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Social identity shapes support for management of wildlife and pests

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ABSTRACT

Public attitudes are important in shaping wildlife management decisions. However, publics are not homogeneous, and conflicting perceptions and attitudes often create barriers to achieving conservation outcomes. Here we use a social identity approach to analyze public acceptance of different options for managing four animals in Australia (kangaroos, wild horses, dingoes, and red foxes). We conducted an online survey (N = 793) of adult residents of Australia. Analyses indicate 11.4% of respondents strongly identified as animal rights activists, 19.0% as wildlife conservationists, and 19.2% as farmers. Using the Potential for Conflict Index and permutational multivariate analysis of variance, we found that on average, all identity groups supported nonlethal management for all species and reintroduction or maintenance of dingoes to suppress kangaroos and red foxes. All identity groups except farmers were generally unsupportive of lethal control, but there was less consensus among responses within groups compared with support for nonlethal methods. Results suggest that policies which prioritize nonlethal management over lethal control (where effective) will be less controversial than those that use lethal management. Likewise, incorporating predator conservation into ecosystem restoration seems well supported across constituencies typically interested in wildlife conservation.

1. Introduction

How we perceive animals can determine how we respond to their management (Heeren et al., 2017; Manfredo et al., 2016). Public perception of wild animals and their management is increasingly important in shaping wildlife management actions (van Eeden et al., 2017), especially given shifts towards concern for animal welfare and coexistence with, rather than dominance over, nature (Manfredo et al., 2009). Conflict between stakeholder groups is a common barrier to effectively addressing environmental problems (Colvin et al., 2015; Daniels and Walker, 2001), so understanding how different groups perceive and respond to wildlife and pest management is needed to ensure management plans are designed with stakeholder support (Bruskotter et al., 2017; Lute et al., 2014; Whittaker et al., 2006).

In this paper, we use a derivation of the social identity approach (Abrams and Hogg, 1990) to interpret public attitudes towards the management of species managed as pests in Australia. Analysis of social identity has been used to interpret and manage conflict in addressing a range of environmental issues (Colvin et al., 2015). Existing research shows that the extent to which an individual identifies with a particular group (e.g., farmers, wildlife conservationists, animal rights activists) can explain how they judge the acceptability of different types of wildlife management, including lethal control (Heeren et al., 2017; Lute et al., 2014; Naughton-Treves et al., 2003). Identifying these groups and quantifying their attitudes and values can be useful in targeting communication about human-wildlife conflict and wildlife management (Fielding and Hornsey, 2016).

The social identity approach, combining social identity theory (Tajfel, 1982) and its extension, self-categorization theory (Turner et al., 1987), provides a useful framework for understanding the formation of social groups and conflict between them (Abrams and Hogg, 1990; Hornsey, 2008). This approach posits that individuals ascribe to groups to protect and bolster their self-identity, improving self-esteem by providing social meaning and reducing uncertainty about appropriate behavior, attitudes, and norms (Hogg, 2000; Hornsey, 2008). As individuals within groups come to identify with the group more strongly, they form stereotypes of 'ideal' group members, which provide a guide for how 'ideal' members should think and behave (Tajfel, 1978; Tajfel and Turner, 1979).

The existence of these groups is only given value through comparison with other groups that hold differing, often conflicting, values. 'In-groups' create stereotypes of 'out-groups', typically assuming a high

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degree of homogeneity within out-groups (Judd and Park, 1988). An example is the perceived urban-rural divide, in which some farmers (typically rural residents) perceive that urban residents see them as negatively impacting the environment (Witt et al., 2009) or having little regard for animal welfare (Te Velde et al., 2002; Vanhonacker et al., 2008), at the same time themselves considering animal rights activists to be "city folk" who have no knowledge of the environment and rural lifestyles (Botterill, 2006; Mehmet and Simmons, 2016). Such perceptions may further polarize attitudes between groups, causing in-group members to dismiss the validity of out-group members' opinions. For example, Einwohner (1999: 66) found that hunters considered animal rights activists to be emotional, sentimental individuals or "bleeding hearts" who "do not or cannot understand a logical, scientific practice like hunting". This 'us against them' mentality hinders conflict resolution so gaining an understanding of the identity groups involved can improve policy development and implementation.

In this study, we used the social identity approach to solicit salient identities relevant to wildlife conservation and pest management (e.g., farmers, animal rights activists, wildlife conservation advocates). We then explore differences in groups' attitudes towards wildlife management interventions using the second generation of the Potential for Conflict Index (PCI_2) metric developed by (Vaske et al., 2010). Based on previous research on stakeholder attitudes towards human-wildlife conflict management (e.g., Bruskotter et al., 2009; Lute et al., 2014; Naughton-Treves et al., 2003) we predict that stakeholders who hold more utilitarian views (e.g., farmers) will be more concerned with achieving an outcome (i.e., reduced impact from wildlife and pests) than other groups who may be more concerned about the appropriateness of the methods used to achieve this outcome. We therefore expect a higher potential for conflict among attitudes towards lethal control than nonlethal control overall, with farmers more likely to accept lethal methods than other groups. We use our analysis to discuss the responsibility of wildlife management agencies to appeal to broader public values and manage conflicting public perceptions.

2. Material and methods

2.1. Measures

We developed a structured questionnaire that aimed to identify public acceptability of management of four mammal species (or species groups) that are managed as pests in the wild across much of Australia: kangaroos (e.g., *Macropus* spp. and *Osphranter* spp.), dingoes (*Canis dingo*), wild horses (*Equus ferus caballus*), and red foxes (*Vulpes vulpes*). Kangaroos are native to Australia, whereas dingoes are regarded as a naturalized species that were introduced over 4500 years ago (Cairns and Wilton, 2016). The latter two species have been introduced since European settlement in 1788. All are managed using both lethal and nonlethal interventions.

The survey contained a variety of response items designed to assess participants' acceptance of the use of different management methods along a five-point scale (strongly disapprove [−2] to strongly approve [2]). We define acceptability to mean "a judgment or decision regarding the appropriateness of a particular action or policy" (Bruskotter et al. 2009: 121). Management methods included lethal (aerial and ground shooting of kangaroos and horses; trapping, shooting, and aerial and ground baiting with poison of dingoes and red foxes) and nonlethal interventions (exclusion fencing of all species; fertility control and translocation of kangaroos and horses; livestock guardian animals to prevent attacks on livestock by dingoes and foxes) that are currently used or have been used in Australia in the past decade. We asked participants to indicate their approval of taking no action to manage these species as well as the suggestion to reintroduce or maintain dingo populations to suppress kangaroo and fox populations. We provided a short description of all these management options to survey participants (see Table A1).

We asked participants to indicate the extent to which they identified with three groups relevant to the conservation of wildlife (animal rights activists, wildlife conservationists, and farmers); response options included "not at all", "somewhat", and "strongly". We chose these identity groups because we considered that they best described Australian social groups with regards to managing wildlife and have been previously used in social identity research (Colvin et al., 2015). Similar research in North America has included identities such as "hunters" and "property rights advocates" but these groups are less relevant for the Australian context where (we believe) hunting culture is less prominent in wildlife conservation and there is less conflict between private and federal land management. Finally, we collected diverse demographic information about respondents, including age, gender, and whether respondents had spent the majority of their lives in urban or rural areas.

2.2. Data collection

Survey data were collected and managed using REDCap electronic data capture tools hosted by The University of Sydney (Harris et al., 2009). The survey was distributed online by a market research company (Survey Sampling International: SSI). SSI sources respondents by sending invitations to participate in research to members who have subscribed to receive surveys. Participants are rewarded for completing surveys with points they accrue to redeem for competition entries or vouchers for goods or services that are unrelated to the survey. The survey recruitment aims to obtain a sample representative of the Australian public based on the most recent government census with regards to age, gender, state of residence, and location in a rural or suburban/urban area (see Table A2). We screened the data and removed 18 low quality responses (e.g., invariant and contradictory responses, Meade and Craig, 2012).

The survey was conducted with approval from the Human Research Ethics Committee of The University of Sydney [protocol number: 2017/875].

2.3. Data analysis

Student's *t*-tests and Pearson's χ^2 tests were conducted to analyze demographics of our population sample. We then compared responses between the three strongly identifying social groups (those who strongly identified as animal rights activists, wildlife conservationists, and farmers) and the total respondent pool (hereafter referred to as "all respondents") as well as comparing between those who strongly identified and did "not at all" identify with these identity groups. We achieved this using permutational multivariate analysis of variance (PERMANOVA in PRIMER6, Anderson, 2001; Anderson et al., 2008), followed by pair-wise comparisons. The results of all pair-wise comparisons are provided in Table A3. The analyses were based on Euclidean distance resemblance matrices with 999 permutations and Type III sums of squares, removing respondents with missing data. The analyses compared acceptance of (1) four possible management categories (lethal control, nonlethal control, retaining or reintroducing dingoes to regulate kangaroo and red fox populations, or taking no action) and (2) lethal control of the four species. Each of these categories comprised multiple items (e.g., lethal control comprised aerial and ground shooting of kangaroos and horses; trapping, shooting, and aerial and ground baiting of dingoes and foxes) which are outlined in full in Table A1.

We then compared mean acceptance and consensus (or lack of consensus) between categories using the Potential for Conflict Index (PCI_2). While the analyses described above test relationships between the groups, PCI_2 assesses within group variability. PCI_2 has been used predominantly to explore stakeholder attitudes towards wildlife conservation and management and was designed to bridge the communication gap between scientists and non-technical audiences (Manfredo et al., 2003; Vaske et al., 2010). PCI_2 values range from 0 to 1, with

$PCI_2 = 0$ indicating no potential for conflict (complete consensus between respondents' answers) and $PCI_2 = 1$ indicating the highest potential for conflict (responses are completely polarized). The results are displayed as a bubble graph with the size of the bubble indicating the degree of dispersion among responses (i.e., larger bubble indicates less respondent consensus and greater potential for conflict) and the y-axis value indicating the mean value of responses (Manfredo et al., 2003; Vaske et al., 2010). To calculate PCI_2, we used the tool available at http://warnercnr.colostate.edu/~jerryv/PCI2/index.htm. We pooled responses across groups; for example, to assess acceptance of lethal control overall by different identity groups we combined data for all lethal control methods for all species (e.g., combined scores were used for aerial and ground shooting horses and kangaroos and shooting, trapping, and aerial and ground baiting dingoes and red foxes). Respondents who provided no response (e.g., "don't know") to some items (e.g., aerial shooting of horses) were not counted as a neutral response (score: zero) but were not removed from the PCI_2 calculation for other items within the same category (e.g., other lethal control methods).

3. Results

In total, 793 completed surveys were received and included in the data analysis. The respondents were 45.1 ± 16.5 (SD) years in age and comprised 49.9% women (see Table A2 for further demographic data). The majority (81.6%) had lived most of their lives in urban or suburban areas. Among the total responses, 11.4% (N = 90) strongly identified as animal rights activists, 19.0% (N = 151) as wildlife conservationists, and 19.2% (N = 152) as farmers. There was some overlap between groups, with 14.1% (N = 112) having identified strongly with multiple identities (including 3.2%, N = 25, as all three, see Fig. A1). Wildlife conservationists (mean age 44.6 ± 17.2 years) were younger than farmers (49.8 ± 17.1 years, $t = 1.97$, $P = 0.009$) while animal rights activists (35.2 ± 14.6 years) were younger than farmers ($t = 1.97$, $P < 0.001$) and wildlife conservationists ($t = 1.97$, $P < 0.001$). More animal rights activists were female (58.9%, N = 53) than wildlife conservationists (53.0%, N = 80) and farmers (40.8%, N = 62). Whether respondents had spent most of their lives in urban or rural areas did not differ significantly between the three strongly identifying sub-groups. However, rural residents were more likely to strongly identify as farmers than urban residents ($\chi^2 = 13.9$, df 1, N = 793, $P < 0.001$). No significant relationship was present comparing urban/rural location with animal rights activists ($\chi^2 = 0.982$, df 1, N = 793, $P = 0.322$) or wildlife conservationists ($\chi^2 = 0.557$, df 1, N = 793, $P = 0.455$).

3.1. Acceptability of management

The majority of the total respondent pool (52.0%, $\bar{x} = -0.27$, PCI = 0.45), animal rights activists (71.1%, $\bar{x} = -0.73$, PCI = 0.40), and wildlife conservationists (60.0%, $\bar{x} = -0.42$, PCI = 0.47) held negative views of lethal control overall (percentages indicate proportion of respondents with an average approval score across species and methods of < 0), while fewer farmers disapproved of lethal control overall (35.5%, $\bar{x} = 0.24$, PCI = 0.46, see also Fig. 1 and Table 1). Acceptance of lethal control differed between the groups overall (Table 1), and pair-wise comparisons also revealed significant differences ($P < 0.05$) between all pairs except when comparing wildlife conservationists with all respondents ($P = 0.175$). All respondents and all three identity groups approved of nonlethal methods overall with no significant difference between any groups (Table 1, pair-wise comparison all $P > 0.05$). Similarly, all groups approved of the suggestion to reintroduce dingoes to suppress kangaroo and red fox populations with no significant difference between any groups (Fig. 1, Table 1, pair-wise comparisons all $P > 0.05$). Animal rights activists approved of taking no action but all other groups disapproved of this option and there was a significant difference among responses overall (Table 1); pair-wise comparisons revealed significant differences between all groups (all $P = 0.001$) except between wildlife conservationists and all respondents ($P = 0.324$).

Attitudes towards lethal control of species varied as a function of social identity groups. All groups disapproved of culling kangaroos except farmers, although there was a significant difference between all groups' degree of acceptance (Table 1, pair-wise comparisons all $P < 0.05$), except comparing wildlife conservationists with animal rights activists ($P = 0.081$). All groups disapproved of culling dingoes except farmers, but there were significant differences in acceptance between groups overall (Table 1) and pair-wise comparisons revealed differences between all groups except between wildlife conservationists and all respondents ($P = 0.111$) and animal rights activists ($P = 0.558$). All groups disapproved of culling wild horses but there were significant differences in acceptance between all groups (Table 1, pair-wise comparisons $P < 0.05$) except for wildlife conservationists and all respondents ($P = 0.23$). Attitudes towards killing red foxes were polarized, with animal rights activists opposed and farmers supportive, while all respondents and wildlife conservationists were largely neutral. There were significant differences in acceptance of lethal fox control among all groups (Table 1, pair-wise comparisons $P < 0.05$) except between wildlife conservationists and the total respondent pool ($P = 0.561$).

Considering attitudes towards lethal control of all four species, there was a difference between those who strongly identified as animal rights activists ($\bar{x} = -0.73$, $N = 90$) and those who said they identified "not at all" as animal rights activists ($\bar{x} = 0.09$, N = 364; pseudo-F = 25.07, test df = 1, residual df = 414, unique permutations = 999, $P = 0.001$) and between those who strongly identified as farmers ($\bar{x} = 0.24$, N = 152) and with those who did "not at all" identify as farmers ($\bar{x} = -0.47$, N = 345; pseudo-F = 27.65, test df = 1, residual df = 457, unique permutations = 997, $P = 0.001$) (Fig. 2). There was no difference comparing those who strongly identified ($\bar{x} = -0.42$, $N = 151$) or did not identify at all as wildlife conservationists ($\bar{x} = -0.19$, N = 262; pseudo-F = 25.07, test df = 1, residual df = 372, unique permutations 998, $P = 0.092$).

Among animal rights activists (pseudo-F = 0.972, test df = 1, residual df = 85, unique permutations = 987, $P = 0.326$) and farmers (pseudo-F = 2.572, test df = 1, residual df = 143, unique permutations = 996, $P = 0.060$), there was no difference between urban and rural residents' approval of lethal control (Fig. 3). Among all respondents (pseudo-F = 6.706, test df = 1, residual df = 729, unique permutations = 999, $P = 0.003$) and wildlife conservationists (pseudo-F = 3.646, test df = 1, residual df = 140, unique permutations = 990, $P = 0.024$), urban residents were more likely to oppose lethal control.

Whether a farmer strongly identified or did not identify at all as a wildlife conservationist was a strong predictor of their acceptance of lethal control (pseudo-F = 6.816, test df = 1, residual df = 78, unique permutations = 979, $P = 0.001$) with those who did not identify as wildlife conservationists more likely to approve of lethal control, but there was no difference drawing the same comparison for animal rights activists (pseudo-F = 0.970, test df = 1, residual df = 60, unique permutations = 906, $P = 0.392$, Fig. 4).

4. Discussion

4.1. Social identity

We found that respondents' social identities were useful predictors and means of exploring acceptance of different options for wild animal management and conservation in Australia. In particular, farmers were more supportive of lethal control and less supportive of taking no action than other response groups, and vice versa for animal rights activists. In accordance with our prediction, acceptance of lethal control exhibited the highest potential for conflict, with all groups except farmers disapproving of lethal control overall. In contrast, there was low potential

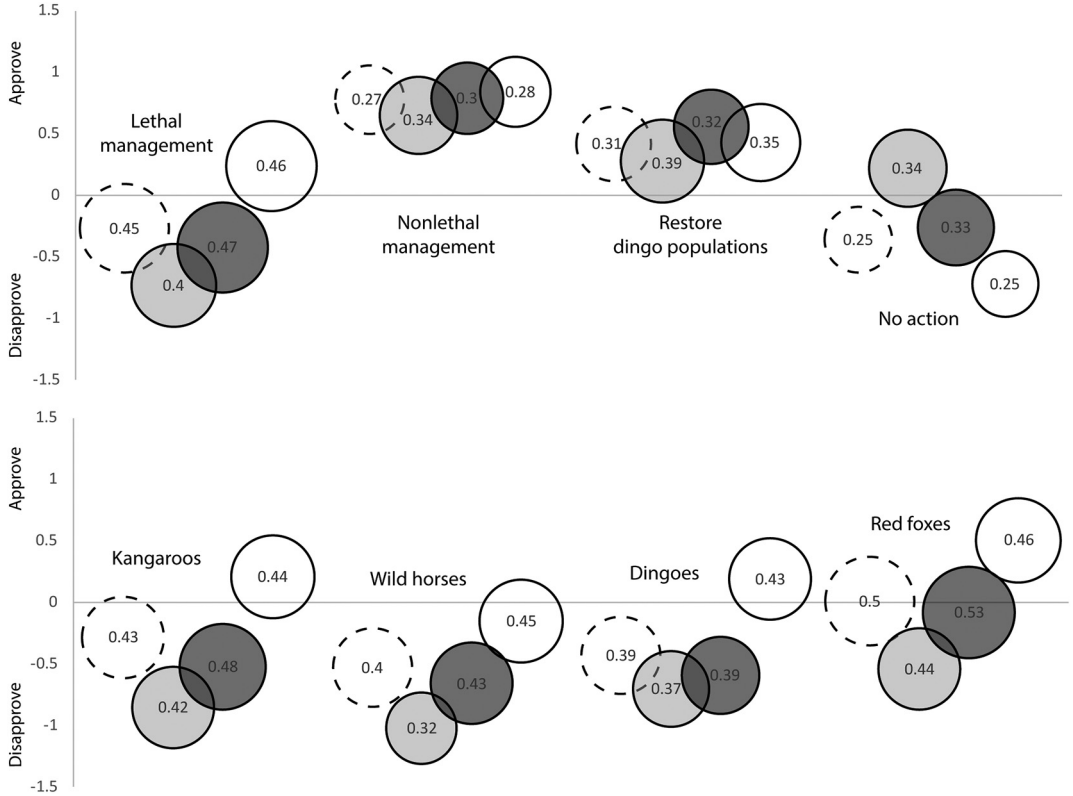

Fig. 1. Comparison between different social identity groups' Potential for Conflict (PCI_2, value displayed in bubble) and acceptance of (top) different management option categories for all species* and (bottom) lethal control of different species. *Restoring dingoes as a management option includes only kangaroos and red foxes. Dashed line indicates all respondents (N = 793); light grey: respondents who strongly identified as animal rights activists (N = 90); dark grey: wildlife conservationists (N = 151); white: farmers (N = 152).

for conflict and no significant differences comparing social identity groups' acceptance of nonlethal methods and the suggestion to reintroduce or maintain predator (dingo) populations to control herbivore (kangaroo) and introduced mesopredator (red fox) populations. All groups generally accepted these latter management options.

An important aspect of social identity is the formation of in-group and out-group stereotypes. A component of this is the out-group homogeneity effect, in which groups construct stereotypes of out-groups that may be inaccurate (Judd and Park, 1988; Labianca et al., 1998). Animal rights activists are typically perceived by farmers (and hunters) to be urban residents with little knowledge of rural issues (Einwohner, 1999; Muth and Jamison, 2000), while farming has traditionally been seen as synonymous with rurality (Sachs, 1996). Farmers also generally have a lower concern for animal welfare than the urban public (Te Velde et al., 2002; Vanhonacker et al., 2008). However, we found farmers' support for lethal control was moderate ($\bar{x} = 0.24$) and despite significant differences in acceptance of wildlife management between groups, there was considerable overlap among respondents across groups; a phenomenon that is not unique to our study (Bruskotter et al., 2017). Indeed, 25 respondents identified with all three identity groups, which represents roughly 27% of the self-identified animal rights activists in our sample. For those who identified with multiple social groups, an animal rights identity appeared to be more salient than a wildlife conservation identity but a wildlife

Table 1
Mean acceptance (and PCI_2) of management methods proposed, including lethal control, nonlethal control, and taking no action for all four species, and reintroducing or maintaining dingoes to manage kangaroos and red foxes. Data are presented with results from PERMANOVA (test DF for all tests is 3). Statistically significant differences in pair-wise comparisons between respondent groups within categories of methods are indicated by superscript letters (running across rows, $P < 0.05$) with results with the same superscript letter not significantly different from each other. Results of pair-wise comparisons are provided in Table A3.

Species	Intervention	All respondents N = 793	Animal rights activists N = 90	Wildlife conservationists N = 151	Farmers N = 152	Pseudo-F	Residual DF	Unique perms	*P*
All combined	Lethal	−0.27 (0.45)[a]	−0.73 (0.40)	−0.42 (0.47)[a]	0.24 (0.46)	10.898	1104	998	0.001
	Nonlethal	0.78 (0.27)[a]	0.65 (0.34)[a]	0.79 (0.30)[a]	0.84 (0.28)[a]	0.822	1047	999	0.598
	Reintroduce or maintain dingoes	0.42 (0.31)[a]	1.28 (0.39)[a]	0.56 (0.32)[a]	0.43 (0.35)[a]	1.050	1101	999	0.401
	No action	−0.36 (0.25)[a]	0.22 (0)	−0.26 (0.33)[a]	−0.72 (0.25)	10.917	1068	998	0.001
Kangaroos	Lethal	−0.28 (0.43)	−0.85 (0.42)[a]	−0.52 (0.48)[a]	0.21 (0.44)	13.163	1137	999	0.001
Wild horses		−0.53 (0.40)[a]	−1.02 (0.40)	−0.66 (0.43)[a]	−0.15 (0.45)	8.151	1133	999	0.001
Dingoes		−0.43 (0.39)[a]	−0.70 (0.39)[b]	−0.59 (0.39)[ab]	0.19 (0.43)	12.700	1137	999	0.001
Red foxes		0.01 (0.50)[a]	−0.54 (0.44)	−0.08 (0.53)[a]	0.51 (0.46)	10.244	1141	998	0.001

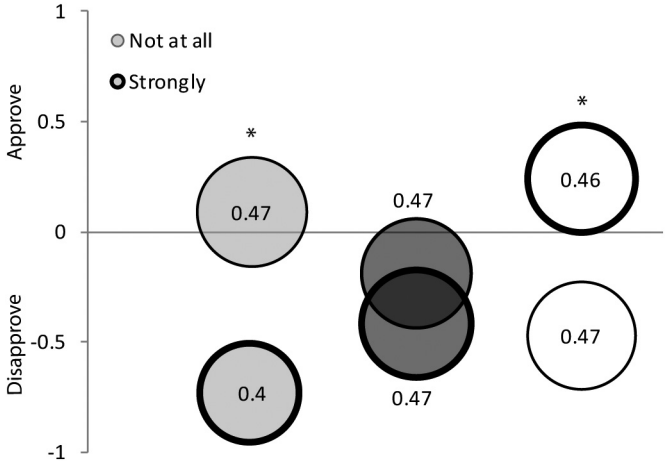

Fig. 2. Approval of and PCI_2 (value in/beside bubble) in approval of lethal control of all four species comparing between those who strongly identified as animal rights activists (light grey), wildlife conservationists (dark grey), and farmers (white), and those who did "not at all" identify with these identities. *Significant differences in pair-wise comparisons between "not at all" and "strongly identifying groups ($P < 0.05$).

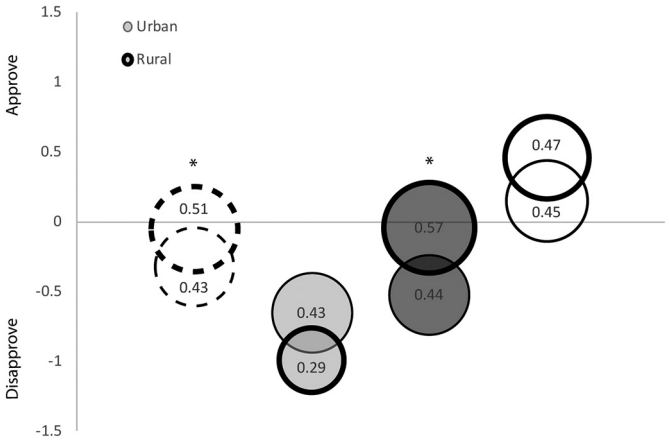

Fig. 3. Acceptance of and PCI_2 (value in bubble) in acceptance of lethal control comparing urban and rural respondents (total response pool and three social identity groups). * Significant differences between urban and rural residents within groups ($P < 0.05$). Dashed line indicates all respondents; light grey: respondents who strongly identified as animal rights activists; dark grey: wildlife conservationists; white: farmers.

conservation identity was more salient than a farmer identity (Fig. 4). There was generally no difference in acceptance of management actions comparing the total respondent pool with wildlife conservationists, perhaps suggesting that the public overall hold values that align with wildlife conservation.

Comparing identity groups, there was no difference in whether a respondent had spent most of their life in an urban or rural area, and urban/rural location did not significantly predict acceptance of lethal control for animal rights activists or farmers. Others have found similarly that social identities and values are stronger predictors of attitudes towards wildlife management than demographics, and that identity can be strongly held even over large geographic distances (Dubois and Harshaw, 2013; Lute et al., 2014). Our study shows that while there is not necessarily a geographical divide among our respondents, the urban-rural divide is manifested as a conflict between the majority of the (mostly urban) public and a farmer identity. Furthermore, similar patterns in approval of lethal control were seen across the identity groups for all four species, suggesting that social identity was a stronger predictor of opposition (or support) for lethal control than differences

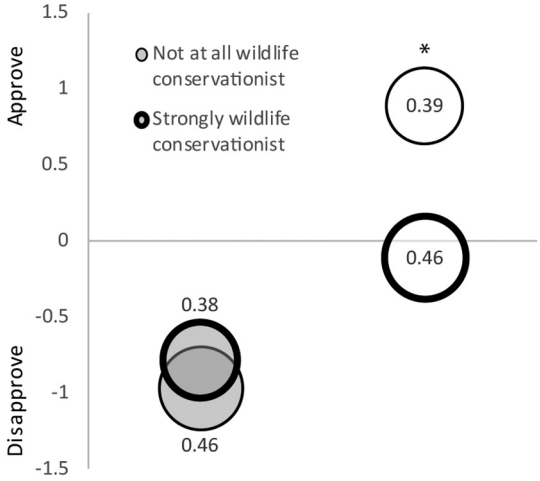

Fig. 4. Difference in acceptability of lethal control between animal rights activists and farmers who strongly identified as wildlife conservationists and those who did not at all identify as wildlife conservationists. *Significant difference between those who did not at all or strongly identified as wildlife conservationists ($P < 0.05$). Values within or beside bubbles are Potential for Conflict Indices (PCI_2). Light grey: respondents who strongly identified as animal rights activists; white: farmers.

between species. This indicates that public opinion should be considered for management of both native and introduced species (Crowley et al., 2017), and that social identity can provide insight into attitudes towards management of both. The identity groups investigated here can serve as a useful basis for future research across a range of social and cultural contexts, but including additional identities (e.g., members of special interest groups or specific farming industries) might offer more meaningful application of such research depending on the specific issue being studied.

4.2. Implications for policy and management

Wildlife management decisions are typically undertaken by governments with little input from the public (Dubois and Harshaw, 2013). A lack of awareness of public attitudes towards wild animals and their management has meant that managers sometimes make false assumptions that can result in management program failure. For example, a common view is that "city people do not like wild animals and don't care what happens to them" (Enck and Decker, 1997). This particular assumption has proven to be false and public backlash against lethal control of both native and non-native species has resulted in halting of management actions (van Eeden et al., 2017). For example, aerial culling of introduced wild horses in Australia was banned (English, 2000; Nimmo and Miller, 2007), and wild horses have recently become protected in a New South Wales National Park (Parliament of New South Wales, 2018). As such, it is critical that contemporary public values are incorporated into decisions about wildlife management. Our results demonstrate that a range of identity groups are opposed to lethal wild horse control, but there are limited data available on whether the Australian public believes horses should be retained in national parks. One solution to incorporating public opinion into wildlife management decisions is polling, which has been undertaken in the USA, but criticism of this process has typically been that the public are largely uninformed and unaffected by the actions they are polled on (Manfredo et al., 1997). There is no polling on environmental management issues in Australia, so instead changes in wildlife management that are influenced by public opinion have typically happened as knee-jerk reactions in response to public backlash, as demonstrated by the horse example given here.

Our survey reveals that public support (including by all three

identity groups) for nonlethal management options and reintroduction of predators should inform decision-making by managers as there was general support and low potential for conflict for these options by all groups. In many regions (in Australia and elsewhere) lethal control is the dominant management method and there is often little support from some governments for nonlethal management action (van Eeden et al., 2018a). This is despite calls to promote high welfare standards in wildlife management decisions (Dubois et al., 2017), concerns that current lethal control programs are not based on evidence of effectiveness (van Eeden et al., 2018b), and lack of public support for lethal methods.

Predator populations in particular have been in decline globally due to widespread lethal control (Ripple et al., 2014), so public support for reintroduction or maintenance of these species could indicate public acceptance of "rewilding" frameworks (Ritchie et al., 2012; Soulé and Noss, 1998). In some contexts, nonlethal interventions have become a legal requirement before lethal control can be undertaken; for example, grey wolf (*Canis lupus*) control to protect livestock in Oregon (Oregon Department of Fish and Wildlife, 2010) and Washington (Wiles et al., 2011). We advocate that such approaches should be replicated elsewhere if nonlethal options are viable. For predators, this could achieve both goals of conserving them and reducing the perceived need for lethal control of overabundant herbivores and mesopredators. In addition, our results show that the public consider predation by a wild predator more appropriate than human-imposed lethal control of native herbivores and introduced mesopredators. Similarly, in the United Kingdom, reintroducing native pine martens (*Martes martes*) to control introduced grey squirrels (*Sciuris carolinensis*) is seen as a preferable option to culling because it is considered to be more natural and it renders the deaths of squirrels hidden from human eyes (Crowley et al., 2018). This perception that killing by non-human animals is more natural than killing by humans is founded on the modern dualism that humans are separate from our constructed concept of 'Nature' (Lorimer, 2012). The public's perception of appropriateness doesn't always align with humaneness (Sharp, 2015). For example, translocation may be advocated as a humane, nonlethal method, but the success of translocations is highly variable and can result in the death of many individuals (Fischer and Lindenmayer, 2000).

Overall, our study presents a challenge for policy makers and managers who must decide whether to continue promoting lethal control practices (or encourage/allow farmers to undertake them) when these actions are not supported by the majority of the public. Similarly for farmers, the majority of their consumers (the public) do not approve of lethal wildlife control, so rising ethical consumerism (e.g., willingness to pay for increased animal welfare or environmental sustainability; Lagerkvist and Hess, 2011; Ottman, 2011), combined with online activism and increasing transparency facilitated by online information sharing (Bennett, 2003), may result in changing demands from consumers with regards to coexistence with wild animals. Our study shows that attitudes towards lethal control among farmers are variable (PCI = 0.46) and moderate ($\overline{x}$ = 0.24), so there may be willingness among some farming communities to transition towards nonlethal management, especially if government support or market incentives are available. In any case, our results demonstrate public support for nonlethal management, so decision-makers should give nonlethal management at least equal consideration to lethal control. Further, decisions that are made should be communicated in a manner that appeals to stakeholder identities in order to reduce the overall level of conflict between stakeholders.

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Appendix A. Supplementary data

Descriptions of management methods presented to participants (Table A1), respondent demographic information (Table A2), results of the pair-wise PERMANOVA tests (Table A3), and overlap between respondent identification (Fig. A1) are available online. Supplementary data to this article can be found online at doi:https://doi.org/10.1016/j.biocon.2019.01.012.

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