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Lundberg, P. and Vainio, A. and MacMillan, D. C. and Smith, R. J. and Veríssimo, D. and Arponen, A. (2019) The effect of knowledge, species aesthetic appeal, familiarity and conservation need on willingness to donate. *Animal Conservation*, 22 (5). pp. 432-443. ISSN 1367-9430.

DOI

<https://doi.org/10.1111/acv.12477>

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1 The effect of knowledge, species aesthetic appeal, familiarity and
2 conservation need on willingness to donate
3

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21 **Article DOI:** 10.1111/acv.12477
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31 **Short title for page headings**

32 Knowledge, aesthetic appeal and familiarity

1 **Abstract**

2 Environmental non-governmental organizations (ENGOS) largely select flagship species for conservation
3 marketing based on their aesthetic appeal. However, little is known about the fundraising effectiveness of this
4 approach or how it compares to ecosystem conservation campaigns that use habitat types as flagships. By
5 performing a willingness to donate (WTD) survey of potential online donors from Finland, we identified which
6 motivations and donor characteristics influence their preferences for a range of different flagship species and
7 ecosystems. Using the contingent valuation method and the payment card approach, we found the combined
8 funding for eight mammal flagship species was 29% higher funding than for eight bird flagship species.
9 Furthermore, the aesthetically more appealing species, as well as the species and ecosystems that are native to
10 Finland, attracted the most funding. We then used ordinal logistic regression to identify the factors influencing a
11 donor's WTD, finding that knowledge of biodiversity conservation and familiarity with the flagship was
12 associated with an increased WTD to birds and ecosystems, and people with higher education levels had an
13 increased WTD to ecosystems. Surprisingly, species aesthetic appeal was not related to an increased WTD,
14 although "need of conservation" was, suggesting that highlighting the plight of these less appealing threatened
15 species or ecosystems could raise money. Our results suggest that the factors driving donating to mammals, birds
16 or ecosystems differ, and so underline the importance of considering the diverse motivations behind donation
17 behavior in fundraising campaigns. They also provide new evidence of the motivations of online donors, an under-
18 studied group who are likely to become an increasingly important source of conservation funding.

19 20 **Keywords**

21 Flagship species, ecosystem conservation, aesthetic appeal, conservation, familiarity, willingness to donate,
22 fundraising, online donors

23 24 **Introduction**

25 Funds for biodiversity conservation are scarce relative to what is needed to halt the ongoing biodiversity crisis
26 (White, Bennett & Hayes, 2001; Waldron *et al.*, 2013). Many environmental non-governmental organizations
27 (ENGOS) raise money for conservation projects by seeking donations, but there is uncertainty over what
28 influences donation behavior (Bennett, Maloney & Possingham, 2015). ENGOS often use species that are

1 known to appeal to humans as flagships to raise funds (Wilcove, 2010; Smith *et al.*, 2012). Additionally, some
2 ENGOS raise money for ecosystem conservation. A better understanding of the factors affecting donation
3 behavior would increase the effectiveness of conservation marketing campaigns, as well as help less appealing
4 species and ecosystems by identifying those attributes that donors consider important (Veríssimo *et al.*, 2017).
5 Many studies dealing with this topic have explored how extrinsic and intrinsic motivations, moral motivation or
6 social identity explain donation behavior (e.g. Brekke *et al.* 2003; Lee & Chang, 2008, Dono *et al.*, 2010). The
7 conservation marketing perspective (cf. Wright *et al.*, 2015) to donation behavior complements these findings
8 by trying to understand the needs and preferences of target audiences (Akchin, 2001). This study aims to
9 increase understanding of the factors affecting target audience choice of flagship species and ecosystems to help
10 improve the effectiveness of fundraising marketing strategies.

11
12 Individuals' willingness to contribute to conservation via flagship species has previously been studied from the
13 viewpoint of tourists (Kontoleon & Swanson, 2002; Veríssimo *et al.*, 2009), students (Tkac, 1998) and the urban
14 public (Tisdell, Swarna Nantha & Wilson, 2007). Recently, online donating has become an important
15 fundraising method for charities (Hart, 2002; Bennett, 2009; Shier & Handy, 2012; Mejova *et al.*, 2014; Shin &
16 Chen, 2016), helped by the rapid increase in social media use by their target audiences (Saxton & Wang, 2014).
17 Thus, individuals who follow ENGOS' social media accounts form a new source of potential donors. However,
18 few studies have focused on online donors (Mejova *et al.*, 2014), so the mechanisms underpinning their
19 donation behavior remain poorly understood (Bennett, 2009; Shier & Handy, 2012; Mejova *et al.*, 2014).
20 Furthermore, a recent study on humanitarian charities suggests the factors driving online donation behavior may
21 differ from traditional "offline" donating (Saxton & Wang, 2014).

22
23 Traditionally, flagship species are selected based on their aesthetic appeal (Caro & Girling, 2010; Smith *et al.*,
24 2012), which includes attributes such as large body size (Smith *et al.*, 2012; Macdonald *et al.*, 2015), warm and
25 bright colours (Stokes, 2007; Prokop & Fancovicova, 2013), and "human-like" anthropomorphic traits (Root-
26 Bernstein *et al.*, 2013; Borgi & Cirulli, 2015), such as a flat face (Sundqvist, 1992) and forward-facing eyes
27 (Smith *et al.*, 2012). As aesthetic appeal is associated with preferences towards wild and domestic animals
28 (Woods, 2000), and willingness to support species conservation (Metrick & Weitzman, 1996; Martin-Lopez,

1 Montes & Benayas, 2007; Colléony *et al.*, 2017), it is no surprise that aesthetically appealing species are
2 predominantly used in conservation marketing.
3
4 Donation behavior may be driven by attributes other than aesthetic appeal, as donors have been found to be a
5 heterogeneous group with dissimilar preferences (Cárdenas & Lew, 2016). Thus far, numerous studies have
6 examined underlying factors influencing willingness to pay (WTP), such as species' conservation attributes
7 (Tisdell *et al.*, 2005; Meuser, Harshaw & Mooers, 2009), aesthetic vs. scientific attributes (Metrick &
8 Weitzman, 1996; Martin-Lopez *et al.*, 2007), and environmental knowledge (Batel, Basta & Mackelworth,
9 2014; Ferrato, Brown & McKinney, 2016). Nevertheless, with some exceptions (e.g. Martin-Lopez *et al.*, 2007),
10 most studies have examined these factors individually, and have concentrated mainly on exploring factors that
11 affect donating to species, leaving factors driving donations to ecosystem conservation understudied.
12 Geographic locality (or familiarity) of the species (Martin-Lopez *et al.*, 2007; Macdonald *et al.* 2015; Cárdenas
13 & Lew, 2016) or ecosystem may also affect the donation decision. However, there is mixed evidence about the
14 association between "patriotic" values or ethnocentrism and donation behavior. More specifically, some authors
15 have found donors to prefer local conservation causes (Dallimer *et al.*, 2015; Cárdenas & Lew, 2016), whereas
16 others have found no evidence (Verissimo *et al.*, 2018).
17
18 It is still unclear how respondent's prior knowledge affects WTP for wildlife conservation. Although previous
19 studies have found knowledge and WTP positively associated (Batel, *et al.*, 2014; Ferrato *et al.*, 2016), this
20 might be an artefact of the study design because the WTP-survey first involved testing, and thus increasing,
21 respondents knowledge. Similarly, studies on the effect of information provision in surveys found an increase in
22 WTP after respondents were exposed to additional information (e.g. Tkac, 1998; Tisdell & Wilson, 2004;
23 Tisdell *et al.*, 2007), although Lariviere *et al.* (2014) perceived similar effects with well-informed respondents
24 only when they had been told their quiz results. A high level of education has also been found to increase the
25 WTP for wildlife conservation (Verissimo *et al.*, 2009; Baranzini, Faust & Huberman, 2010), but the association
26 between educational field and WTP for wildlife conservation has so far been unexplored. The field of education
27 may affect whether the respondent gives more importance to conservation need than to aesthetic appeal.
28

1 All of this means donor willingness to fund a specific conservation flagship will depend on a range of factors,
2 including the donor's characteristics and level of conservation knowledge, as well as the species' aesthetic
3 appeal, familiarity/locality and perceived conservation need. Moreover, all of these factors are interdependent
4 and so need to be examined together. In this study we examined how these factors explain willingness to donate
5 (WTD) to flagship species and ecosystems among potential online donors. We sought to answer the following
6 questions: 1) Which factors influence WTD to flagship species that vary in their aesthetic appeal and
7 familiarity/locality? 2) Which factors affect WTD to ecosystem conservation? 3) How, if at all, does prior
8 knowledge of biodiversity conservation relate to WTD to flagship species and does it vary with the aesthetic
9 appeal and familiarity/locality of the species, or to ecosystem conservation? 4) What is the role of donor
10 characteristics on WTD to flagship species or ecosystems?
11

12 **Materials and methods**

13 **Survey design and implementation**

14 We interviewed representatives of three Finnish ENGOs from appropriate departments (administration,
15 fundraising and communications) to help design the questionnaire (Online Appendix S1). The survey was pre-
16 tested on undergraduate environmental science students (n=22), and a group of conservation biologists and
17 researchers, and non-experts (n=27). We targeted the main survey at potential adult online donors, i.e. people who
18 have shown an interest in nature conservation or the work of Finnish ENGOs by following their Facebook pages.
19 We implemented our survey in co-operation with one ENGO, the Finnish Association for Nature Conservation,
20 who posted our survey on their Facebook page (<https://www.facebook.com/luonnonsuojeluliitto>). The survey was
21 online between 9th and 21st May in 2015. We received 2130 responses, but had to exclude 51 (3 blank, 14
22 incomplete and 34 underage), resulting in 2079 valid responses. Most of the respondents were women and city-
23 dwellers, half of them had donated previously and one third were ENGO-members (Table 1). Our respondent
24 sample was self-selected (cf. Bethlehem, 2008), and therefore we did not extrapolate the results to the whole
25 Finnish population.

26 **Willingness-to-donate method**

27 We used the contingent valuation method to assess relative differences in allocating money to ecosystems and
28 flagship species. We used a hypothetical donation to an ENGO as a payment vehicle. We had 14 bid levels

1 ranging from €0 to €500, which were chosen based on discussions with ENGOs, pilot studies and previous
2 studies (e.g. Giraud *et al.* 1999; Reaves *et al.*, 1999; Baranzini *et al.*, 2010). Consequently, we asked our
3 respondents to think about a total sum that they were willing to donate to the conservation of four ecosystems
4 altogether, and then to allocate the sum between these ecosystems. Subsequently, after randomizing the
5 respondents into two groups, we asked the same question about eight mammal (Group 1) and eight bird species
6 (Group 2). This method was similar to the Martin-Lopez *et al.* (2007) study, where respondents first stated their
7 WTD to a hypothetical fund, and then chose five of fifteen species to which the donation would be targeted.

8 **Choice of conservation causes**

9 Because mammals and birds are predominantly used as flagship species, we chose these taxonomic groups for
10 closer examination. To reduce the effect of taxa on WTD-decisions, each respondent concentrated on either
11 mammals or birds (Table 2). We chose our study species so that we had four native and four non-native species
12 to Finland that are used as flagships either by an ENGO operating in Finland or abroad (Online Appendix S2),
13 allowing us to explore differences between native vs. non-native species, as well as the possible effect of
14 familiarity/locality noted in previous studies (e.g. Woods, 2000; Martin-Lopez *et al.*, 2007). We chose species
15 that varied in their aesthetic appeal (ie. colourful vs. brown, cute vs. ugly, large vs. small, species with vs.
16 without anthropomorphic traits). The determination of species' aesthetic appeal was based on a literature
17 review. For example, bats were perceived as ugly or unattractive in previous studies (Knight, 2008; Vincenot *et*
18 *al.*, 2015). Our study species occur in four different ecosystems: savanna, rainforest, Finnish old-growth forest
19 and Finnish freshwater ecosystems, and thus we chose these as study ecosystems (Table 2).

20
21 We used freely available photographs under Creative commons license from Flickr and Wikipedia for each
22 species and ecosystems (see a description of selection process of the photos in Online Appendix S2). As
23 information provision or learning in a survey has been found to affect WTD estimates (Tkac, 1998; Tisdell *et*
24 *al.*, 2007; Lariviere *et al.*, 2014), we gave only colour photographs and the common names of the species to be
25 able to study the effect of aesthetic appeal independently from (perceived) need of conservation. For the same
26 reason, WTD-questions were asked prior to the questions about biodiversity conservation.

27
28

1 **Self-reported drivers of willingness-to-donate**

2 We wanted to test the effect of different drivers on hypothetical donations. After stating the WTD to ecosystems
3 and species, the respondents were asked to evaluate how different potential drivers had affected their WTD-
4 choices using a five-point Likert-scale ranging from “very much” to “very little”. We included drivers that have
5 previously been identified as influencing conservation decisions by government agencies (Metrick & Weitzman,
6 1996) and on WTP among visitors of a national park (Martin-Lopez *et al.*, 2007). These were: 1) Threat or
7 rarity, 2) Beauty, cuteness, aesthetic appeal, 3) Is present in Finland, 4) Familiarity, 5) Evokes positive feelings
8 and 6) Confined geographical range. All these drivers, apart from the last one, were also used for the
9 ecosystems.

10 **Biodiversity conservation knowledge**

11 We created a four-question quiz with conservation biology experts at the University of Helsinki to measure
12 respondent’s knowledge of biodiversity conservation (KBC) (see Online Appendix S1) using a similar scoring
13 system as Uliczka *et al.* (2004). The questions were rated individually on a scale ranging from zero to two
14 (0=wrong, 1=partially correct, 2=correct), with a maximum score of eight points. The scores were used as an
15 explanatory variable in subsequent analyses. Furthermore, as knowledge related to biodiversity conservation can
16 also be obtained through education, we included the field of education (i.e. whether the respondent was
17 educated in the natural sciences, agriculture or forestry) as a possible factor explaining the WTD-choices.

18 **Respondent characteristics**

19 We collected information about respondents’ gender, education level, the type of residential environment and
20 memberships of ENGOS.

21 **Data-analysis**

22 We used SPSS Statistics 22 and R version 3.4.3 to analyse the data. All respondents evaluated four ecosystems,
23 whereas one half of the respondents evaluated mammals (Group 1) and the other half birds (Group 2). We
24 performed an independent samples Mann-Whitney U-test to compare differences in WTD across these two
25 groups (groups 1 and 2). In the survey we attempted to replicate a genuine donation situation where the donor
26 chooses one of the predetermined values that s/he considers the most suitable for each cause. Thus, the values
27 are ranked but not within equal intervals. In keeping with the standard practice, we considered these values as

1 minimum donations and treated the WTD-variables as ordinal variables in our analysis, although this is an
2 assumption because we do not know where the real WTD lies.
3
4 We used Principal Component Analysis (PCA) to re-combine self-reported drivers of WTD to three broader
5 WTD-motives. Instead of removing correlated variables, we used a PCA to retain more data from our original
6 dataset, as PCAs combines correlating variables into non-correlating components. We named these WTD-
7 motives based on the variables comprising the component as “visceral motives”, “need of conservation” and
8 “familiarity/locality” (see tables B2-B4 in Online appendix S2). We used the factor scores of these WTD-
9 motives in subsequent analyses.
10
11 To address our research questions 1-4, we performed a series of ordinal logistic regression (OLR) analyses,
12 which is a useful method for ordinal dependent variables. We found some correlation between explanatory
13 variables (e.g. “need of conservation” and KBC ($r=0.108^{**}$, Group 1; $r=0.078^*$, Group 2)), but because of the
14 low amount of variance explained ($VIF<3$) we included them in the same model. We used an information-
15 theoretic approach in model selection, which assumes that there can be several competing models instead of a
16 single model, and the final model is an average from a set of candidate models. In Figure 1 we present the
17 model selection process. We performed the same procedure for all 20 models (see Online Appendix S2 for
18 relative importance values and confidence intervals for each averaged model). We used the Holm-Bonferroni
19 method (Holm, 1979; Abdi, 2010) to adjust the p-values to counteract the type I error in multiple hypothesis
20 testing. To further address research question 3, we used linear regression to test possible associations between
21 the KBC-scores and the WTD-motives.
22

23 **Results**

24 **Willingness-to-donate to species and ecosystems**

25 All conservation causes received support in our WTD-exercise, and there were only small differences in the
26 number of €0 votes between causes (Table 3). However, species or ecosystems that are native to Finland, or
27 species that are aesthetically appealing had the most combined funding. Mammal flagships attracted 29% more
28 funding than bird flagships when comparing the combined sums (Mann-Whitney U-test, $U=455975$, $n=2079$,
29 $p<0.001$).

1 **Willingness-to-donate motives**

2 By using PCA we converted the six self-reported drivers of WTD into three uncorrelated WTD-motives:
3 “visceral motives”, “need of conservation” and “familiarity/locality” (see Online Appendix S2). The order of the
4 three WTD-motives differed between mammals, birds and ecosystems. The first component of the PCA that
5 accounts for the majority of variability within the dataset, was “visceral motives” for mammals and
6 “familiarity/locality” for birds and ecosystems. The third component was “need of conservation”. The total
7 variance explained by these three components was 75.63% for mammals (Group 1), 78.94% for birds (Group 2)
8 and 82.97% for ecosystems (Online Appendix S2).

9 **Biodiversity conservation knowledge**

10 The KBC-scores approximated a normal distribution, although with a slight skew towards higher scores,
11 indicating that it successfully distinguishes between the different levels of knowledge in our respondents
12 (Online Appendix S2).

13

14 **WTD-motives explaining donation behavior**

15 After applying the Holm-Bonferroni adjustment, the visceral motives showed no effect on WTD to species or to
16 ecosystems (Table 4). In contrast, need of conservation explained WTD well for all study species and
17 ecosystems: the more respondent felt urgency of conservation was important, the higher their payments. In
18 addition, the motive “familiarity/locality” was positively associated with familiar/local birds and ecosystems,
19 and negatively with non-native causes.

20

21 **Prior knowledge of biodiversity conservation explaining willingness-to-donate**

22 Higher KBC-scores increased WTD, especially for birds and ecosystems (Table 4). Respondents who had
23 studied natural sciences or agriculture/forestry, instead, reported reduced WTD to three Finnish aesthetically
24 appealing mammals. Furthermore, the KBC was positively associated with the need of conservation motive and
25 negatively with visceral motives (Table 5). There was also a positive association between the familiarity/locality
26 motive and KBC in Group 2, although the effect sizes were small and the models explained a very small
27 proportion (0.1–1%) of the variation.

28

1 **Donor characteristics explaining donation behavior**

2 Regarding donor characteristics, neither gender nor the type of residential area explained WTD to flagship
3 species or ecosystems (table 4). However, ENGO-membership increased with WTD to both species and
4 ecosystem conservation. Similarly, respondents with a high level of education were willing to donate more to
5 ecosystem conservation than those with lower level of education.

6 7 **Discussion**

8 **Influence of self-reported motives on willingness-to-donate**

9 In general, the respondents were willing to donate more to aesthetically appealing species. Despite this, visceral
10 motives were not associated with increased WTD, which mirrors results from the broader literature (Martin-
11 Lopez *et al.*, 2007; Hettinger, 2010; Colléony *et al.*, 2017). It is possible that the respondents did not recognise
12 or admit the effect of visceral motives on WTD-choices when they were reflecting on their own behavior.
13 However, there was a near-significant negative association ($p < 0.05$ but considered non-significant due to the
14 repeated hypothesis problem) for an aesthetically less appealing species, suggesting more research is needed to
15 distinguish the possible effect of aesthetic appeal on WTD to flagship species or ecosystems.

16
17 The perceived need of conservation increased WTD to ecosystems and species irrespective of their aesthetic
18 appeal, as the people who most appreciated the need of conservation also chose larger sums. Thus, there is great
19 potential for fundraising by appealing to more ecologically-oriented donors. Furthermore, the lack of association
20 between high aesthetic appeal and increased WTD indicates that respondents prioritized the need for
21 conservation among aesthetically appealing species, which made the effect of aesthetic appeal disappear when
22 both types of motives were evaluated at the same time. Our findings partly contradict previous studies (Metrick
23 & Weitzman, 1996; Martin-Lopez *et al.*, 2007) that found visceral factors exceeding the importance of scientific
24 ones, but resonate with Tkac (1998) and Tisdell *et al.* (2007) who found that individuals favoured species in
25 conservation need over those with a high aesthetic appeal. We also found some evidence that the order of the
26 motives may change among aesthetically less appealing species.

27

1 Familiarity/locality was the most important PCA component explaining the WTD to birds and ecosystems in our
2 study. While familiarity/locality increased the WTD to birds and ecosystems that were native to Finland, it
3 diminished the WTD to non-native birds and ecosystems. However, the examination of total WTD-amounts
4 attracted by each species showed that non-native, well-known mammal flagships attracted most support. Our
5 findings suggest that familiarity/locality motive seems to be driven by both ethnocentricity and familiarity
6 through exposure to media (e.g., nature documentaries) and conservation marketing campaigns. Another way to
7 examine this is to look at it from a brand awareness point of view (Veríssimo *et al.*, 2014), a concept used in
8 consumer behavior studies that is known to explain consumers' purchasing behavior (Macdonald & Sharp,
9 2000). Brand awareness may similarly affect donation behavior, although the "products" are different, perhaps
10 explaining why both species native to Finland and well-known non-native flagships (orangutan and tiger) were
11 popular in our study.

12

13 **The effect of knowledge of biodiversity conservation on willingness-to-donate**

14 We found that higher KBC-scores and WTD were related, but we only found this association with birds and
15 ecosystems. This finding suggests that the underlying determinants to donate to mammals, birds and ecosystems
16 may differ at least among online donors. Because visceral motives comprised the most important PCA-
17 component for mammal flagships, aesthetic appeal may have a greater effect on WTD to mammals compared to
18 birds or ecosystems, although we did not find an association between aesthetic appeal and WTD. Rather
19 similarly, Tisdell *et al.* (2005) found species likeability was positively associated with favouring of species'
20 survival for mammals, but the result was less clear with other taxa. Consequently, our results suggest that
21 knowledge of biodiversity conservation may be associated with donation choices among online donors, but
22 further research is still needed to understand their association.

23

24 Education in natural sciences or in agriculture/forestry did not increase WTD to species or ecosystems, but we
25 found that these respondents were willing to donate less to three aesthetically appealing Finnish mammals that
26 were non-threatened or threatened only at the national level. Thus, these respondents may have targeted their
27 support to species with more urgent conservation need globally.

28

29

1 **Donor characteristics influencing willingness-to-donate**

2 Respondents who were members of an ENGO were willing to donate more to species and ecosystems. We did
3 not find gender differences in WTD to species or ecosystems, which is in line with Cárdenas and Lew (2016).
4 However, as previous research has brought mixed results (e.g. White *et al.*, 2001; Baranzini *et al.*, 2010; Batel
5 *et al.*, 2014), further studies are needed. The majority of our respondents were women, which may reflect the
6 observed tendency of women to act more pro-environmentally than men (e.g. Mainieri *et al.*, 1997; Zelezny *et*
7 *al.*, 2000). In addition, young women have been found to be more likely to support environmental issues on
8 Facebook (Brandtzaeg, 2017). Furthermore, in Finland women are more likely to donate to environmental
9 causes, although all Finns tend to donate less to environmental causes than other charitable sectors (Pessi,
10 2008). Thus, the gender distribution in our sample may mirror the same phenomenon, suggesting that our
11 sample is a good representation of the target group of potential online donors.

12

13 **Complexity of motives affecting willingness-to-donate**

14 Although the need of conservation seemed to affect WTD-choices, we still cannot exclude the effect of visceral
15 motives on WTD, as the influence of aesthetic appeal clearly showed in the WTD-amounts for individual
16 flagships, and because some respondents recognized the role of visceral motives in their decision making. There
17 may also be other motives driving donation behavior, of which the respondents may themselves be unaware. In
18 addition, it is likely that any actual donations would differ from the WTP values, and there was also a possibility
19 of free-riding (i.e. relying that others are paying without making an own contribution) when examining donating
20 behavior (cf. Macmillan et al. 1999). However as the incentive to free ride is unlikely to vary across species, we
21 do not consider this to be a significant issue in our study.

22

23 It is also worth noting that the interpretation of items measuring motives may vary among individuals. For
24 example, the item “Evokes positive feelings” can consist of different interpretations that cannot be captured with
25 a questionnaire. It is also possible that the item “Familiarity”, was understood differently among respondents:
26 either having knowledge about the species (threat status etc.) or that they could recognize the species, which
27 may have blurred the influence of this motive in our results. Consequently, to better understand the mechanisms
28 behind environmental donation behavior, the use of a mixed method approach that includes both qualitative and
29 quantitative data is required for future research. Further, more research is needed to understand how individuals’

1 donation motives can effectively be utilized in conservation marketing. Marketing research has identified
2 promising strategies that influence individuals' donation motives, such as presenting hedonic products in a
3 donation situation (Savary, Goldsmith, & Dhar, 2015), or presenting the social information about the donations
4 of others (Martin & Randal, 2008).

5

6 **Conclusions**

7 Our results suggest that the factors that determine how much people donate for mammal, bird and ecosystem
8 conservation may differ. While knowledge of biodiversity conservation and familiarity/locality are related to
9 donating to birds and ecosystems, other factors, such as aesthetic appeal may be more important for mammal
10 flagships, at least online. Although birds generally attracted less financial support than mammals, it is important
11 to note that the preferences are audience specific, and birds may appeal to specific donor types, such as bird-
12 watchers or eco-tourists. Furthermore, our results suggest that WTD to ecosystem conservation is mainly driven
13 by scientific considerations. Thus, including ecosystems as donation targets could induce donations from more
14 knowledgeable individuals, but it is worth noting that it may be limited to a narrow range of donors. The
15 perceived importance of conservation, irrespective of aesthetic appeal, suggests there is scope for increasing
16 donations for all threatened species and ecosystems, including those that are aesthetically less appealing.

17

18 **Supporting Information**

19 The questionnaire used in our survey (Online Appendix S1) and supportive data from analysis (Online
20 Appendix S2) and the goodness-of-fit tests (Online Appendix S3) are available online. Survey data is collected
21 in Finnish and will be stored in Finnish Social Science Data Archive after this project has ended.

22

23 **Acknowledgements**

24 PL was funded by a grant from the Maj and Tor Nessling Foundation, The Finnish Concordia Fund and Kone
25 Foundation. AA was funded by the Kone foundation. We thank the Finnish Association for Nature Conservation
26 (FANC), WWF Finland and Finnish Natural Heritage Foundation for advices in formulating the survey, and
27 FANC for co-operation in implementing the survey as well as Oy Fazer Ab for the incentive gift in our survey.
28 We also thank Metapopulation Research Centre and especially Kristjan Niitepõld for help in formulating the
29 KBC-questions, and two anonymous reviewers for helpful comments on the paper.

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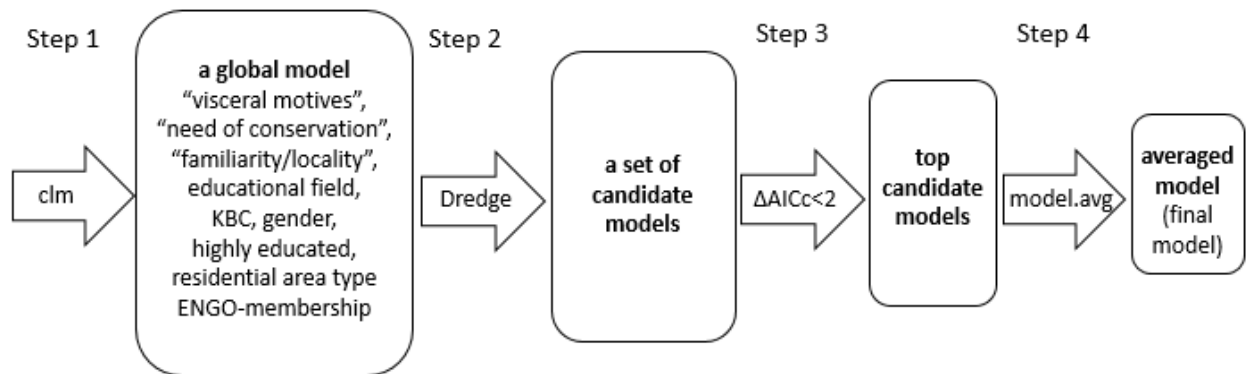
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- 17

FIGURE

2

3 **Figure 1** A flowchart illustrates the model selection procedure. In step 1. we used the function *clm* from the
 4 ordinal-package (Christensen, 2015) and created a “global model” that included all the covariates. In step 2 we
 5 used the “dredge” command from package MuMIn (Barton, 2018) to create a set of candidate models from the
 6 “global model”. In step 3 we chose the top candidate models using delta AICc<2 as a selection criteria. In step 4
 7 we used “model.avg” function to perform the model averaging. We used the zero average method (“full
 8 average” in MuMIn package in R) which is suitable for assessing which attributes affect most WTD-estimates
 9 (cf. Grueber *et al.*, 2011).

TABLES

Table 1. Socio-demographic background and previous self-reported donation behavior.

Variable		Group1 (mammals)	Group2 (birds)
n (per group)		1032	1047
Age	mean (SD)	34.5 (11.93)	34.9 (12.30)
Gender: women	%	80.9	82.9
Type of residential area:			
densely built city	%	46.4	46.5
suburb	%	39.1	39.1
countryside	%	13.9	13.8
Highly educated*	%	58.4	60.0
Households monthly income level	median (€)	2 500 - 2 999	2 500 - 2 999
Size of household	mean (SD)	2.15 (1.13)	2.14 (1.15)
Education field in natural sciences/agriculture and forestry	%	23.4	20.6
Knowledge of biodiversity conservation (0-8 p)	mean (SD)	4.53 (1.46)	4.41 (1.47)
A member of a ENGO/ENGOS	%	34.4	33.1
Have participated in conservation organization actions	%	23.1	21.6
Have donated to conservation ENGOS in real life	%	54.0	52.1

* Highly educated = included levels of bachelor's degree, master's degree and doctoral degree. Dichotomous variable (y/n).

Table 2. Mammal and bird flagship species that were chosen as study species, with their habitats that were chosen as study ecosystems.

Species	Cons. status ^a	Species is native to Finland	Used by an ENGO operating in Finland	Characteristics perceived as appealing					Occurs in habitat ^e
				Large body size ^b	Colourful plumage or fur ^c	Anthro-pomorphic traits ^d	Endemic species	Species is threatened	
Mammal flagships									
Lynx (<i>Lynx lynx</i>)	VU	x	x		x	x		x	FOF
Siberian flying squirrel (<i>Pteromys volans</i>)	VU	x	x					x	FOF
Wolverine (<i>Gulo gulo</i>)	CR	x	x					x	FOF
Eurasian otter (<i>Lutra lutra</i>)	NT	x	x						FWE
Bornean orangutan (<i>Pongo pygmaeus</i>)	EN		x	x		x	x	x	R
Sumatran tiger (<i>Panthera tigris sumatrae</i>)	CR		x	x	x	x	x	x	R
Golden-crowned flying fox (<i>Acerodon jubatus</i>) ^f	EN						x	x	R
African wild dog (<i>Lycaon pictus</i>)	EN			x	x			x	S
Bird flagships									
Siberian Jay (<i>Perisoreus infaustus</i>)	NT	x	x						FOF
White-backed Woodpecker (<i>Dendrocopos leucotos</i>)	EN	x	x		x			x	FOF
Golden Eagle (<i>Aquila chrysaetos</i>)	VU	x	x	x				x	FOF
Lesser White-fronted Goose (<i>Anser erythropus</i>)	CR	x	x		x			x	FWE
Philippine Eagle (<i>Pithecophaga jefferyi</i>)	CR			x			x	x	R
Honduran Emerald (<i>Amazilia luciae</i>)	EN				x		x	x	R
Verreaux's Eagle-Owl (<i>Bubo lacteus</i>)	LC					x			S
Southern Ground Hornbill (<i>Bucorvus leadbeateri</i>) ^f	VU			x	x			x	S

^a Foreign species: IUCN red list status. Local species: The 2010 Red List of Finnish Species. Note: some of the species native to Finland are not globally threatened.

^b Mammals body-size data: Ecological data (Smith et al. 2003). We categorized large mammal >20 kg. Birds body-size data: Ecological archives (Liskevand *et al.*, 2007). We categorized large bird >3 kg

^c Colourful=the plumage or fur is other colour than solely brown or grey (aposematic colours, white-yellow-black combinations, black and white etc). Or the species has body parts that are bright coloured.

^d Species has a flat face (Sundqvist, 1992) with relatively forward-facing eyes (Macdonald *et al.*, 2015). The decision on whether the species belongs to species with anthropomorphic traits, is based on subjective evaluation by the authors, but the distinction using the criteria mentioned before was quite easy with these species.

^e R=rainforest, S=Savanna, FWE=Finnish freshwater environments (near streams, lakes etc), FOF=Finnish old-growth forest.

^f Presumably less appealing species

Table 3. WTD-results of mammals, birds and ecosystems.

Payment card amount	Mammal flagships (Group 1, n=1032)								Bird flagships (Group 2, n=1047)							Ecosystems (All, n=2079)				
	Sumatran tiger	Bornean orangutan	Lynx	Eurasian Otter	Wolverine	Siberian flying squirrel	African wild dog	Golden-crowned flying fox	Golden eagle	White-backed woodpecker	Siberian jay	Honduran emerald	Lesser. white-fronted goose	Philippine eagle	Verreaux's eagle owl	Southern ground hornbill	Finish old-growth forests	Finnish fresh-water ecosystem	Rainforest	Savanna
€	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
0	7.2	8.3	8.4	8.4	8.3	8.4	12.0	11.0	8.7	9.3	9.6	14.2	13.3	13.9	14.3	14.5	4.2	4.0	5.9	8.9
1	6.0	9.0	6.4	7.7	8.9	7.4	12.9	12.3	7.2	8.7	9.0	11.4	14.6	12.7	12.3	14.2	1.5	2.2	2.3	5.6
3	8.4	9.2	8.9	10.4	10.1	10.2	11.4	11.0	11.7	12.5	13.8	14.6	13.4	13.8	13.0	14.8	3.4	3.4	3.8	6.2
5	19.9	20.3	21.9	21.7	19.0	20.4	21.5	21.5	19.4	20.6	20.9	21.3	20.8	22.0	22.3	20.8	12.7	12.6	13.1	20.1
10	16.1	18.5	20.5	18.8	19.6	20.4	16.4	16.2	21.7	20.3	19.8	17.0	16.2	17.0	17.0	16.8	16.8	17.9	17.5	22.0
15	7.4	4.8	6.2	5.7	5.9	5.6	4.3	5.3	5.7	6.3	4.2	4.1	4.4	4.1	4.7	3.6	7.0	7.3	7.8	5.1
20	13.0	11.1	11.2	11.7	10.5	11.2	8.6	9.5	9.9	8.7	10.0	7.0	6.7	7.1	6.7	6.1	16.7	16.1	14.4	13.2
30	4.7	3.9	3.3	3.9	3.9	4.6	2.6	2.5	3.8	3.6	3.1	1.9	2.8	1.9	2.3	1.5	8.3	8.3	7.4	3.7
40	2.8	2.2	1.9	1.6	1.7	2.3	1.3	1.6	1.8	1.8	1.2	1.5	1.3	1.2	1.2	1.4	4.2	4.5	4.3	1.6
50	5.5	5.6	5.5	4.8	5.5	4.1	3.4	3.7	4.4	3.7	4.2	2.8	2.7	2.3	2.2	2.0	12.3	11.4	10.7	7.4
75	1.6	1.2	1.0	0.6	1.3	0.7	0.9	0.8	0.9	0.4	0.2	0.6	0.5	0.5	0.2	0.8	2.1	1.7	1.9	1.0
100	3.5	2.5	2.0	1.6	2.3	1.9	1.6	1.7	2.1	1.8	1.8	1.3	1.3	1.5	1.5	1.3	6.2	6.0	5.9	3.1
200	0.8	0.3	0.5	0.6	0.9	0.4	0.3	0.1	1.0	0.9	0.8	0.6	0.7	0.5	0.5	0.2	2.1	2.3	2.3	0.9
500	2.6	2.2	2.0	2.0	1.6	1.8	1.9	1.5	1.4	1.1	1.1	1.0	0.9	1.0	1.0	1.0	2.5	2.3	2.4	1.1
Missing	0.7	0.7	0.1	0.4	0.5	0.5	1.0	1.3	0.3	0.3	0.2	0.8	0.5	0.5	0.9	0.9	0.0	0.2	0.3	0.2
Total (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Total WTP (€)*	32178	27008	25892	24995	24924	24041	21682	19454	23344	19854	19784	16318	15958	15918	15757	14844	86151	83411	82869	48148

*Note: The amount of respondents evaluating mammal flagships, bird flagships and ecosystems, as well as the amount of targets (eight species vs. four ecosystem) differ and therefore the payment card amounts or the total WTP for mammals and birds cannot be directly compared with WTP-results for ecosystems.

Table 4. Factors affecting WTD to flagship species and ecosystems from ordinal logistic regression analysis, showing averaged estimates and the level of significance. Statistically significant results after Holm-Bonferroni adjustments are presented in bold. Standard errors, relative importance values and confidence intervals of averaged models are presented in Online appendix S3

Models for species and ecosystems	“Visceral motives”		“Need of conservation”		“Familiarity/locality”		Educational field ^b		KBC ^c		Highly educated ^d		Gender ^e		Residential area type ^f		ENGO-member	
	B	p	B	p	B	p	B	p	B	p	B	p	B	p	B	p	B	p
<i>Mammal flagships (n=848)^a</i>																		
Lynx*	0.06	0.400	0.29	0.000	0.19	0.002	-0.44	0.002	0.09	0.039			0.13	0.473	0.18	0.041	0.43	0.001
Orangutan			0.52	0.000	-0.19	0.002			0.07	0.154	0.25	0.154	0.07	0.630	0.11	0.290	0.50	0.000
Wild dog	-0.09	0.183	0.39	0.000	-0.13	0.031	-0.01	0.902	0.01	0.795			0.02	0.787	0.15	0.128	0.51	0.000
Flying squirrel*	0.00	0.909	0.40	0.000	0.13	0.030	-0.42	0.003	0.04	0.344	0.01	0.885	0.06	0.637	0.19	0.032	0.42	0.002
G-C. Flying fox	-0.15	0.015	0.40	0.000	-0.05	0.421	-0.09	0.521	0.05	0.266	0.00	0.907	0.09	0.565	0.03	0.625	0.49	0.000
Otter*			0.29	0.000	0.13	0.033	-0.36	0.010	0.05	0.321	0.02	0.777	0.15	0.427	0.20	0.023	0.63	0.000
Tiger	0.04	0.491	0.59	0.000	-0.07	0.315			0.05	0.254	0.15	0.311	0.03	0.783	0.24	0.006	0.36	0.007
Wolverine*	-0.01	0.807	0.38	0.000	0.22	0.000	-0.10	0.481	0.11	0.005	0.27	0.732	0.03	0.746	0.15	0.140	0.63	0.000
<i>Bird flagships (n=864)^a</i>																		
Siberian Jay*	-0.06	0.348	0.37	0.000	0.24	0.000	0.07	0.594	0.17	0.000	0.01	0.902			0.16	0.118	0.61	0.000
Philippine Eagle	-0.01	0.741	0.44	0.000	-0.21	0.001	0.03	0.749	0.18	0.000	-0.07	0.523					0.27	0.041
W. Woodpecker*	-0.08	0.257	0.41	0.000	0.23	0.000	0.04	0.715	0.15	0.000			0.15	0.434	0.06	0.485	0.56	0.000
W. Eagle-Owl			0.44	0.000	-0.14	0.025	0.01	0.903	0.14	0.000	-0.03	0.694	0.02	0.844	0.00	0.910	0.29	0.030
Lesser W-f. Goose*	-0.13	0.035	0.41	0.000	-0.00	0.803	0.08	0.553	0.15	0.000	-0.05	0.640	-0.00	0.949	0.05	0.559	0.58	0.000
Southern Hornbill	-0.08	0.260	0.44	0.000	-0.21	0.001	0.01	0.914	0.17	0.000	-0.05	0.637	0.01	0.875			0.34	0.011
Golden Eagle*	-0.01	0.832	0.43	0.000	0.28	0.000	0.04	0.693	0.16	0.000					0.07	0.468	0.52	0.000
Honduran Emerald	-0.00	0.876	0.47	0.000	-0.18	0.004	0.01	0.893	0.18	0.000	-0.04	0.684	0.04	0.703	-0.00	0.927	0.21	0.147
<i>Ecosystems (n=1745)^a</i>																		
Savanna			0.28	0.000	-0.19	0.000	0.02	0.771	0.14	0.000	0.16	0.125	0.25	0.035	0.03	0.557	0.50	0.000
Fin. old forest*	-0.00	0.841	0.16	0.001	0.38	0.000			0.15	0.000	0.29	0.001	0.02	0.750	0.14	0.026	0.76	0.000
Rainforest	0.00	0.908	0.31	0.000	-0.15	0.000	0.02	0.723	0.11	0.000	0.27	0.003	0.27	0.024	0.01	0.844	0.47	0.003
Fin .freshwater e.*	-0.03	0.524	0.20	0.000	0.34	0.000	-0.03	0.699	0.10	0.000	0.24	0.006	0.03	0.687	0.14	0.026	0.58	0.000

^a n after removing responses that contained NA to be able to run the analyses, ^b education from the field of natural sciences/ agriculture and forestry (y/n),

^c KBC=Knowledge of biodiversity conservation (0-8 p) ^d highly educated (y/n), ^e gender: 0=male, 1=female,

^f residential area type: 1=densely built city, 2= suburb, 3= countryside.

* Species/ecosystem that is native to Finland

Table 5. Associations between the knowledge of biodiversity conservation score (independent variable) and WTD-motives (dependent variable) using linear regression model.

Model	Estimate	SE	P-value	Adjusted R ²
Group 1. Mammal flagships				
Need of conservation	0.073	0.022	0.001	0.011
Visceral motives	-0.068	0.022	0.002	0.009
Familiarity/locality	0.015	0.022	0.483	-0.001
Group 2. Bird flagships				
Need of conservation	0.053	0.021	0.014	0.005
Visceral motives	-0.053	0.022	0.015	0.005
Familiarity/locality	0.046	0.022	0.035	0.003