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The role of animal welfare values in the rhino horn trade debate

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Abstract

The poaching crisis facing Africa's white rhinoceros is one of the continent's most pressing conservation challenges. The controversial proposal to legalize the international trade in rhino horn as a solution has led to a polarized conservation community. While a legal trade in rhino horn has been explored from an economic perspective, stakeholder values are yet to be adequately considered in addressing the issue. Exploring the role of stakeholder values in the rhino horn trade debate is crucial, as divergent stakeholder values and attitudes influence policy support and acceptability, creating conflict over appropriate management interventions. Using a survey of 285 participants, we show that people with stronger animal welfare values are less supportive of a legal rhino horn trade policy. We also demonstrate that people with stronger animal welfare values are less influenced by information provision, and that biospheric and altruistic value orientations do not significantly influence support for this policy. Our findings highlight the importance of considering stakeholder values when developing conservation actions, particularly concerning discussions about controversial policy actions. These findings can be extended beyond the illegal wildlife trade crisis to other challenges affecting iconic wildlife, such as trophy hunting, other sustainable use initiatives and invasive species management.

KEYWORDS
animal welfare values, attitudes, experimental survey, illegal wildlife trade, legal rhino horn trade, policy support, rhinoceros

1 | INTRODUCTION

The management of African rhinoceros (*Ceratotherium simum*) is a high profile and contentious conservation challenge. Poaching of rhino horn has drastically increased over the last decade, primarily driven by East Asian demands for medicine, ornaments and consumption (Ferreira, Pfab, & Knight, 2014; Lee & Du Preez, 2016). Poaching increased from 13 rhino in 2007 to 1,215 in 2014 (TRAFFIC, 2016),

despite an international rhino horn trade ban under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) since 1977. Various management interventions have been proposed to curb poaching, including increased militarized antipoaching enforcement (Duffy, 2014) and a regulated, nonlethal, legal rhino horn trade (Biggs, Courchamp, Martin, & Possingham, 2013; Di Minin et al., 2015), sparking polarized debates among the conservation community (Challender & MacMillan, 2014;

Prins & Okita-Ouma, 2013). The complexity and feasibility of rhino management options have been explored from economic or market-based perspectives (e.g., Child, 2012; Ferreira & Ouma, 2012; Ferreira et al., 2014), but stakeholder values are yet to be adequately considered in this contentious debate.

Values are defined as "concepts or beliefs about desirable end states or behaviors, that transcend specific situations, and guide selection or evaluation of behavior and events" (Schwartz & Bilsky, 1987, p. 551). Values are important to consider due to their influential role in support for policies (e.g., climate change: Leiserowitz, 2006; Dietz, Dan, & Shwom, 2007; Stoutenborough, Bromley-Trujillo, & Vedlitz, 2014). Frameworks such as Wildlife Value Orientations have been extensively used to research stakeholder perceptions of wildlife management issues and policies (Hermann, Voß, & Menzel, 2013; Jacobs, Vaske, & Sijtsma, 2014; Whittaker, Vaske, & Manfredo, 2006; Zinn, Manfredo, & Barro, 2002). Research has also shown the relationship between peoples' voting behavior regarding wildlife management policies and their value orientations. For example, Manfredo, Fulton, and Pierce (1997) demonstrated that voting behavior for banning steel-jaw traps in Colorado was strongly associated with the salient belief that "trapping is cruel and inhumane" and the wildlife protection-use value orientation.

In the wider context of environmental policies, most research has examined two particular value systems— biospheric and altruistic values (Schultz et al., 2005; Stern & Dietz, 1994), within Schwartz's universal values (Schwartz & Bilsky, 1987; Schwartz, 1992). Individuals with biospheric values are concerned about problems affecting all living things (i.e., ecosystem and biosphere), compared to individuals with altruistic values whom are concerned about problems affecting the welfare of other humans (De Groot & Steg, 2008; Schultz et al., 2005). Both of these values are generally positively associated with pro-environmental attitudes and behaviors (Dean, Fielding, & Wilson, 2019; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014; Stern & Dietz, 1994). In the context of on-the-ground wildlife management, the framework exploring mutualism and domination (wildlife value orientations) has been the most studied (e.g., Hermann et al., 2013; Manfredo, Teel, & Dietsch, 2016; Manfredo, Teel, & Henry, 2009; Vaske, Jacobs, & Sijtsma, 2011). Despite the importance of this framework, it is not clear whether frameworks such as Schwartz's universal values also influence support for wildlife management solutions.

The scope of values potentially influencing stakeholders' views about conservation actions may also incorporate other dimensions (Dubois & Harshaw, 2013; Hampton, Warburton, & Sandøe, 2018; Wallach, Bekoff, Batavia, Nelson, & Ramp, 2018; Whittaker et al., 2006; Zinn, Manfredo, Vaske, & Wittmann, 1998). Animal welfare values are one such value system that is becoming increasingly important

for conservation. Conflicts between conservation and animal welfare are particularly problematic regarding controversial issues which involve harm to wildlife, such as invasive species control (Longcore, Rich, & Sullivan, 2009; Perry & Perry, 2008) and sport hunting (Curnutt, 1996) (Dubois & Fraser, 2013). Activities causing direct harm to wildlife, like harvesting or hunting, are prioritized and viewed differently depending on whether people are more traditional conservation versus welfare-oriented (Dubois & Fraser, 2013).

Traditionally, concern for individual animal welfare has not been included in conservation decision-making, partly as a result of conservation metrics over-emphasizing species welfare and seeming difficulties in comparing competing sets of complex values (Ramp & Bekoff, 2015). For example, trophy hunting and culling as conservation strategies can lead to positive outcomes for both wildlife populations, broader biodiversity and communities coexisting together (e.g., Dickson & Adams, 2009; Störmer, Weaver, Stuart-Hill, Diggle, & Naidoo, 2019), thus from a consequentialist line of thinking "the ends justifies the means" (Nelson, Bruskotter, Vucetich, & Chapron, 2016). However, hunting has sparked a global discourse over its appropriateness as a conservation tool (intensified after the media coverage of the 2015 illegal killing of "Cecil" the lion in Zimbabwe; Nelson et al. (2016)), from an individual animal welfare and moral perspective.

This dichotomy between conservation and animal welfare is waning as "compassionate conservation" gathers momentum due to increasing recognition of nonhuman animals' sentience and sapience (Ramp & Bekoff, 2015; Wallach et al., 2018). Compassionate conservation stipulates the need for a conservation ethic, which incorporates the protection and intrinsic value of animals individually, not just as members of a population of species (Ramp & Bekoff, 2015). Although rhino horn can be renewably harvested from live animals, trade in this product may still elicit moral repugnance in those who view wildlife use as morally, culturally or socially wrong (Dickman, Johnson, van Kesteren, & Macdonald, 2015; Hutton & Leader-Williams, 2003), regardless of the humaneness of the practice (Dubois & Harshaw, 2013). Thus, the influence of such variables like animal welfare values on people's support for wildlife policy requires consideration in the development of conservation actions.

There are many different actors that influence implementation and success of conservation initiatives, ranging from local communities living near wildlife to international players affecting policy development. For example, research highlights the importance of considering values and perceptions of stakeholders at local to national levels (e.g., Muntifering et al., 2017; Rubino & Pienaar, 2018; Wright, Cundill, & Biggs, 2018) in management efforts for conserving African rhinoceros. While most research on human dimensions of

conservation issues focuses, appropriately, on local communities, there is increasing recognition that international actors such as members of conservation NGOs may exert a major influence on conservation policy development (Bauer, Nowell, Sillero-Zubiri, & Macdonald, 2018; Biggs et al., 2017; Duffy, 2013; Rauwald & Moore, 2002). For example, international conservation and welfare NGOs have significantly shaped and driven decision-making at an international-level, in arenas such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), concerning ivory (Biggs et al., 2017; Duffy, 2013) and lion policies (Bauer et al., 2018), despite being nonstate actors. Furthermore, the Chinese government recently postponed their policy decision to legalize the domestic trade in tiger and rhino parts and the use of tiger and rhino horn by qualified doctors from captive bred animals (Cheung, Wang, & Biggs, 2018), after public outcry from conservation and environmental groups such as the World Wildlife Fund (WWF) (World Wildlife Fund, 2018).

Many international conservation NGOs and their public membership are based in wealthy Western countries, with divergent values about the use of wildlife and resources compared to those in African countries cohabiting with iconic wildlife such as elephants and rhinoceros (Akama, 1996; Duffy, 2013). Research suggests a shift in wildlife values from "domination" to more "protectionist" (Manfredo, Teel, & Bright, 2003; Zinn et al., 2002) and "mutualistic" (Manfredo et al., 2009; Manfredo et al., 2016) value orientations. This is potentially as a result of broader value changes within western societies, likely due to urbanization and modernization (Manfredo et al., 2003; Manfredo et al., 2009; Manfredo et al., 2016). With increasing societal changes likely to cause further value shifts in the future, gaining insight about people's values is imperative, particularly in light of the significant influence these countries exert on conservation policy.

Thus, to explore our baseline understanding of the values influencing peoples' response to certain rhino management options in an affluent western country, we used a survey that examines how particular values affect peoples' responses to information about rhino management, focusing on legal trade as a proposed policy response due to the strong contention surrounding it in this debate. Additionally, by randomly allocating participants to a treatment (information) or control condition, we also aimed to explore whether the provision of information from a pro-trade argument influenced responses towards this controversial policy.

2 | METHODS

We surveyed 285 participants, recruited from a large Australian university (The University of Queensland, Brisbane) between September and October 2016, via face-to-face intercept surveys. We had an approximate recruitment rate of 91% (26 out of 311 people declined to participate in the survey). Participants were recruited in a large recreational area on campus. We recorded participant responses manually and completion time per survey was approximately 10–15 min. To prevent biased representation, we used a stratified random sampling technique by gender. We pilot-tested ($n = 11$) the survey prior to data collection to refine the questionnaire. The survey rated a range of participant characteristics, provided information according to experimental conditions and then rated support for the controversial policy response—legal rhino horn trade—hereafter, referred to as policy support.

We randomly assigned participants to one of two experimental conditions:

1. Treatment condition: presented factual information about rhino poaching, horn harvesting, and the argument for legalizing horn trade as summarized in the peer-reviewed literature (Child, 2012; Biggs et al., 2013; Di Minin et al., 2015; see Supporting Information S1).
2. Control condition: no information provided.

We assessed participants' policy support by using four items addressing degree of support for humane harvesting of rhino horns and legal horn trade (Table 1). Each item was rated on a 5-point scale (1 = strongly oppose to 5 = strongly support). Responses to these four items were averaged to produce the "Legal trade support" score (Cronbach's $\alpha = 0.83$). As an indicator of behavioral support for legal trade, we utilized an in situ behavior, where participants were invited to sign a paper-based petition in support of legal rhino horn trade ("Petition support": 1 = yes, 0 = no; Table 1).

We assessed participants' value orientations (altruistic and biospheric) using the short version of Schwartz's Value Scale (De Groot & Steg, 2008). For each value, participants were asked to rate the importance of the four value statements "as a guiding principle in their lives" (e.g., "Respecting the earth"), on a 9-point scale (−1 representing opposed to my values, 0: not important and 7: extremely important (Table 1). For each value, the mean score for all four items provided an "altruistic value" (Cronbach's $\alpha = 0.75$) and a "biospheric value" (Cronbach's $\alpha = 0.87$) score.

To assess welfare values related to the use of animals, we used the condensed Animal Attitude Scale (AAS-5; Herzog, Grayson, & McCord, 2015), containing five items ranked on a 5-point scale from 1 = strongly disagree to 5 = strongly agree (Table 2). Higher scores indicate greater animal welfare values (Cronbach's $\alpha = 0.68$). Three items were used to measure participants' self-rated awareness about rhino poaching in South Africa, each ranked on a 5-point scale (1 = very little, 5 = a lot; Table 1). Responses were averaged

TABLE 1 Survey questions designed to measure focal participant characteristics, attitudes and behavioral support towards legal rhino horn trade

Variable	Questions	Response
Dependent variables		
Legal trade support (attitudes)	Overall how favorable do you think establishing a legal rhino horn trade as a management option is?	1 = *very unfavorable*; 5 = *very favorable*
	I would support the humane harvesting and sale of rhino horn to conserve rhinos.	1 = *strongly disagree*; 5 = *strongly agree*
	To what degree would you support or oppose the following initiatives in order to fund rhino conservation?	
	The sale of rhino horn from currently live rhinos	1 = *strongly oppose*; 5 = *strongly support*
	The sale of existing stockpiles of rhino horn	1 = *strongly oppose*; 5 = *strongly support*
Petition support	Would you be willing to sign a petition now to support legal trade?	Yes/No
Explanatory variables		
Values:	*I'm now going to read out 8 values and would like you to rate the importance of them "as a guiding principle in your life":*	
Altruistic	Equality: equal opportunity for all; A world at peace: free of war and conflict; Social justice: correcting injustice, care for the weak; Helpful: working for the welfare of others	−1 = *opposed to my values*; 0 = *not important*; 7 = *of supreme importance*
Biospheric	Preventing pollution: protecting natural resources; Respecting the earth: harmony with other species; Unity with nature: fitting into nature; Protecting the environment: preserving nature	−1 = *opposed to my values*; 0 = *not important*; 7 = *of supreme importance*
Conservation group membership	Are you a current member of a conservation group(s)?	Yes/No
Megafauna experience	Have you ever seen other large animal species in the wild (e.g., elephants, lions, giraffes)?	Yes/No
Awareness	How much would you say you know about rhino poaching in South Africa?	1 = *very little, almost nothing*; 5 = *a lot*
	Are you aware of the current debate about the best policy action to mitigate rhino poaching?	1 = *very unaware*; 5 = *very aware*
	Are you aware of the issue between securing livelihoods of local South African people and the protection of rhinos?	1 = *very unaware*; 5 = *very aware*

to create a "subjective awareness" score (Cronbach's $\alpha = 0.66$). We assessed socio-demographic characteristics through a range of questions concerning age (years), gender (0 = male; 1 = female), current conservation group membership (0 = *no*, 1 = *yes*) and past tourism experience with wild megafauna (0 = *no*, 1 = *yes*) (Table 1).

2.1 | Analysis

To assess the effect of the treatment (information provision) on policy support, we used a linear regression. Policy support was calculated by taking the mean of multiple Likert-style items, and as such is considered suitable for use in linear regression as continuous variables (Tabachnick & Fidell, 2013). Linear regression comprised three steps: the

first assessed the treatment effect on "Legal trade support" as the response variable; the second added a range of participant characteristics (e.g., value orientation, awareness, animal welfare values, socio-demographics) as independent variables; and the final step included significant variables from the previous step as interaction terms. Use of interaction terms allows us to assess whether the effect of treatment is different in different groups of respondents.

To determine the treatment effect on the situ behavior (signing petition), we used binary logistic regression comprising three steps: the first assessed the treatment effect on willingness to sign a petition ("Petition support"); the second added participant characteristics as independent variables; and the final step included significant variables from the previous step as interaction terms.

TABLE 2 Survey questions measuring a participant's welfare values related to animal use, adopted from Herzog et al. (2015) condensed animal attitude scale (AAS-5)

Variable	Questions	Response
Animal welfare value	It is morally wrong to hunt wild animals just for sport.	1 = strongly disagree; 5 = strongly agree
	I do not think that there is anything wrong with using animals in medical research.[a]	1 = strongly disagree; 5 = strongly agree
	I think it is perfectly acceptable for cattle and pigs to be raised for human consumption.[a]	1 = strongly disagree; 5 = strongly agree
	The slaughter of whales and dolphins should be immediately stopped even if it means some people will be put out of work.	1 = strongly disagree; 5 = strongly agree
	I sometimes get upset when I see wild animals in cages at zoos.	1 = strongly disagree; 5 = strongly agree

[a]Items reverse coded, as higher scores indicate greater animal welfare value.

We analyzed data using SPSS version 23.0 (IBM Corp., Armonk, New York). All data and models were assessed to ensure that normality, linearity, homoscedasticity and multicollinearity assumptions were not violated (for details on analysis see Supporting Information S2). No random effects were used in any of the models (i.e., all models were single level effects and did not use mixed effects).

3 | RESULTS

An approximately equal number of males ($n = 135$, 47.4%) and females ($n = 150$, 52.6%) were represented, with an average age of 21 years ($SD = 4.01$, range 17–63; Table 3). The majority of respondents were students ($n = 274$, 96.1%; Table S1). The mean "awareness" score was below the mid-point on the 5-point Likert-scale (mean = 1.92, $SD = 0.73$; Table 3), indicating low-subjective awareness of the rhino poaching crisis and policy debate in participants.

3.1 | Factors influencing "legal trade support"

Support for the legal trade policy in the treatment information group (mean = 3.5, $SD = 0.9$) was greater than the no-information control group (mean = 2.7, $SD = 0.8$; Table 3). Linear regression demonstrated that providing information

was significantly associated with greater support for the policy ($\beta = 0.441$, $p < .001$), even after controlling for factors such as socio-demographics, values and experience ($\beta = 0.481$, $p < .001$; Table 4). Animal welfare values also exerted a significant influence on support ($\beta = -0.270$, $p < .001$), with individuals expressing lower animal welfare values (i.e., greater support for the use of non-human species) demonstrating greater support for legal trade (Table 4). There was a significant interaction between the treatment effect and animal welfare values ($\beta = 0.819$, $p = .028$; Table 4), indicating that providing information about the policy was more effective at changing attitudes in participants with lower animal welfare values (Figure 1). Value orientation (altruistic and biospheric) did not significantly influence support for legal trade (Table 4).

3.2 | Factors influencing "petition support"

Logistic regression demonstrated that information provision significantly increased the rate of signing a petition supporting legal trade (Odds ratio, OR = 5.11, $p < .001$), even after controlling for factors such as socio-demographics, values and experience (OR = 5.821, $p < .001$; Table 5). Awareness, values and animal welfare values were also significantly associated with petition signing. Specifically, participants with greater awareness of the rhino poaching crisis and management strategies (OR = 1.56, $p < .05$), stronger biospheric values (OR = 1.46, $p < .05$), lower altruism values (OR = 0.66, $p < .05$) and lower animal welfare values (OR = 0.56, $p < .05$) were more likely to
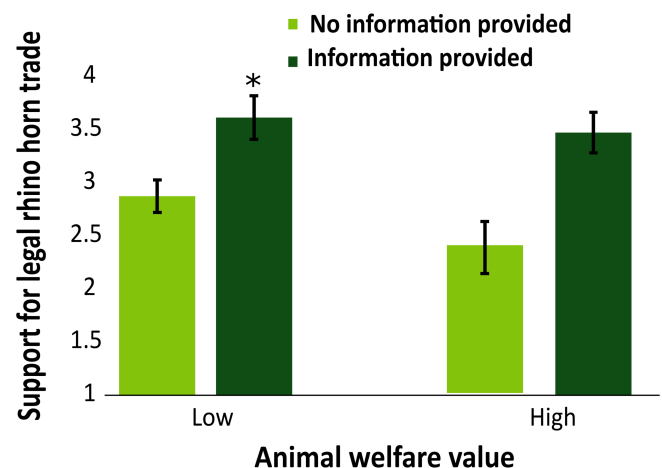
FIGURE 1 Support for legal rhino horn trade expressed by participants with low- or high-animal welfare values, exposed to either a no-information or treatment information condition on a scale of 1 = strongly oppose; 2 = oppose; 3 = uncertain; 4 = support. Error bars represent 95% CIs. *$p < .05$. Note: Low- or high-animal welfare value was categorized as < mean ± SD >, that is, low-animal welfare value <3.63 ± 0.64; high-animal welfare value >3.63 ± 0.64

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TABLE 3 Descriptive and statistical test values of focal variables between control (no-information) and treatment groups

Variable	Group Control					Treatment					Difference between control and treatment
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
1. Legal trade support[a]	2.70	0.80	2.80	1.00	5.00	3.50	0.90	3.80	1.00	5.00	$t = -8.21$; $p = .000$
2. Petition support	0.23	0.42	0.00	0.00	1.00	0.60	0.49	1.00	0.00	1.00	$\chi^2 = 39.93$; $p = .000$
3. Altruistic value[b]	5.72	0.96	6.00	1.25	7.00	5.96	0.85	6.00	2.50	7.00	$t = -2.23$; $p = .027$
4. Biospheric value[b]	5.38	1.08	5.50	2.75	7.00	5.73	1.04	6.00	2.25	7.00	$t = -2.73$; $p = .007$
5. Conservation group membership	0.58	0.24	0.00	0.00	1.00	0.96	0.29	0.00	0.00	1.00	$\chi^2 = 1.47$; $p = .23$
6. Megafauna experience	0.59	0.49	1.00	0.00	1.00	0.52	0.50	1.00	0.00	1.00	$\chi^2 = 1.39$; $p = .24$
7. Awareness	1.90	0.70	1.70	1.00	4.00	2.00	0.80	2.00	1.00	4.00	$t = 0.37$; $p = .37$
8. Animal welfare value	3.51	0.59	3.60	1.80	4.80	3.73	0.65	3.80	1.80	5.00	$t = -2.88$; $p = .004$
9. Age	21.00	5.00	20.00	17.00	63.00	21.00	3.00	20.00	17.00	36.00	$t = 0.16$; $p = .876$
10. Gender	0.47	0.50	0.00	0.00	1.00	0.58	0.50	1.00	0.00	1.00	$\chi^2 = 2.89$; $p = .09$
Sample size (n)	139					146					

Note: Legal trade support, awareness and animal welfare value were measured on a 5-point scale (range 1 to 5).
[a]$n = 282$.
[b]Values were measured on 9-point scale (range −1 to 7); age was measured in years; dichotomous variables included: petition support (0 = not signed, 1 = signed), conservation group membership (0 = no, 1 = yes), megafauna experience (0 = no, 1 = yes) and gender (0 = male, 1 = female).
Abbreviation: *SD*, standard deviation.

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TABLE 4 Linear regression analysis of focal variables influencing support of legal rhino horn trade

Variable	Model 1[a] Unstandardized coefficient (B)	SE (B)	β	Model 2[b] Unstandardized coefficient (B)	SE (B)	β	Model 3[c] Unstandardized coefficient (B)	SE (B)	β
Constant	2.699	0.073		3.682	0.586		4.230	0.632	
Treatment	0.834	0.102	0.441***	0.909	0.099	0.481***	−0.353	0.581	−0.187
Age				−0.002	0.170	−0.008	−0.001	0.170	−0.002
Gender				−0.027	0.111	−0.140	−0.017	0.110	−0.009
Conservation group membership				0.219	0.189	0.061	0.240	0.188	0.067
Megafauna experience				0.109	0.101	0.057	0.126	0.100	0.067
Awareness				0.089	0.070	0.069	0.110	0.070	0.085
Altruistic value				−0.031	0.067	−0.029	−0.030	0.066	−0.028
Biospheric value				0.019	0.060	0.021	0.025	0.060	0.028
Animal welfare value				−0.402	0.098	−0.270***	−0.954	0.268	−0.641***
Group * animal welfare value							0.349	0.158	0.819*
R^2	0.195			0.265			0.275		
F for change in R^2	67.486***			4.445***			4.870*		
Sample size (n)	282			282			282		

Abbreviation: SE, standard error.

[a]Model 1 tested the effect of Treatment (i.e., treatment (information provision)) vs. control (no information)) on legal trade support.

[b]Model 2 tested the effect of information in addition to a range of participant characteristics as independent variables on legal trade support.

[c]Model 3 tested the effect of information, participant characteristics and interactions between information and any participant characteristics significant in model 2.

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

TABLE 5 Binary logistic regression analysis of focal variables predicting petition signing in support of legal rhino horn trade

Variable	Model 1[a] Unstandardized coefficient (B)	SE (B)	OR	Model 2[b] Unstandardized coefficient (B)	SE (B)	OR	Model 3[c] Unstandardized coefficient (B)	SE (B)	OR
Constant	−1.220	0.204	0.295	0.641	1.542	1.899	0.037	1.868	1.038
Treatment	1.631***	0.266	5.110	1.762***	0.287	5.821	3.156	2.314	23.475
Age				−0.028	0.048	0.973	−0.030	0.480	0.979
Gender				0.159	0.315	1.172	0.148	0.320	1.159
Conservation group membership				0.286	0.523	1.330	0.328	0.521	1.388
Megafauna experience				−0.002	0.280	0.998	0.067	0.285	1.070
Awareness				0.445*	0.196	1.560	0.914**	0.341	2.495
Altruistic value				−0.406*	0.193	0.666	−0.474	0.284	0.622
Biospheric value				0.383*	0.176	1.466	0.703*	0.298	2.020
Animal welfare value				−0.572*	0.279	0.564	−1.066*	0.482	0.344
Group * awareness							−0.743	0.413	0.476
Group * animal welfare value							0.691	0.571	1.995
Group * Biospheric							−0.543	0.373	0.581
Group * altruistic							0.115	0.393	1.122
Cox & Snell R^2	0.14			0.19			0.21		
Nagelkerke R^2	0.19			0.26			0.28		
Sample size (n)	282			282			282		

SE, standard error.

[a]Model 1 tested the effect of Treatment (i.e., treatment [information provision] vs. control [no information]) on petition support for legal trade.

[b]Model 2 tested the effect of information in addition to a range of participant characteristics as independent variables on petition support for legal trade.

[c]Model 3 tested the effect of information, participant characteristics and interactions between information and any participant characteristics significant in model 2.

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

sign the petition in support of legal rhino horn trade (Table 5).

4 | DISCUSSION

To our knowledge, this is the first study to explore the role of values influencing people's response to policy options in the rhino horn debate in a wealthy western country. Our findings show that individuals' with strong animal welfare values are significantly less supportive of legalizing rhino horn trade as a policy response and are less receptive to information about the policy. This aligns with other research demonstrating the relationship between peoples' values about wildlife and the acceptability of management options concerning numerous species and across various geographic scales and scenarios (e.g., Jacobs et al., 2014; Lute, Navarrete, Nelson, & Gore, 2016; Whittaker et al., 2006; Zinn et al., 1998).

Our finding that animal welfare values significantly weakens support of the legal rhino horn trade policy parallels other research emphasizing the need to understand peoples' animal welfare value positions in conservation (e.g., Dubois & Fraser, 2013). Addressing rhino poaching is a complex issue, entailing the conservation of the species, the welfare of individual animals, and the welfare of communities dependent on rhinos. Conflict can arise between the conservation of a population of a species overall and animal welfare, as the latter draws on moral perspectives to reduce individual animal suffering, regardless of an animal's conservation status (Harrop, 2003; Wallach et al., 2018). Any activity causing harm to wildlife, in this case the removal of a rhino's horn (albeit even if performed humanely), will be perceived differently if the person has a more traditional conservation versus animal welfare value-orientation (Dubois & Fraser, 2013).

The diminished effectiveness of information in individuals endorsing stronger animal welfare values highlights the challenge of introducing contentious conservation actions such as a legal trade of horn. This finding is consistent with environmental research indicating that information is more

likely to motivate change when the information aligns with the attitudes and values of the audience (Bain, Hornsey, Bongiorno, & Jeffries, 2012; Bolderdijk, Gorsira, Keizer, & Steg, 2013). Research shows that framing the information in a certain way (e.g., moral vs. pragmatic frames; Van Zant & Moore, 2015) or communicating psychological issues such as social norms (e.g., the proportion of people supporting policies; De Groot & Schuitema, 2012) may influence the receptivity of individuals to information. Conservation decision makers need to thus be aware of various stakeholder values and the likely uptake of information when communicating or trying to gain support for conservation actions.

Our findings on the importance of animal welfare values in conservation policy and management debates align with those from other western countries. For example, people in the Netherlands with a mutualism value orientation predominantly believed that the lethal control of deer and geese damaging crops was unacceptable, compared to those with a domination orientation (Sijtsma, Vaske, & Jacobs, 2012). Furthermore, Zinn et al. (1998) demonstrated that individuals in Denver and Colorado Springs metropolitan areas, USA, with protectionist versus pro-use wildlife values were less willing to accept destroying a mountain lion as a management action.

The lack of consideration of stakeholders' divergent values can contribute to policy failure on iconic species, due to the influence of different value systems on policy positions. For example, progress towards a successful policy solution for the African elephant (*Loxodonta africana*) has been stymied by a lack of recognition that divergent stakeholder values contribute to the conflicting views about how best to achieve elephant conservation (Biggs et al., 2017). Furthermore, similar fundamental tensions between stakeholder groups have dominated the CITES debate over which trade policy will best protect wild African lion (*Panthera leo*) populations, with ethics strongly governing policy formulation (Bauer et al., 2018). Indeed, policy debates around iconic species such as rhino, elephant, and tiger are heavily influenced by values (Bauer et al., 2018; Biggs et al., 2017) but there are currently no mechanisms or processes for incorporating different values into decision-making processes within NGOs or in international fora. Therefore, to overcome the current impasse on rhino horn trade policy a structured process including values and evidence is required (Biggs et al., 2017; Gregory et al., 2012).

The results of our paper suggest that conservation agencies (both government and NGOs) should seek resources for, and start enacting, such processes incorporating scientific evidence together with consideration of values to strengthen science-based decision-making (Biggs et al., 2017). Such a process is particularly urgent following China's announcement in late 2018 of the intention to

consider the relegalization of the domestic trade in rhino horn (Cheung et al., 2018).

4.1 | Limitations and future research

Our research presented information in the experimental intervention on the benefits of legalization, as argued by pro-trade southern African range states. The type of information provided may have influenced our findings. For example, the results may have differed if there was greater emphasis on the potential risks and uncertainties associated with a legal trade of rhino horn. The extent and type of information provided in future studies can be expanded as more research on the benefits and potential risks of legal trade is conducted. The petition used in our survey served as an in situ measure of behavior. Although in situ behaviors such as commitment signing have been associated with longer-term uptake of behaviors (Lokhorst, Werner, Staats, van Dijk, & Gale, 2013), the degree to which petition signing reflects longer-term behavior is unknown. Further studies assessing longitudinal uptake of relevant behaviors are also needed.

Despite randomization, there were some differences between participants allocated to information and control conditions; specifically, those allocated to the information condition exhibited higher animal welfare values than those in the control condition. While group differences can potentially influence observed results, we found that information increased policy support and likelihood of signing a petition, even when controlling for these differences. Given that higher animal welfare values constrained the impact of the information, it is likely that group differences resulted in smaller effect sizes associated with information provision observed in this study.

Participants in our study demonstrated low awareness of the rhino poaching crisis and policy debate, which may have influenced the effect of information provision. If participants had higher awareness, and existing opinions, of the issue (e.g., members of anti-trade animal welfare or conservation NGOs), our results may have shown increased polarization for or against legalizing rhino horn trade in response to the information provided. For example, people originally in favor of restoring wolf populations in the southern Rockies, USA, found arguments presented from proponents of the policy more persuasive, ultimately strengthening their initial opinion (i.e., changing from "somewhat" supportive to "extremely" supportive) (Meadow, Reading, Phillips, Mehringer, & Miller, 2005).

We recognize the limitations of our study in its focus on university students in Australia only as respondents. However, students are an appropriate proxy for people in a western country who may have influence in global debates, to

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preliminary test the role of values and information provision on rhino management responses. University students represent higher educational attainment than the general population and we recognize that our findings may not apply to groups with poorer education or literacy. We are cognizant that our selection of study sample may have influenced the size of the observed effects. Research conducted in the areas of health show that studies with indicators of potential selection bias exhibit greater effect sizes (Saltaji et al., 2018; Savović et al., 2012). While we are not able to quantify the specific influence of selection bias in this particular study, it is possible that using more rigorous methods of sampling would generate more modest effect sizes. Our sample had similar gender balance compared to the broader population of the South East Queensland census area (Australian Bureau of Statistics, 2016; Table S2). Our sample had a younger age structure as expected of a student sample (Table S2). While we do not have data to compare non-demographic variables such as Schwartz's values, it is likely that a student sample would differ to the broader public for some of these, which we acknowledge as a caveat to generalizing our results.

We also acknowledge that other western countries, such as the USA where a higher level of conservation donations originate from (Waldron et al., 2013), may have different values in regards to animal welfare. Our results therefore provide a first analysis of how animal welfare values relate to acceptance of policy options and evidence on rhino conservation policies, but there is a need for further research. Future research should encompass a greater range of key international stakeholder groups, such as the general public, NGOs and animal welfare advocacy groups that influence the policy debate, communities in Africa dependent on wildlife tourism, and people in countries where rhino horn may be harvested (e.g., Wright et al., 2018), purchased and consumed. In addition, future research should also evaluate the impact of presenting different types of information (e.g., the argument against legalizing horn trade), and explore the influence of values towards other proposed rhino management interventions.

Finally, our findings provide insight into the social complexities of a controversial conservation policy debate. The implications of our results extend beyond the illegal wildlife trade issue to other challenges affecting iconic wildlife, including trophy hunting, other forms of sustainable use, and invasive species management.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

AUTHORS CONTRIBUTION

All authors conceived and designed the research. A.B. collected and analyzed the data and wrote the initial draft of the article. A.D. contributed to data analysis and made revisions to several drafts. H.P. reviewed and provided feedback on initial drafts. D.B. reviewed all drafts and provided significant feedback and revisions.

DATA ACCESSIBILITY STATEMENT

Due to the possible sensitivity of human subjects' data and in compliance with human ethics approval granted by University of Queensland, interviews are only accessible to the authors. However, anonymized data may be accessible by request.

ETHICAL STANDARDS

Human ethics approval was granted by the University of Queensland's School of Communication & Arts research ethics committee.

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SUPPORTING INFORMATION

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