Increased information and marketing to specific individuals could shift conservation support to less popular species

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Abstract

Flagship species are widely used in conservation to raise awareness and funds, and recent observational research suggests that less popular species can be marketed to increase support for their conservation. Using two species groups, sharks and dolphins, this paper experimentally investigates whether stated conservation preferences can shift from more charismatic species to those not typically considered as flagship species. Although universal appeal is considered a desirable trait for flagship species, there are individual differences in preferences for species. Therefore, this paper also investigates the role of individual demographic and attitudinal differences on choices, as these may impact the success of conservation marketing. Using discrete choice experiments, six forced choice sets of two species were presented to 168 participants, with species shown and the amount of information presented about each one varied. Demographic differences between participants was found to affect donating behavior: individuals with more positive attitudes to sharks were more likely to donate to shark conservation, as are individuals with a biology background. However, it was found that individual choices can also be shifted through the provision of additional information. Participants chose to conserve species with more information, whether the two species in the choice set were both sharks, both dolphins, or a shark and a dolphin. When equal amounts of information were provided about two species, potential donors preferred the more endangered species. This research suggests that by selecting appropriate populations to target for marketing, even less charismatic species can be used as flagship species and attract potential donors.

1. Introduction

1.1 Choosing flagship species for conservation

Flagship species are frequently used in conservation, generally to generate awareness and promote conservation to a wide audience, and as a tool to generate money (Bowens & Entwistle, 2002). In spite of this frequent use, there is variation in the definition and role of flagship species (Barua 2011), but here we follow Heyworth's (1995) definition of 'popular charismatic species that serve as symbols and rallying points to stimulate conservation awareness and action'. Past research has focused on identifying the physical characteristics which make species appealing (e.g. large bodied mammals with forward facing eyes, Smith *et al*., 2012). Species selected as flagships tend to be attractive and recognizable (Smith *et al*., 2010), even though there is evidence that knowledge and positive attitudes are key determinants of conservation support (Thompson & Mintzes 2002). Although one function of flagship species is as a key fundraising tool for international conservation non-governmental organizations (NGOs) (Smith et al. 2012), primarily focusing on aesthetics restricts the number of taxonomic groups which are deemed appropriate for use as a flagship species (Smith et al. 2012). Flagship species also perform other roles where attitudes may be more important than appearance, such as influencing policy and promoting conservation awareness (Barua et al. 2011). If attitudes are key to preferences for different species, there should be less focus on a species' visual appearance, and more on the cultural importance of potential flagship species, as suggested by the theory of flagship species action (Jepson & Barua 2015). The theory of flagship species action describes how species should be selected based on their cultural importance and broad appeal (Jepson & Barua 2015). Under this theory, and also other recent analyses of flagship species selection processes (e.g. Verissimo et al. 2009, 2011), identifying the relative appeal of different potential flagship species for different demographics is an important step in flagship species selection. Although flagship species are sometimes conceptualized as species with general appeal, there is increasing recognition that flagship species may be more effective if both their purpose (e.g. to raise funds or awareness) and the specific audience is considered (Bowen-Jones & Entwistle 2002; Veríssimo et al. 2009, 2017; Barua et al. 2011). Regardless of the exact process for determining which species will function best as a

flagship species, conservation organizations may wish to position less obviously popular species as 'flagship species'. This may be to align public support and the image of a conservation project with the goals of a specific organization. For example, tigers are a frequently used flagship species (Barua 2011) but are unlikely to act as a rallying point for coral reef conservation: conservation projects which focus on a particular species group or area are likely to want to select a flagship species from within that group or area (Bowens & Entwistle, 2002). Under these circumstances, the chosen flagship species might appeal to a smaller public, but could still act as a charismatic representative of their group and a rallying point for conservation.

1.2 Individual traits which may influence attitudes to potential flagship species

If conservation organizations wish to use a more unusual species as a flagship, initial market research may help to identify which individuals might be more likely to support conservation of the species. Various definitions of flagship species emphasize the importance of public attitudes to the species, rather than the appearance or ecological significance of a flagship species (e.g. Walpole & Leader-Williams 2002; Wright et al. 2015). Attitudes are specific indicators of broadly integrated feelings, beliefs and values (Kellert & Berry 1987), all of which vary between individuals. Furthermore, as attitudes are an important contributor to pro-environmental behavior (Bamberg & Möser 2007), identifying the individual traits which contribute to the formulation of an attitude is an important part of flagship species use. Initial research on potential determinants of attitudes to animals suggested gender was of was primary importance (Kellert & Berry 1987). While more recent research showed no general differences between males and females in attitudes to animals, it was found that females tended to show higher empathy towards 'loveable animals' and less empathy towards animals which evoke a sense of fear (Schlegel & Rupf 2010). This study also found that the type of education institution attended (ranging from primary, grammar and agricultural schools to a Swiss university of applied sciences) affected the attitudes individuals held towards species. For example, students from agricultural schools considered mammals and reptiles undesirable, while university students showed a greater preference for insects than students from other educational backgrounds (Schlegel & Rupf 2010). Davey (1994) also identified gender differences in attitudes to invertebrates and animals which

92 evoke a sense of fear, such as rats, snakes and bats. Female participants reported significantly greater
93 levels of fear relative to male participants, but there was no relationship between fear and age. These
94 studies suggest that both gender and educational background are demographics which may impact
95 which species are appropriate as flagship species, particularly for species which invoke fear.
96
97 Greater knowledge has been associated with the development of pro-environmental attitudes in a
98 number of contexts. For example, individuals with better knowledge of sharks and dolphins are more
99 likely to favor their conservation and disapprove of harmful behavior such as recreational activities
100 with captive individuals (Barney et al. 2005; O'Bryhim & Parsons 2015). Similarly, students who
101 experience environmental education about lemurs tend to have greater knowledge about lemurs and
102 more positive attitudes towards them than those who do not (Rakotomamonjy et al. 2014). Personal
103 knowledge in the form of experience is also an important variable which influences pro-
104 environmental attitudes (Friedrich et al. 2014). Yore & Boyer (1997) demonstrated that students who
105 had direct experience with wildlife through bird watching had more pro-environmental attitudes,
106 showing greater concern for and interest in other species than students who did not have this
107 experience.
108
109 1.3 The impact of information provision on pro-environmental behavior
110 Greater knowledge is not only associated with pro-environmental attitudes, but there is also a
111 relationship between information provision and pro-environmental behaviors. Recent research
112 suggests that when more information is provided on less popular species and they are featured on their
113 own webpage, these species can gain as many as 15 times more conservation donors than when they
114 are not featured on their own webpage (Veríssimo et al. 2017). Likewise, stated consumer preferences
115 for keeping species as exotic pets was reduced by 39% when individuals were presented with
116 information about potential diseases and the legality of keeping these animals (Moorhouse et al.
117 2017). In contrast, information on welfare and conservation impacts did not have any impact on stated
118 likelihood of purchase in this sample. This suggests that although greater knowledge about
119 environmental issues is associated with pro-environmental behaviors, it may only be some types of

information which produce this effect. If the information a conservation donor holds about a species can have such a great influence on their behavior, the way that flagship species are used could be completely rethought: conservation NGOs may be able to use educational campaigns to increase the profile of less charismatic species which require conservation attention but are underfunded.

The influence of one type of information on flagship species conservation has attracted particular attention. The International Union for Conservation of Nature (IUCN) red list categorizes species by threat status as extinct in the wild, extinct, critically endangered, endangered, threatened, and least concern by their decreasing likelihood of extinction (IUCN Species Survival Commission 2000). Declaring a species extinct is deemed an effective way of raising awareness of the effects of anthropogenic activity, even though the public's interest in extinction events is short lived (Clements 2013). However, relative risk of extinction may still be relevant information when individuals are making decisions about one-off donations, and providing donors with information on IUCN threat status could boost donations, although the evidence for this appears mixed. In one study at Paris Zoological Park there was no effect of IUCN threat status on donating behavior (Colléony et al. 2017) but information on threat status was not explicitly available to potential donors while they were making their choice, which may explain the lack of result. World Wildlife Fund (WWF) donors prefer more endangered species, but donors to the Zoological Society of London's Evolutionarily Distinct and Globally Endangered (EDGE) do not show any preference for more or less endangered species (Veríssimo et al. 2017). Instead, EDGE donors prefer more appealing species which are more prominent and have more information provided on the EDGE website. Veríssimo et al. (2017) suggest this lack of effect may be as all EDGE species are threatened, and so no effect of IUCN status is found as all species are perceived as threatened. However, it may be that the relative difference between adjacent IUCN threat categories are not distinguished by potential donors. In the WWF study, adjacent categories were grouped for analyses (e.g. near threatened and least concern were grouped, and compared to the group critically endangered and endangered in the wild) whereas this grouping was not used in the EDGE study (Veríssimo et al. 2017). Therefore, the preference for more threatened species found in the WWF study cannot conclusively show that donors distinguish between

147 individual IUCN threat statuses. If IUCN threat status is something which might be used to encourage
148 donations, we need to demonstrate whether individuals will shift their choices towards the more
149 threatened species when information on IUCN threat status is presented.
150
151 1. 4 Sharks and dolphins as flagship species

152 The observational research outlined above suggests that the information provided about species can
153 affect the behavior of conservation donors, potentially increasing support for less charismatic species.
154 However, it has not been experimentally demonstrated that information provision can shift stated
155 conservation preferences from more charismatic species to those which are not typically considered as
156 flagship species. This study investigates this using two species groups, sharks and dolphins. Sharks
157 often invoke fear and are thus not often considered as potential flagship species. One suggested
158 characteristic which makes a species potentially unsuitable as a flagship species are negative
159 reputations attached to the species (Bowen-Jones & Entwistle 2002). Negative stigmas are attached to
160 sharks, and this is only further fueled by negative and inaccurate portrayals of sharks in news and
161 entertainment broadcasts (Philpott 2002). Although the whale shark *(Rhincodon typus)* was used as a
162 flagship species in India (Jepson & Barua 2015), successfully eliminating the threat of hunting by
163 large scale fisheries (Rowat & Brooks 2012), this example of a shark as a flagship species is an
164 exception. This absence of sharks as flagship species contrasts with dolphins, which have repeatedly
165 used as a flagship species, particularly in developed countries (Walpole & Leader-Williams 2002).
166 Dolphins are deemed 'charismatic' megafauna (Barney et al. 2005), and fit the flagship species
167 criteria because they are culturally important and aesthetically appealing to members of the public
168 (Barua et al. 2011). Although dolphin species receive more attention as flagship species, both shark
169 and dolphin populations are threatened. One sixth of dolphin species are listed as vulnerable,
170 endangered or critically endangered by the IUCN, and many species of dolphins are showing
171 substantial declines in their populations (Bejder et al. 2006). Sharks fare worse, with nearly one
172 quarter of shark species under the same categories (Dulvy et al. 2008).
173

1.5 Study aims

The first aim of this study was to investigate whether it was possible to shift stated conservation preferences between sharks and dolphins by presenting different information to potential donors. Secondly, the study aimed to understand the role of individual differences in attitudes and demography, which has not been investigated in previous observational research. If a potential flagship species may lack universal appeal, understanding the role of individual attitudes and demographic variables on species preferences can ensure that appropriate audiences are targeted by conservation NGOs considering these species as flagships (Veríssimo et al. 2011). As males have been shown to have more knowledge about sharks (O'Bryhim & Parsons 2015) and because females are shown to have less positive attitudes to species (like sharks) which invoke fear, gender was one demographic variable investigated. The study also investigates the potential impact of having higher education or work experience in organismal biology, as individuals with higher education or work experience in these areas may have greater knowledge about and more positive attitudes to marine animals in general (Barney et al. 2005), and therefore may be more likely to respond to sharks as potential flagship species than individuals without this background.

2. Methods

2.1 Species selection

One shark species and one dolphin species from each IUCN red list category apart from 'extinct' was chosen for inclusion in the study (see Table.1). Species were chosen to ensure a range of geographic distributions and 'distinct' appearances, so that different species did not look too similar in photos. The final condition for inclusion was the availability of a good quality photo which showed the head and most of the body. Although the Yangtzee river dolphin has been declared functionally extinct (Turvey et al. 2010), it is one of only two dolphins classified as critically endangered by the IUCN and was selected as an appropriate picture was available.

200 Table 1: The twelve species of shark and dolphin selected for inclusion in the study

IUCN Red List	**Species**		**Geographic range**
Categories	**Common Name**	**Binomial Name**	
Critically endangered	Sawback Angelshark	*Squatina aculeate*	Coastal Mediterranean and East Atlantic
Endangered	Great hammerhead	*Sphyrna mokarran*	Coastal tropics globally
Vulnerable	Great white shark	*Carcharodon carcharias*	Global, concentrated in temperate coasts
Near threatened	Tiger shark	*Galeocerdo cuvier*	Global tropics and warm temperate seas
Least concern	Leopard shark	*Triakis semifasciata*	US / Mexican Pacific coast
Data deficient	Nurse shark	*Ginglymostoma cirratum*	Atlantic and east Pacific, mostly tropical
Critically endangered	Yangtzee river dolphin	*Lipotes vexillifer*	Yangtzee River, China
Endangered	Hectors dolphin	*Cephalorhynchus hectori*	Coastal New Zealand
Vulnerable	Atlantic humpback dolphin	*Sousa teuszii*	Tropical east Atlanic
Near threatened	Chilean dolphin	*Cephalorhynchus eutropia*	Chilean coast
Least concern	Common bottlenose dolphin	*Tursiops truncates*	Global tropics and temperate seas
Data deficient	False killer whale	*Pseudorca crassidens*	Global tropics and warm temperate seas

201

2.2 Study design

The survey was administered in English and started with demographic questions on gender, age and highest level of education (see supplemental file for survey questions). A series of questions were then used to determine whether the participant would fall in the 'biologist' or 'non-biologist' group. Current students were asked for their degree course, and biological subjects (with the exception of medicine-allied fields) were classed in the biology group. Working and retired participants were asked if they had ever worked in: animal biology, biology, conservation biology, ecology, environmental sciences, evolutionary biology, or marine biology. Those which clicked any of these options were also classed in the biological group.

The discrete choice experiment was in the second section, with six choice sets presented sequentially. In each choice set, participants chose between two species with the text 'if you were going to donate money for the conservation of one of these species, which one would you pick?'. For each choice, a photo of each species and their geographic location and common and scientific names were displayed. Additional information on IUCN threat category, threats (e.g. hunting, entanglement in fishing nets) and conservation actions (e.g. protected areas, CITES listing) was displayed for some choices (for further details, see below). For each participant, the species shown and assigned to each condition was randomized in each choice set.

To explore whether providing additional information could impact participant choices, two choice sets were used: one with two dolphins and one with two sharks. In both choice sets, additional information was presented for only one of the species. To explore whether preferences for either sharks or dolphins could be altered by providing additional information, three choice sets were shown: 1) shark vs dolphin (control, basic information only); 2) shark vs dolphin (additional information for dolphin choice); 3) shark vs dolphin (additional information for shark choice). To explore whether IUCN red listing category impacted choices, a final choice set showed one shark and one dolphin, with additional information for both. Species pairs with identical IUCN red list categories (e.g. both shark

230 and dolphin listed as endangered) were used as a control for comparison with pairs where the shark
231 was more threatened, pairs where the dolphin was more threatened, and pairs where one or both
232 species were listed as data deficient.
233
234 Attitudes to and previous personal experience with sharks or dolphins were recorded in section three.
235 Participants were asked whether they had ever swum with sharks or dolphins, or seen them in a
236 marine park. Attitudes to sharks and dolphins were obtained by asking participants to rate a series of
237 four statements for each species group. A 7 point Likert scale was presented with each statement,
238 from 'strongly agree' to 'strongly disagree'. Separate attitude scores were calculated for sharks and
239 dolphins, with numerical values 1-7 assigned to the 7 Likert points. Positive statements
240 ('sharks/dolphins are intelligent creatures'; 'sharks/dolphins are an important part of the ecosystem';
241 'all sharks/dolphins should be protected') were scored so that 'strongly agree' was assigned 7, and
242 'sharks/dolphins are dangerous' was reverse scored. Therefore more positive attitudes to the species
243 are shown with higher scores. Attitudinal scores could vary from 4-28.
244 2.3 Distribution, ethical information and data statement
245 The survey was designed and distributed using 'Qualtrics' (Qualtrics, Provo, UT). Two online survey
246 populations were targeted: individuals with and without a biology background. To minimize
247 differences in distribution methods and therefore the possible population of the sample, no specific
248 'non-biology' group was targeted. Instead, participants were separated into individuals with and
249 without a background in biology using the criteria outlined above. However, due to the smaller
250 number of 'biologists' than 'non-biologists' in the sample population of online individuals, an
251 anonymous link was generated and posted on Twitter and in UK-based Biology-related Facebook
252 groups to recruit sufficient participants with a biology background. This method of distribution led to
253 snowball sampling, where participants further distributed the link to other acquaintances. Due to the
254 location of the original postings, the sample is likely to have a UK participant bias, but no information
255 was collected on the nationality of participants. Distribution occurred over a five-week period from
256 December 2016 to January 2017. All participants who completed the survey were over the age of
257 eighteen and no incentives were provided to complete the survey. The study was approved by the

Royal Holloway Ethical Approval Process. The survey questions are available in the supplemental file, research data is confidential.

2.4 Analysis

All analyses were conducted in R 3.1.2 (R Development Core Team 2008). Generalized linear models with poisson errors from the package lme4 (Bates et al. 2015) were used to determine whether previous experience with a species (either swimming with, or seeing in an aquarium), knowledge on the species group, or a biology background, could predict attitudinal scores towards dolphins and sharks. Binomial tests were used to determine whether additional information could change participant choices when choosing between two sharks or two dolphins. For each choice set, a follow up binomial logistic regression was used to determine whether there were differences between the 14 two-way species comparisons (e.g. bottlenose dolphin vs. hectors dolphin).

A mixed-effects binomial logistic regression was used to determine the impact of including additional information about either the shark or dolphin in a choice set. Shark and dolphin attitudinal scores, gender and whether the participant had a biology background were also included as fixed effects. Species pair (36 combinations of one shark and one dolphin) and respondent ID were included as random effects. When choosing between a shark and a dolphin which both had additional information, a mixed-effects binomial logistic regression was used to investigate how participant decisions were affected by shark and dolphin attitudinal score, gender, background in biology, and difference in IUCN red list status. Species pair (36 combinations of one shark and one dolphin) was included as a random effect. Type II Wald Chi-square tests were conducted on the mixed effect binomial logistic regressions with the Anova function in the car package (Fox & Weisberg 2011).

3. Results

In total, 197 participants started the survey, but only 168 participants completed all the questions. The demographic characteristics of these 168 participants are shown in Table 2. Attitudes to dolphins were more positive than attitudes to sharks (paired t test, $t=7.40$, $df=167$, $p<0.001$, mean difference = 1.65,

95%CI 1.21-2.10). Attitudes towards sharks and dolphins were not explained by gender, experience swimming with either species or seeing it in an aquarium, or by having a biology background (generalized linear model with Poisson errors: shark, df=4, χ^2=3.768, p=0.4383; dolphin, df=4 χ^2=0.247, p=0.993).

Table 2: demographic characteristics of 168 participants which completed the survey

Demographic characteristics		Number of participants
Sex	Female	105
	Male	63
Age	18-24	70
	25-34	49
	35-44	24
	45-54	14
	55-64	6
	65-74	3
	75+	2
Biology background	Yes	89
	No	79
Swum with sharks	Yes	47
	No	121
Swum with dolphins	Yes	45
	No	123
Seen sharks in an aquarium	Yes	146
	No	22
Seen dolphins in an aquarium	Yes	124
	No	44
Shark attitude score (mean±SD)		22.24±3.04
Dolphin attitude score (mean±SD)		23.89±2.53

292 3.1 The effect of additional information

293 When a choice between two sharks was presented, the shark with more information was more likely
294 to be chosen (binomial test, 116 out of 168 participants chose the shark with more information,
295 $p<0.001$). A binomial logistic regression showed that there was no difference between different two-
296 way species comparisons ($X^2=17.20$, df=14, p=0.246, McFadden $R^2=0.083$). When a choice between
297 two dolphins was presented, the dolphin with more information was more likely to be chosen
298 (binomial test, 113 out of 168 participants chose the dolphin with more information, $p<0.001$). A
299 binomial logistic regression showed differences between different two-way species comparisons
300 ($X^2=24.28$, df=14, p=0.042, McFadden $R^2=0.114$), however, post-hoc pairwise comparisons using
301 Tukey contrasts found no significant differences ($p>0.42$ for all contrasts).
302
303 3.2 Effect of information on participant choice between sharks and dolphins
304 Across the four choice sets where participants chose between a shark and a dolphin, the dolphin was
305 selected 55.3% of the time. When participants had to choose between a shark and a dolphin and no
306 additional information was provided about either, participants chose the dolphin in 95 out of 168
307 choice sets. The provision of additional information about sharks meant participants were less likely
308 to choose the dolphin (77 of 168 choice sets), but additional information about dolphins did not
309 increase the probability that the dolphin was selected (104 of 168 choice sets, Figure 1 and 2, mixed
310 effects binomial logistic regression, $X^2=10.77$, df=2, p=0.005, control vs. shark, z=-1.96, p =0.05,
311 odds ratio -0.60±CI0.35-1.00; control vs. dolphin, z=1.35, p=0.177, odds ratio 1.43±CI0.85-2.42).
312 Participants who had studied or worked in biology were less likely to choose the dolphin (Figure 1,
313 mixed effects binomial logistic regression,, $X^2=4.79$, df=1, p=0.029, odds ratio 0.57±CI0.35-0.94) but
314 there was no effect of gender (Figure 1, mixed effects binomial logistic regression, $X^2=2.01$, df=1,
315 p=0.156, odds ratio 0.69±CI0.40-1.16). Participants with more positive attitudes to dolphins were
316 more likely to choose the dolphin (Figure 1, odds ratio 1.19±CI1.06-1.35, mixed effects binomial
317 logistic regression, $X^2=8.55$, df=1, p=0.003), whereas participants with more positive attitudes to
318 sharks were less likely to choose the dolphin, and therefore more likely to choose the shark (Figures 1
319 and 2, odds ratio 0.75±CI0.66-0.83, mixed effects binomial logistic regression, $X^2=27.05$, df=1,

p<0.001). Differences between participants explained more of the variance (variance = 0.65±SD0.80) than differences between species pairs (variance = 0.37±SD0.61).

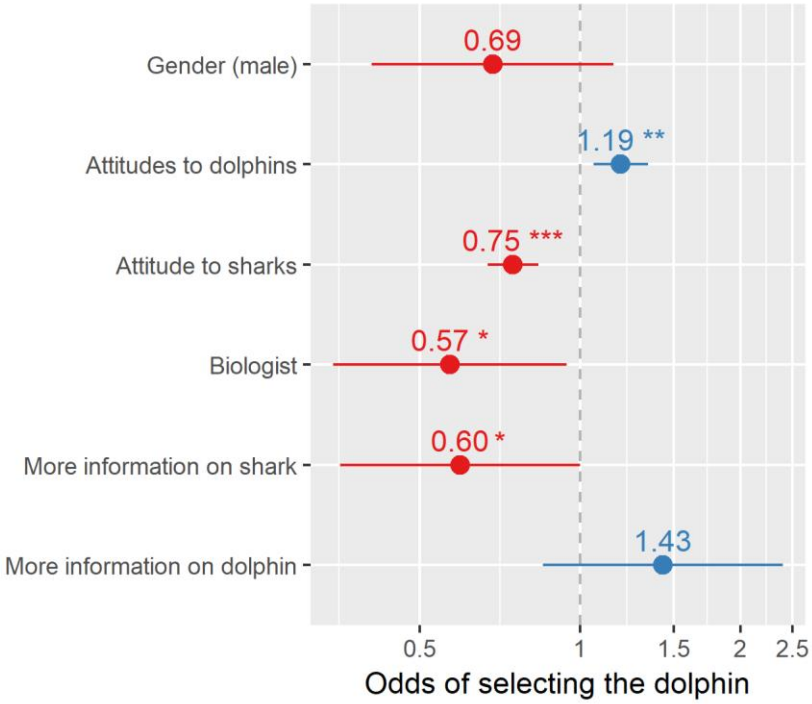


Figure 1: Fixed effects odds ratio estimates for choosing to donate money for the dolphin when presented with a choice between a shark and a dolphin, conditional on random effects.

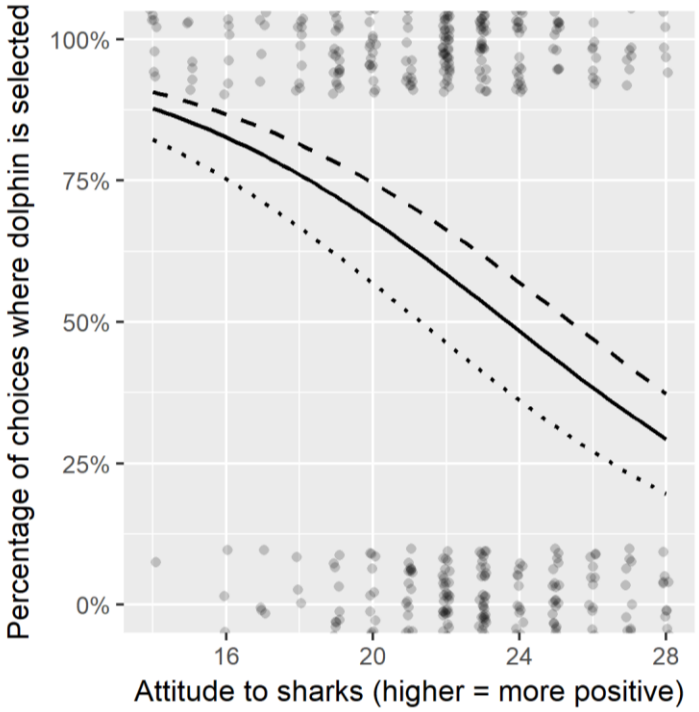
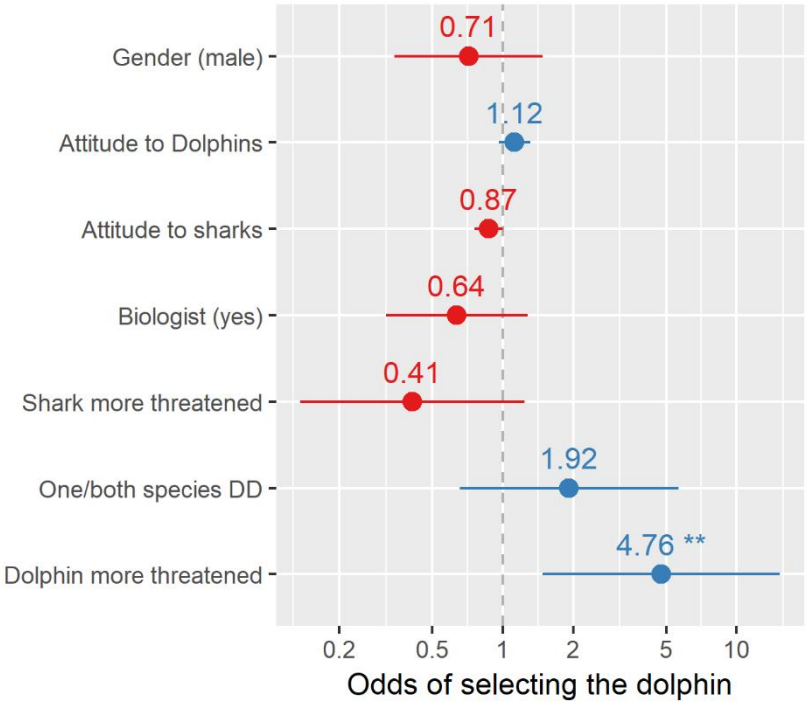


Figure 2: Predicted percentage of choices when individuals would choose to donate to the dolphin, conditional on random effects, and relative to the effect of shark attitudinal score and whether the dolphin (dashed line), shark (dotted line) or neither (solid line) species was presented with additional information.

330 3.3 The effect of IUCN red list status

331

332 When participants had to choose between a shark and a dolphin and additional information was
333 presented about both choices, 96 of 168 participants chose the dolphin. Differences in IUCN status
334 did affect whether individuals were likely to select the dolphin (Figure 3, mixed effects binomial
335 logistic regression, X^2=25.22, df=3, p<0.001). Compared to when the dolphin and shark species had
336 the same IUCN status, participants were more likely to pick the dolphin when it was more threatened
337 (Figure 3, z=2.61, p=0.009, odds ratio 4.76±95%CI1.50-15.94), but not more likely to pick the shark
338 when it was more threatened (Figure 3, z=-1.58, p=0.115, odds ratio 0.41±95%CI 0.13-1.24).



339 Figure 3 here

340 Figure 3: Fixed effects odds ratio estimate for choosing to donate money for the dolphin
341 when presented with a choice between a shark and a dolphin, conditional on random effects.
342 DD = IUCN red list category Data Deficient.
343

344 However, the 95% confidence intervals for when the shark was more threatened and the dolphin was
345 more threatened did not overlap, suggesting participants will select the shark when it is more
346 threatened and the dolphin when it is more threatened. There was no effect of gender (Figure 3, odds
347 ratio 0.71±95%CI0.34-1.48, mixed effects binomial logistic regression, X^2=0.82, df=1, p=0.366),

attitudes to dolphins (odds ratio 1.12±95%CI0.96-1.32, mixed effects binomial logistic regression, X^2=213, df=1, p=0.145), attitudes to sharks (Figure 3, odds ratio 0.87±95%CI0.76-1.00, mixed effects binomial logistic regression, X^2=3.70, df=1, p=0.054) or biology background (Figure 3, odds ratio 0.64±95%CI 0.31-1.27, mixed effects binomial logistic regression, X^2=1.61, df=1, p=0.204). The random effect of species comparison did not explain any of the variance in the data, but was retained in the model to control for pseudo-replication.

4. Discussion

Dolphins are frequently used as a marine flagship species to capture the imagination and draw public attention towards conservation and preservation of the natural environment (Barney et al. 2005). When comparing sharks and dolphins, this research supports the use of dolphins as flagship species, as participant attitudes to dolphins were more positive, and they were more often selected as recipients of hypothetical conservation funds. These results therefore highlight the success and appropriateness of dolphins being used as a marine flagship species within conservation. This preference for dolphins over sharks may reflect prior information which participants held about these species groups. Existing flagship species, such as dolphins, are featured in magazine articles, board games, television shows, films and even food products (Feldhamer et al. 2003). This species specific marketing guarantees more widespread exposure to the general public, in comparison with species which are not employed as flagships. Furthermore, sensationalized news reports of sharks as threatening and fearsome species (Boissonneault et al. 2005) could also impact donor decisions; news stories published between the years 1969 and 2003 made use of exaggerated and alarmist information when describing human shark encounters (Boissonneault et al. 2005). A lack of general knowledge on different shark species has led to persecution of even relatively placid species, such as the grey nurse shark (*Carcharias taurus*) (Boissonneault et al. 2005). Previous research has shown that a lack of knowledge or inaccurate information can limit pro-conservation behavior and cause individuals to act in a less environmentally friendly manner (Lorenzoni et al. 2007). These differences in the cultural contexts of sharks and dolphins may have caused the preference for dolphin conservation shown here.

Flagship species are often used in international fundraising, meaning that campaigns have to appeal to and target a broad audience (Smith *et al.*, 2010). Although dolphins were more popular overall, sharks were chosen as the recipients of funds in 44.6% of choices. Moreover, when additional information was presented about either the shark or the dolphin, the species with more information about it was chosen, suggesting that within this sample the preference for dolphin conservation was not fixed, even within an individual donor. This study shows a complex relationship between donor characteristics, presentation context and species choice. The results of this study support previous observational research (Veríssimo et al. 2017) and show that less popular species can be marketed to increase their popularity and fundraising ability. In all four choice sets where additional information was presented about only one species in the choice set, the species with more information was more likely to be selected. This effect was found both within species groups (choosing between two sharks or two dolphins) and between species groups (choosing between a shark and a dolphin). It is particularly noticeable that providing additional information on sharks resulted in a 25% increase in donors when participants could choose between a shark and a dolphin. This study goes further and shows that not just the amount of information, but also the content of the information presented about species, can impact choices. When the same amount of information was presented about both species in the choice set, there was no effect of the demographic characteristics of participants (gender or biology background). Instead, a strong effect of information content was found, with participants preferring to conserve the species at greater risk of extinction. This suggests that more endangered species may receive greater support even when they are less charismatic, and that these endangered species may have greater appeal across different demographics. A previous study which looked at which species were used as flagships on NGO websites found that species classified as endangered were no more likely to be selected as flagships than those classified as vulnerable (Smith et al. 2012). However, conservation NGOs may wish to consider choosing endangered species as flagships, and promoting greater support by clearly indicating the IUCN threat status of these species.

In addition to changes to individual decisions based on the information presented, there were differences between participant choices based on their demographics. Having a biology background and attitudes to dolphins and sharks were significant predictors of donating behavior when participants chose between conserving a shark and a dolphin. Unsurprisingly, participants with more positive attitudes to dolphins were more likely to select the dolphin, and those with more positive attitudes to sharks were more likely to select a shark. Previous research has shown that various factors determine attitudes to sharks and dolphins, but unlike previous studies which have found attitudes to be associated with personal experiences (Yore & Boyer 1997; Powell & Ham 2008; Friedrich et al. 2014), this study found no relationship between attitudes and experiences. This study also found no relationship between gender and attitudes to sharks and dolphins. Although participants had less positive attitudes to sharks than to dolphins, there were very little absolute differences in attitudes (shark attitudinal score 1.65 lower, equivalent to participants scoring sharks one category less positively in 1-2 dimensions). This indicates that attitudes to sharks are not universally negative, and there are many individuals which might support shark conservation if conservation NGOs targeted these individuals for fundraising. In another study of attitudes to sharks, 64% of respondents had positive views of sharks, with some individuals considering them to be fascinating and ecologically important (Friedrich et al. 2014). Other individuals may also support shark conservation if they had more positive attitudes, which could be promoted through increased knowledge or familiarity. Although this study found no effect of knowledge or experience, previous research suggests a correlation between these and attitudes. For example, (Woods 2000) reported that familiarity was a key determinant of Australian resident's favorite animals. This favoritism was found to stem from perceived levels of attractiveness, intelligence and character. The results showed the sixth least favorite animal for Australian residents was sharks, whereas the dolphin was the second favorite animal (Woods 2000). The lack of relationship found in this study may be as the experience and knowledge measures used were relatively general, e.g. people were either classified as having a background in biology or not, but no distinction was made on the type of training or experience of people in these groups.

Although our study suggest encouraging results for promoting less charismatic species, it should be remembered that our sample may not be representative of the wider population, as participants with more positive attitudes to marine life in general may have been more likely to complete the survey. When equal information was presented about the shark and dolphin in a choice set, participants with a biology background were more likely to select the shark. The latent variable of prior knowledge may be a significant predictor of donating intentions which could explain both this result and the effect of attitudes. Those with a biology background might be expected to have more knowledge about both sharks and dolphins, and previous research found an effect of direct education on marine topics (e.g. undergraduate marine biology) and attitudes to sharks (Barney et al. 2005). There was no effect of gender on participant choices, even though gender has previously been associated with differing levels of shark knowledge, and knowledge with potential behavior towards sharks and their conservation (O'Bryhim & Parsons 2015). Although previous research suggests males are an appropriate demographic market for shark conservation, the evidence here does not suggest that sharks would be less effective flagship species for a female audience. This suggests that a broader range of flagship species may be effective to inspire conservation support in wider demographics than previously thought. One potential audience to consider for shark conservation are the 590,000 people who participate in shark ecotourism each year. This industry generates over USD$314 million per year (Cisneros-Montemayor et al. 2013), and understanding why people participate in shark ecotourism may help market more effectively to this demographic. For example, crocodiles (like sharks) can be a threat to humans and are a popular tourist attraction in Northern Australia, where tourists view crocodiles because of the potential threat and power of crocodiles (Ryan 1998). If these perceptions also motivate shark ecotourism, these values could be used to choose an appropriate flagship to more effectively market shark conservation.

5. Conclusions

Flagship species for conservation are usually charismatic megafauna which are visually appealing and non-threatening, restricting the number of taxonomic groups which are deemed appropriate for use as a flagship species (Smith et al. 2012). Nevertheless, conservation organizations, particularly those

459 which focus on a single species or species group, may wish to use species which do not share these
460 characteristics to raise awareness and funds (Veríssimo et al. 2011). Our results have important
461 implications for the marketing of species which are not typically considered as flagship species.
462 Firstly, this study shows that less charismatic species can gain conservation support from some
463 demographics. If conservation organizations wish to use a more unusual species as a flagship, initial
464 market research may help to identify which individuals might be more likely to support conservation
465 of the species. Once the target demographic is identified, the species can be marketed specifically to
466 that demographic (Veríssimo et al. 2011). Secondly, across demographics, individual preferences of
467 potential conservation donors can be shifted to less charismatic species through the provision of
468 additional information, and by highlighting more endangered species. When an atypical species is
469 selected as a flagship, providing greater information about the species and clearly indicating its IUCN
470 threat status may improve support. Although these measures may not be sufficient to allow atypical
471 flagship species to gain the same support as typical flagship species, these measures can still increase
472 support for these species, broadening the pool from which flagship species are chosen.
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