $p < 0.01$), followed by 'afraid' ($r = -0.47$, $p=0.17$), with the (greatest) negative correlation. The effect size of comparison between the selected group of birds for conservation vs. the unselected birds was large for the rating of 'beautiful' (Cohen's $d=0.87$, 95%CI=(0.58, 1.15)). Student gender showed a statistically significant interaction effect ($F(1,62)=4.54$, $p=0.037$) in the strength of association between the rating of 'beautiful' and conservation decisions. The results showed that the more interesting (not boring) a bird species was, whether it be *selectively* beautiful/cute *or* inducing fear (afraid) – but not both – the higher the overall ranking (deemed conservation worthy) it received from the participants. Conversely, the birds that did not generally rank high tended to be those which were neither too beautiful and/or cute, and which also simultaneously incited milder (as opposed to intense) feelings of dread or fear, and/or furthermore; ranked relatively high on the 'boring' category. Several avian species that have recently become extinct or are on the verge of becoming so seemed to fall into this latter category. Conservation efforts for this category of extinction-prone avian species should hence prioritize information about their unique lifestyle and behavior such as foraging, song, nest-building, courtship rituals, migration and other quirks – over their physical attributes – to obtain favorable public support and thus, funding.

Keywords
Avian conservation, Avian species, Extinct, Species conservation, Birds, Aesthetic perception, Conservation attitudes, Wildlife management, Wildlife species, Foraging

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Introduction

The physical characteristics of wildlife species influence humans' emotions toward them (1,2). These physical characteristics include animal body shape (3), coloration (4) and feeding habits (5), among others. Beautiful and attractive animals that induce positive emotions in people receive more attention and consequently, more conservation actions (6). On the other hand, collective fear or disgust of certain species may lead to ignored or inadequate wildlife management. Among the various species of birds, previous research found that humans' emotions may influence how they manage individual species (7). For example, people use techniques such as egg removal or traps when they feel angry or disgusted about common urban avian inhabitants such as house sparrows, crows or pigeons because they compete for food and space with native birds. In contrast, happy feelings that are stimulated by beautiful bluebirds motivate protective attitudes.

Other factors, such as sex, age, culture background, and living environment also have an impact on humans' emotions (8). For the population of high school students, one study investigated their attitudes toward spiders (9). Since spiders are traditionally considered least popular animals, the study focused on negative emotions.

The current study intended to fill the gap in research by examining high school students' conservation attitudes toward birds and its relationship with emotions. The research questions were: 1] Are High School students' conservation attitudes associated with their emotions, both positive and negative, based on aesthetic perception of the physical characteristics of birds? 2] Is the pattern and degree of the associations influenced by sex and prior birding experience?

Methods

Survey development and expert review

The initial version of the survey contained images of 20 birds that were selected from a pool of 40 birds using the randomization option on Cornell Lab of Ornithology's website, https://birdsoftheworld.org/bow/home , Birds of the World. After seeing each bird image (Appendix), students were asked to rate four emotions on a scale from 1 to 10 (1 being the least and 10 being the most) – 'beautiful', 'cute', 'afraid' and 'boring'. The fifth question asked how much money they were willing to donate to each species. A biology teacher who specializes in birds and a statistics teacher at the author's school reviewed the survey. Based on the feedback, the measurement of conservation attitude was changed from specifying the amount of money to donate to having students choose their top species for conservation, as the decision to exactly how much money would be donated to each species was tedious and vague.

Survey piloting and finalization

The author piloted the survey with five random students at school. It turned out that repeated ratings for 20 birds were overwhelming. To minimize the survey fatigue effect, the author shortened the survey by removing 10 birds (i.e. leaving 10 birds in the survey). Further, to avoid potential priming effect, these ten birds

were randomized in terms of order of appearance in the survey using the randomization function of the software Qualtrics™ (Qualtrics LLC, Seattle, WA, USA) . At the end of the survey, the images of the birds were displayed in one panel for review and the students were asked to select 5 of them to donate money to for conservation. The question was phrased as "If you were told that all of these bird species are categorized as either vulnerable, endangered, or critically endangered by the International Union for Conservation of Nature (IUCN), what are the five birds you would most willing to donate money to in order to fund their conservation?" (see the complete survey in the Appendix)

Additionally, the piloting also resolved the concern that students would be unable to differentiate between the cute and beautiful categories, which was brought up by advisors during development. Students were asked afterward by the author how they differentiated between the two, and the general consensus was that the two categories were distinguished by emotions towards proximity, with cute being defined as a bird species one would want to get closer to in order to touch or cuddle with, while beautiful was defined as a bird species one would want to admire from far away. The universal feeling seemed to be that cute was something the students would want to cuddle or pet, while beautiful was a more distant form of appreciation. Additionally, boring was an emotion that was primarily dictated by having no unique or distinguishing features in the physical attributes of color, shape, or ornamentation.

There was also a concern that the different positions the birds were shown in could confound the ratings (flying versus standing). However, the decision to include different locomotive positions could be justified by the reasoning that the positions the birds were presented were how they would most likely be found in the wild, hence those positions presented the participants with the closest experience to how they would judge these birds in real life. The majority of birds were preferentially terrestrial and were therefore drawn or imaged in their most natural standing position, but the Bermuda Petrel and Black Swift are both birds that spend the majority of their day airborne and were therefore drawn or imaged as they would be found in their aerial domain. Additionally, the differences in positions between the species were commonplace in most bird field guides and other informational websites such as Birds of the World, where the images were obtained from.

Data collection and statistical analysis

The data were collected at a high school in Northern Virginia via teacher advising groups between May 14th-23rd, 2025. The survey was anonymous. The participants filled out the survey through a generic link generated by Qualtrics™. Descriptive data analysis, Spearman's rank correlation analysis, empirical equations, and paired samples t-test (two-tailed) were conducted to answer the first research question and repeated measures analysis of variance (ANOVA) was performed for the second research question. Differences with p values < 0.05 were considered significant. All data analyses were conducted

using the statistical analysis software IBM SPSS® (v30.0).

Results

A total of 83 students responded to the survey. Of these, 65 students completed the survey, which was the final sample size of the study. Table 1 shows the rank order of the birds being selected for conservation (the lesser the rank, the larger the conservation favorability) and the associated average ratings with (standard deviation) of the four aesthetic attributes. Figure 1 is a graphical presentation of the data.

Table 1. Students' selection of birds for conservation and the ratings of aesthetic attributes

Birds name	Rank in conservation popularity (n=65)	Mean rating on Cute (SD)	Mean rating on Afraid (SD)	Mean rating on Beautiful (SD)	Mean rating on Boring (SD)
Chilean Woodstar	2 (51) *	7.52 (2.40)	1.58 (1.89)	7.91 (2.28)	2.20 (2.71)
Red-billed Curassow	3 (36)	2.83 (2.72)	4.71 (2.90)	3.68 (2.79)	2.38 (2.63)
Taita White-eye	7 (29)	6.66 (2.34)	1.52 (2.16)	5.83 (1.99)	4.14 (2.85)
Black Swift	3 (36)	4.97 (2.87)	3.17 (2.65)	5.23 (2.84)	3.32 (2.80)
Mangrove Finch	9 (23)	5.49 (2.57)	1.85 (2.46)	4.68 (2.35)	5.09 (2.94)
White-throated Wren-Babbler	10 (21)	5.72 (2.40)	1.88 (2.40)	4.40 (2.40)	4.32 (2.96)
Victoria-crowned Pigeon	5 (35)	3.22 (2.71)	4.83 (2.91)	5.51 (3.08)	2.34 (2.45)
Spoon-billed Sandpiper	6 (31)	5.23 (2.55)	2.00 (1.95)	5.05 (2.46)	3.82 (2.79)
Bermuda Petrel	8 (27)	5.08 (2.77)	2.94 (2.87)	5.65 (2.72)	3.78 (2.98)
Crested Ibis	1 (61)	2.31 (2.45)	5.02 (2.89)	3.29 (2.50)	2.54 (2.73)

*Numbers in the parenthesis represent the # of students who selected the bird for conservation. A *lesser* Rank *number* implies a larger conservation popularity or a larger conservation worthiness for that bird. Conversely, a *greater* mean rating for a particular aesthetic attribute implies a *larger* amount of that attribute (more cute, more afraid, more beautiful, more boring, with 1 being least and 10 being most). As examples, the Chilean Woodstar is the most beautiful bird, while the Crested Ibis is the most conservation worthy.

61 out of 65 (93.8%) students selected the Crested Ibis for conservation and its average rating of afraid was also the highest. 51 (78.5%) students selected the Chilean Woodstar and it received the highest ratings on both cute and beautiful and the lowest rating on boring. The Spearman's rank correlation between rank and boring was the highest and statistically significant (r=0.82, p<0.01) followed by Afraid (r= - 0.47, p=0.17), Cute (r=0.44, p=0.20), and Beautiful (r=0.06, p<0.88), all the latter three attributes being non-significant with rank.

Figure 1 shows the actual rank on the x-axis and the rating for the various categories on the y-axis. From the distribution of the category scores, eyeballing the graph shows that the beautiful and cute attributes are generally correlated. The afraid attribute drives conservation ranking (eq.1), unless the | absolute| difference between the (average of the cute and beautiful) attributes and the afraid attribute is large (see rank 2 as an example). Also, the boring attribute is unsurprisingly, generally directly correlated with rank, as evidenced by the Spearman's rank correlation. An empirical equation was therefore

constructed to predict the rank from the (mathematical manipulation of) various category ratings as shown in eq.1.

Calculated Score = afraid + {|[(cute + beautiful)/2] - afraid|} – boring eq.1

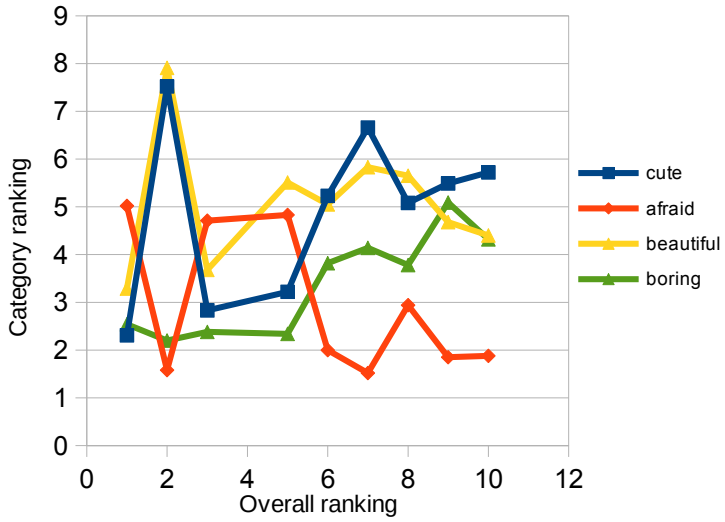

Figure 1. Graph of the average ratings of aesthetic rank (Y axis) plotted against the rank order of birds being selected for conservation (X axis). The figure logically lends itself to be a column graph but the X-Y type was chosen instead, because it better displayed the inter-relationships between the aesthetic attribute rankings.

Using the equation, the graph in figure 2 was obtained. It can be seen that 88% of the variability in the rank could be explained by eq. 1, and therefore by the four aesthetic attributes examined. The calculated score from equation 1 was found to be inversely correlated with the conservation rank; i.e. the greater the calculated score, the larger the conservation popularity or a larger conservation worthiness for that bird and the lesser its rank number.

The paired samples t-test showed that there was a statistically significant difference of ratings on cute ($t(64)=3.20$; 95%CI=(1.68, 7.27); $p=0.002$), afraid ($t(64)=3.33$; 95%CI=(1.45, 5.78); $p=0.001$), and beautiful ($t(64)=7.00$; 95%CI=(6.01, 10.82); $p<0.001$) between the selected (5 most popular or conservation worthy) birds for conservation and the unselected ones. The effect sizes were small for cute (Cohen's $d=0.40$, 95%CI=(0.14, 0.65)) and afraid (Cohen's $d=0.41$, 95%CI=(0.16, 0.67)). The effect size was large for beautiful (Cohen's $d=0.87$, 95%CI=(0.58, 1.15)). The difference of ratings on boring was not statistically significant between the selected birds and the unselected birds ($t(64)= -1.74$; 95%CI=(-5.22, 0.36); $p=0.09$).

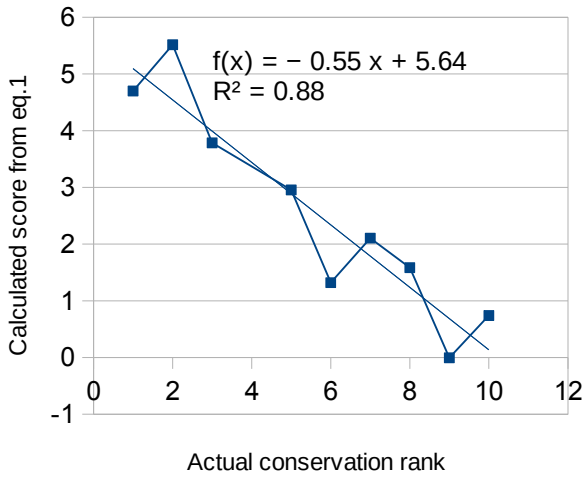

Figure 2. The linear correlation between the conservation rank and the calculated score from eq.1.

Table 2. Ratings of feelings of students categorized by gender

	Male		Female	
Aesthetic attribute	Mean of total ratings for the selected birds (SD)	Mean of total ratings for the unselected birds (SD)	Mean of total ratings for the selected birds (SD)	Mean of total ratings for the unselected birds (SD)
Cute	23.04 (8.34)	21.67 (10.45)	29.43 (11.19)	22.86 (11.49)
Afraid	13.70 (8.84)	10.37 (8.96)	19.08 (10.73)	15.16 (10.01)
Beautiful	27.19 (8.30)	21.74 (9.55)	31.92 (9.37)	21.35 (9.80)
Boring	17.26 (14.43)	19.30 (10.71)	14.84 (10.34)	17.76 (9.97)

The first repeated measures ANOVA considered the between-subjects effect of sex. There were 37 females and 27 males (note: one student indicated others and was removed from the repeated measures ANOVA analysis due to lack of power). As the within-subjects measure only had two conditions (selected group of birds vs. unselected group of birds), Mauchly's test of sphericity for the assumption of equal variance of the differences between all possible pairs of within-subject effect was not reported. Table 2 shows the means of the groups. The only statistically significant interaction was between ratings for Beautiful and sex ($F(1,62)=4.54$, $p=0.037$). For the females, the average of the total ratings on Beautiful for their selected group of birds for conservation was 31.92 and 21.35 for the unselected group. For the males, the corresponding numbers were 27.19 and 21.74. Figure 3 shows the pattern of the interaction.

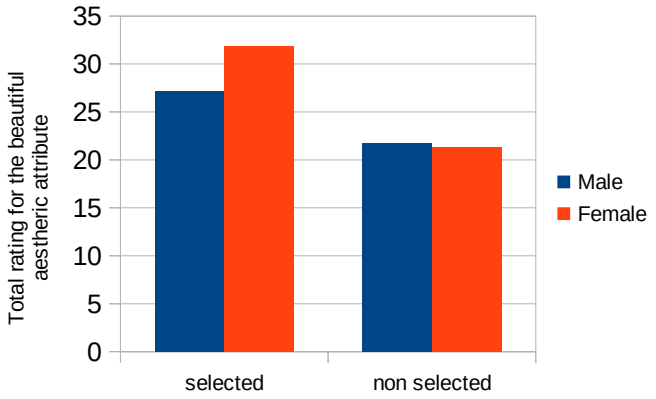

Figure 3. Interaction effect between the rating of the aesthetic attribute of beautiful and gender on conservation selection

The second repeated measures ANOVA considered the effect of birding experience. There were 12 students who indicated that they had prior birding experience. For them, the ratings of the aesthetic attributes of afraid, beautiful, and boring had a larger difference between selected versus unselected groups of birds than those who did not have the birding experience. Table 3 shows the details. However, none of the interactions between aesthetic attributes and prior birding experience was statistically significant.

Table 3. Ratings of aesthetic attributes for the students who had birding experience versus for those with no experience

	Had birding experience		No birding experience	
Aesthetic attribute	Mean of total ratings for the selected birds (SD)	Mean of total ratings for the unselected birds (SD)	Mean of total ratings for the selected birds (SD)	Mean of total ratings for the unselected birds (SD)
Cute	24.75 (8.08)	23.92 (11.18)	27.19 (11.01)	22.00 (11.03)
Afraid	17.33 (8.80)	11.58 (8.33)	16.69 (10.64)	13.50 (10.15)
Beautiful	32.33 (7.41)	20.08 (9.23)	29.37 (9.51)	21.85 (9.76)
Boring	16.33 (11.03)	23.75 (5.93)	15.75 (12.54)	17.17 (10.66)

Discussion

An analysis of eq.1 and Figures 1 and 2 shows that, first; it can be posited that the more frightening a bird appears (the greater the afraid rating), combined with a larger absolute difference between the [(average of beauty and cute ratings) and the afraid rating], the more likely it is to be recommended for conservation. This seems to imply that a bird is more likely to be recommended for conservation if it is perceived as being threatening but not *simultaneously* being (cute or beautiful). In other words, a bird that evokes feelings of fear – but not of beauty – is more likely to be recommended for conservation. Birds such as the Crested Ibis and the Red

billed Curassow fall into this category. Outside of the surveyed birds, the shoebill stork, emu, cassowary and the condor may fall into this category. Regardless of Darwinian or Lamarckian acquisition by humans, birds that incite intense feelings of fear or dread, appear neither beautiful nor cute.

Second; if the bird does not evoke feelings of fear or of being afraid, then the absolute difference between the [(average of beauty and cute ratings) and the afraid rating] must be significantly large (to offset the addition of the afraid term) for that bird to be recommended for conservation; although the lesser boring rating may help in this regard. The Chilean Woodstar, and Blackswift fall into this category. Outside of the surveyed birds, the peacock, parrot and toucan may fall into this category. Again, Darwinian or Lamarckian acquisition by humans may result in intensely beautiful and cute birds not inciting feelings of fear and generally, to also not appear boring.

The birds that would not rank high on the conservation rank would hence be those which are neither too beautiful and/or cute, and which also simultaneously incite milder (as opposed to intense) feelings of dread or fear, and/or furthermore; rank relatively high on the 'boring' category. The Victoria-crowned Pigeon, Spoon-billed Sandpiper, Taita White-eye fall into this category. Outside of the surveyed birds, the Spix's macaw, the Black-faced honeycreeper, the Alagoas foliage-gleaner and the Cryptic treehunter have/had aesthetic characteristics which match this low conservation rank category. Unsurprisingly, these species are either extinct, or are on the verge of becoming so.

For a bird to hence appear 'conservation worthy' to the dominant species capable of engineering extinction – *viz. Homo Sapiens* - on the planet, they need to possess the *sole* characteristics or *either* instilling fear or dread, *or* of projecting beauty of sufficient magnitude. On the other hand, species that appear moderately threatening and moderately beautiful/cute are the least likely to garner public opinion for conservation. It is also quantitatively important that 'Conservation worthy' species must not appear to be boring.

As discussed above, overall, a willingness to donate, in order to fund conservation was related to aesthetic perception. An important factor in deciding which birds to donate to seemed to be dependent on how interesting the birds were, regardless of whether this took form in a bird being exceptionally cute/beautiful, or intensely scary to the student. The three bird species that ranked at the top three in terms of conservation popularity — the Crested Ibis, Chilean Woodstar, and the Red-billed Curassow — were all birds that were exotic looking, with unique features such as the iridescent feathers on the Woodstar and the unusually shaped crests on the heads of the Ibis and the Curassow. The Black Swift, which tied with the curassow for third place in conservation popularity, did not have any flashy features but instead had an interesting body shape and proportions compared to the other species, which could explain its ranking despite being plainer in terms of color and features.

The Chilean Woodstar in particular had the highest ratings for both cute and beautiful, which may originate from it being a member of the family *Trochilidae*, the hummingbird family, which are birds that are easily distinguished by those with no experience in birding and are often viewed as a symbol of luck in many cultures. It also ranked second in conservation popularity, behind the Crested Ibis, which ranked much lower in the cute and beautiful attributes but obtained a much higher rating for the afraid aesthetic attribute.

On the contrary, the birds that ranked the lowest in terms of conservation popularity — the Bermuda Petrel, the Mangrove Finch, and the White-throated Wren-Babbler — were all birds that had colors that would conventionally be considered plain and dull: black, brown, and white. These were also birds that had conventional silhouettes and body shapes and could be associated with more common birds that students in the Northern Virginia area see every day. For example, the Mangrove Finch and the White-throated Wren-Babbler could both be perceived as sparrow-like birds, and the Bermuda Petrel's shape is similar to a gull's, both being seabirds. This decreases their potential of being seen as "special" and "interesting" enough to want to conserve compared to the birds that ranked high in conservation popularity. The Mangrove Finch and White-throated Wren-Babbler ranked the highest in the boring aesthetic attribute, further revealing that how dull they were perceived affected their rank in conservation popularity. Statistically, rank and being boring had the highest correlation. The more boring a bird was perceived, the less likely it was picked for conservation; although this attribute needed to be combined with the other three aesthetic attributes in order to predict overall conservation rank (eq.1). Based on eq.1, the four aesthetic attributes worked together to influence the conservation preference. It could be inferred that birds like the shoebill stork, ostrich, and cassowary, which are considered frightening, may receive conservation scores similar to those of peacocks, parrots, and toucans, which are viewed as beautiful and cute.

There was a gender difference in terms of the degree of association between ratings on the beautiful attribute and of conservation decisions. The influence of aesthetic perception had more impact on females decisions. This may stem from the cultural norm of women and girls placing more value in outward appearances and beauty, basing their decisions more on how cute or beautiful an animal is than men and boys would. Especially in adolescence, where much of the transition from childhood to adulthood for females has its foundations in maturing through fashion style, makeup, and figure; in choosing which species to conserve; beauty would have a larger influence on them than it would on their male counterparts. The influence by prior birding experience was not statistically significant although students who did have experience tended to have higher ratings (with the exception of cute) for the aesthetic attributes for selected birds than their non-experienced counterparts.

For the younger demographic who are willing to invest in environmental conservation, how a

species is portrayed and marketed, especially to those that are not familiar with its natural history, could be an important factor for whether that species is marked for conservation. For teens, the species must be interesting enough in some aspect, whether it be a unique shape, color, or feature on the head, wing, or tail that distinguishes itself from species that the person may see every day, such as birds belonging to the Corvid family (Crows, Ravens, Magpies, Jays), sparrows, and seabirds. Familiarity, as the saw goes, may indeed breed contempt. It may not matter in what aspect the species distinguishes itself in, whether it be more beautiful or scarier, as long as it elicits an emotional reaction that prevents it from being deemed as boring.

This study had several limitations. First, the data were collected from a single high school in the DC metropolitan area, which limits the generalizability of the findings to the population of this age group. Second, the survey only asked the students to rate specified dimensions of emotions or aesthetic attributes. There might be unidentified emotions, or attributes such as frequency with which viewing encounters occur, involved in answering the conservation question. Third, the physical characteristics of the birds included in the survey may not be fully visible in fixed-angle still photographs.

Environmental conservation organizations such as the World Wildlife Fund may find it useful to take advantage of an at-risk species' unique environment, lifestyle, and behavior such as foraging, song, nest-building, courtship rituals, migration and other quirks that may elicit the same emotional reaction that a more unique species' appearance would, and hence garner more attention conservation-wise. Species which already have strong cultural ties, unique features, and stronger aesthetic design overall should have these qualities highlighted.

Conclusion

The attitudes toward the conservation of a threatened avian species significantly depend on the bird's ability to tap into humans' emotions toward it. This study found that the two aesthetic attributes of 1] being beautiful/cute or 2] appearing to be threatening/scary generally needed to be mutually exclusive to a bird to deem it 'conservation-worthy'. In addition, the bird also had to appear interesting in its physical attributes. Conversely, birds perceived to be moderately cute/beautiful and moderately threatening/scary were also more likely to be designated as boring and hence less likely to be deemed 'conservation-worthy'. Conservation efforts for this latter category of extinction-prone avian species hence should probably prioritize information about their unique lifestyle and behavior such as foraging, song, nest-building, courtship rituals, migration, food-chain irreplaceability and other quirks – over their physical attributes – to obtain favorable public support and thus, funding; especially in the younger demographic.

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