

Wicked “wild dogs”: Australian public awareness of and attitudes towards dingoes and dingo management

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ABSTRACT

Public opposition has shaped management of wild animals in Australia, but public interest in dingo control has been minimal. We hypothesised that this is due to lack of awareness of dingo management practices, in part because using the term “wild dogs” to describe management renders “dingoes” invisible, framing the issue as one of control of introduced pests rather than control of an iconic Australian animal. We distributed an online questionnaire survey to the Australian public ($N = 811$) to measure how the public perceived dingoes and their management, how these views compared with other animals managed as pests in Australia, and whether the term “wild dogs” has shaped views and knowledge of dingo management. Most respondents (84.6%) considered dingoes to be native to Australia and there was low approval of lethal control methods, except when justification was provided (e.g., to protect livestock or endangered native species). Only 19.1% were aware that “wild dog” management included dingoes, and attitudes towards “wild dogs” were more negative than those towards dingoes. If public awareness about dingo management increases, pressure from the public may result and shape future management actions, including restricting the use of lethal control practices like poison baiting on public lands. As such, public attitudes should be incorporated into decision-making, and appropriate communication strategies need to be employed to prevent backlash.

Key words: human-wildlife conflict, wildlife management, pest management, dingo, wild dog, 1080

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Introduction

As human populations have become more urban and modernised, societal values have shifted towards protection of animals and moved away from human dominance over nature (Manfredo *et al.* 2009). As such, management of wildlife, particularly where that wildlife is charismatic, can be a highly emotive and controversial issue (van Eeden *et al.* 2017). This has consequences for management decisions and practices, for example, as public attitudes are generally the driving force in improving animal welfare legislation and policy (Serpell 2004). Understanding public awareness and attitudes around a management issue is therefore important for predicting responses to proposed management actions (Jacobs *et al.* 2014). 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 public outcry and the cessation of management programs.

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 assumption has proven to be false in Australia regarding some species. For example, management of feral horses (*Equus caballus*) and kangaroos (particularly eastern grey kangaroos, *Macropus giganteus*) has become increasingly controversial. Introduced horses are managed in Australia due to their detrimental impacts

on ecosystems, but backlash from the public and action by the RSPCA against aerial culling of horses in Guy Fawkes River National Park in 2000 resulted in a ban on such practices (English 2000, Nimmo and Miller 2007). Feral horses were even given protection in a national park by the Kosciuszko Wild Horse Heritage Bill in 2018 (Parliament of New South Wales 2018) based on the perceived cultural value of the horses and welfare concerns (Driscoll *et al.* 2019). Kangaroos are managed by both private landowners and governments to prevent vegetation degradation that may be caused by overgrazing as a threat to the environment and competition with livestock, and kangaroo pelts, leather and meat are also harvested commercially (Pople and Grigg 1999). People opposed to kangaroo culling have successfully stalled or prevented culls on numerous occasions through protesting, disrupting culls, vandalism, and legal action (Knaus *et al.* 2013, McKinnon *et al.* 2018).

The focus of this study is the dingo (variously referred to as *Canis dingo*, *C. lupus dingo*, and *C. familiaris*). Dingoes are thought to have arrived in Australia over 3500 years ago from Asia (Balme *et al.* 2018) and are now generally considered a naturalised, native species. Dingoes are managed across much of Australia, particularly in areas where they pose a threat to livestock, on both private

and public lands, including national parks (Smith and Appleby 2015). Most management conducted is lethal control, with baiting with sodium monofluoroacetate (1080) the dominant tool (Binks *et al.* 2015). Indeed, poison baiting has become central to pest management practices in Australia over the past two centuries (Philip 2019). Large scale fencing projects also occur, including the maintenance of a 5500 km dingo barrier fence, and fencing is typically complemented with lethal control like poison baiting. Some of these tools, including poison baiting and fencing, are supported by government funds, and bounties are paid for dingo scalps by governments in some areas (National Project Steering Committee 2014, van Eeden *et al.* 2018). Little is known about Australian public attitudes towards these management practices, but public concern has resulted in reduced use of 1080 for managing native and non-native species in some areas (e.g., Gunns Limited 2010).

Globally, attitudes towards large carnivores are changing, with management in some regions shifting from persecution to conservation (Bruskotter *et al.* 2007, Chapron *et al.* 2014). This is partly due to recognition of the important role that large carnivores can play in regulating ecosystems by suppressing large herbivores and mesopredators (Ripple *et al.* 2014). As Australia's largest non-human terrestrial mammalian predator, dingoes may suppress large herbivores like kangaroos and emus (*Dromaius novaehollandiae*) (Caughley *et al.* 1980) and introduced mesopredators like feral cats (*Felis catus*) and red foxes (*Vulpes vulpes*) (Letnic *et al.* 2012). These introduced predators are considered a major reason why Australia has the highest rate of native mammal extinction in the world (Woinarski *et al.* 2014), and this in turn has been an important consideration prompting calls to protect dingoes and reintroduce them to areas they have been removed from (Dickman *et al.* 2009, Newsome *et al.* 2015).

Restoration of large carnivores in other continents has been facilitated in part by support for carnivore conservation and backlash against some methods of lethal control by urban publics. For example, international outrage over trophy hunting of animals like African lions (*Panthera leo*) led to changes to US endangered species protection and to restrictions on importing wildlife trophies (Macdonald *et al.* 2016). Online petitions against hunting of carnivores including bears (*Ursus arctos*) and gray wolves (*Canis lupus*) has led to reductions in cull targets and even bans on hunting in some European countries (van Eeden *et al.* 2017). Given these occurrences overseas, and the incidence of public backlash against management of charismatic animals like horses and kangaroos in Australia, it is interesting that there has been little backlash against widespread control of dingoes using 1080 and other lethal methods. Indeed, public backlash towards a single isolated event involving 1080 poison used to kill two dingoes in an experiment on an island resulted in public outcry that led to the project being ordered to be terminated (van

Eeden *et al.* 2017). The small number of dingoes used in this experiment seems trivial compared with widespread lethal control of dingoes on mainland Australia, and yet there appears to be little public discussion about the latter.

Dingoes may figure prominently in the lives and minds of many Australian livestock graziers and they have cultural significance for many Aboriginal and Torres Strait Islander peoples (Smith and Litchfield 2009), but we have little understanding of where they sit in the eyes of the broader Australian public. One factor that may influence public understanding of dingo management is use of the term “wild dogs” when describing management of dingoes and other wild canids in Australia. The term “wild dogs” is commonly used by those involved in livestock production industries and is defined as including dingoes, feral dogs, and dingo-dog hybrids (Fleming *et al.* 2001, Kreplins *et al.* 2018). While the term is proposed to be practical (management rarely distinguishes between dingoes, dogs, and hybrids), there has been some speculation that use of this term obscures public awareness about lethal dingo control (Hyttén 2009). In a study in Victoria, for instance, Johnston and Marks (1997) found that 79% of respondents considered “wild dogs” to be pests and 63% supported their eradication, but the survey did not mention dingoes nor define what it meant by “wild dogs”. A survey of workers at a mine site in Western Australia found participant attitudes towards “dingoes” were generally favourable (Smith *et al.* 2019), but no survey has investigated how the use of the term “wild dog” to describe how dingo management affects attitudes towards dingoes and their management.

We conducted an online survey to document public attitudes towards dingoes and their management. We aimed to determine (1) public awareness and acceptance of dingo control, (2) how attitudes towards dingoes and their management compared with other species commonly managed as pests (horses and kangaroos), and (3) how use of the term “wild dogs” may obfuscate dingo management. We expected that awareness of dingo management would be low and that attitudes towards “wild dogs” would be lower than those towards dingoes. The results can be used to develop better communication strategies for informing the public about dingo conservation and management issues.

Methods

We created a structured survey to determine public perspectives on dingoes. The questions analysed here are part of a broader survey effort about wildlife management (van Eeden *et al.* 2020, van Eeden *et al.* 2019). For this study, we focused on questions that asked about knowledge of, attitudes towards, and perceptions of dingoes, and whether the public was aware of current dingo management practices. We also compared attitudes towards dingo management with those towards species for which public attitudes are already documented to predict

how greater public awareness of dingo management might shape future actions, specifically horses, kangaroos, and red foxes. These comparison species were selected because we are already aware that management of kangaroos and horses receives backlash from the public that has influenced management practices, while some surveys have documented public support for fox control (e.g., Johnston and Marks 1997). We considered the latter important because, by placing the dingo within a spectrum of species management that is likely or unlikely to receive backlash from the public, we might predict how public opinion would shape future dingo management if awareness increased.

Questions were mostly multiple choice and Likert-type items. We asked whether participants considered dingoes to be native or non-native and to what extent they considered dingoes to be a pest (not at all, somewhat, always). To get an indication of knowledge about dingoes, we presented two statements and asked participants to indicate whether they were true or false. These were "Dingoes, like kangaroos, are marsupials and keep their early stage young in a pouch" (correct answer = false) and "Dingoes originate from Asia and are thought to have been brought to Australia by humans thousands of years ago" (correct answer = true). We also presented participants with a list of 11 species that are managed in Australia, including dingoes, and asked whether they were aware that legal lethal control is conducted for each species (only results for dingoes presented here).

To record attitudes towards dingo management and compare these with attitudes towards horses, kangaroos, and foxes, we presented respondents with a range of lethal and non-lethal management methods used to control these four groups of animals and asked them to what extent they approved of these actions, from strongly disapprove (score = -2) to strongly approve (score = 2). We provided short descriptions of each of these methods (see Supplementary Information). We included four lethal methods (aerial baiting, ground baiting, trapping, and shooting) and two non-lethal methods (livestock guardian dogs and fencing) for managing dingoes and their impact on livestock production, as well as the possibility of taking no management action. We included a brief description of each management method, and while fencing is usually used in conjunction with lethal control, we did not state this specifically, so we consider it a non-lethal tool for the purpose of this analysis. For this study, we use "shooting from the ground" (distinct from aerial shooting) as the method to compare across the four species groups because this method is commonly used to manage all. In assessing attitudes towards management methods for controlling kangaroo and fox populations, we also included the suggestion to maintain or reintroduce dingo populations. For most questions, an opt-out answer was provided (e.g., "don't know", "can't say"). Where these answers were given, the record was removed when analysing responses to that question.

The final component explored understanding of and attitudes towards the term "wild dogs" compared with "dingoes". We asked respondents to indicate what they considered "wild dog" management to include, from any or all of "feral dogs that were once (or have descended from) domestic dogs", "hybrids between feral dogs and dingoes", and "dingoes". Following Bruskotter *et al.* (2015), we measured attitudes towards dingoes and wild dogs using word associations with four paired statements with opposite meanings (good and bad, valuable and worthless, pleasant and unpleasant, harmful and beneficial) which were presented on a five-point scale (e.g., very good (score: 2), somewhat good (1), neither good nor bad (0), somewhat bad (-1), very bad (-2)). This framework is based on Ajzen & Fishbein's (1980) evaluative scales of attitude measurement. Based on their responses, an overall "affect score" was calculated for each respondent by averaging scores across the five pairs of statements, one each representing their attitudes towards dingoes and wild dogs. To compare attitudes towards management of dingoes and wild dogs, we asked respondents to what extent they agreed with the statements "It is acceptable to kill [dingoes/wild dogs] that prey on endangered native wildlife" and "It is acceptable to kill [dingoes/wild dogs] that attack livestock" on 5-point Likert-type scales ranging from strongly disagree (-2) to strongly agree (2). For all analyses, we compared responses between groups using *t*-tests assuming equal variance in SPSS (IBM Corp. 2016). This approach is commonly taken in psychological and social science research when normality and continuity are assumed for Likert-type responses (Borgatta and Bohrnstedt 1980).

Survey distribution

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 was distributed over 5-12 December 2017 until at least 800 completed surveys were received ($N = 811$). The distribution aimed to obtain a sample of the Australian public that approximately represented the most recent Australian government census (www.abs.gov.au/census, accessed 2/2/2018, Supplementary Table 1).

The study was approved by The University of Sydney's Human Ethics Committee (2017/875).

Results

We received 811 completed responses, among whom 50.31% identified as female and the average age was 44.92 years \pm 0.58 SE. Most (65.4%, $N = 544$) correctly stated

that dingoes are not marsupials (9.7% incorrect, 24.9% didn't know) but only 32.8% ($N = 271$) correctly stated that dingoes originate from Asia and are thought to have been brought to Australia by humans (22.8% incorrect, 44.4% didn't know). Around a third of respondents (35.3%) were aware that dingoes are legally controlled by lethal means in Australia. Most (84.6%) considered dingoes to be native to Australia. When asked whether they considered dingoes to be a pest, 9.5% considered them to always be a pest, 31.3% sometimes a pest, and 52.8% never a pest.

Public approval of shooting dingoes was slightly negative ($\bar{x} = -0.27 \pm 0.05$ SE), more negative than approval of shooting foxes ($\bar{x} = 0.27 \pm 0.05$ SE, $t = 1.96$ $df = 1529$, $P < 0.001$) and kangaroos ($\bar{x} = -0.11 \pm 0.05$ SE, $t = 1.96$, $df = 1525$, $P = 0.02$) and higher than approval of shooting horses ($\bar{x} = -0.43 \pm 0.05$ SE, $t = 1.96$, $df = 1521$, $P = 0.03$, Fig 1). Considering methods used to manage dingoes, all lethal methods were viewed negatively overall (shooting $\bar{x} = -0.27 \pm 0.05$, trapping = -0.31 ± 0.05 , aerial baiting = -0.61 ± 0.05 , ground baiting = -0.50 ± 0.05) and non-lethal methods were viewed more positively (livestock guardian animals = 0.65 ± 0.05 , fencing = 0.94 ± 0.04). The public overall considered that some management of dingoes should be undertaken (negative attitude towards taking no management action, $\bar{x} = -0.32 \pm 0.04$, Fig 1).

Only 19.1% of respondents were aware that "wild dog" control included management of dingoes. On average, respondents had slightly positive attitudes towards dingoes (average affect score = 0.194 ± 0.03) and lower, negative attitudes towards wild dogs (affect score = $-0.870 \pm$

0.03 , $df = 1620$, $P < 0.001$). Respondents showed higher approval of killing wild dogs ($\bar{x} = 0.92 \pm 0.04$) that preyed on endangered species than of killing dingoes that did the same ($\bar{x} = 0.40 \pm 0.04$, $df = 1518$, $P < 0.001$) and the same pattern was observed for when livestock were attacked (wild dog $\bar{x} = 1.03 \pm 0.04$, dingo $\bar{x} = 0.62 \pm 0.04$, $df = 1532$, $P < 0.001$). There was higher approval of killing dingoes that attacked livestock than those that killed endangered native wildlife ($df = 1515$, $P < 0.001$) but no difference for the same comparison with wild dogs ($df = 1535$, $P = 0.35$).

Discussion

Public awareness and acceptance of dingo control

Australian public awareness of dingoes and their management was low. Attitudes towards dingoes appeared to be generally positive, with most respondents unaware that dingoes did not originate in Australia, most considering them to be native, and around half considering that they are never a pest. Approval of lethal methods for managing dingoes was generally low, but there was some support for non-lethal methods.

Attitudes towards dingo management in contrast to horse and kangaroo management

Approval of shooting kangaroos and horses was negative, and approval of shooting dingoes was more negative than that of kangaroos – an animal for which there has

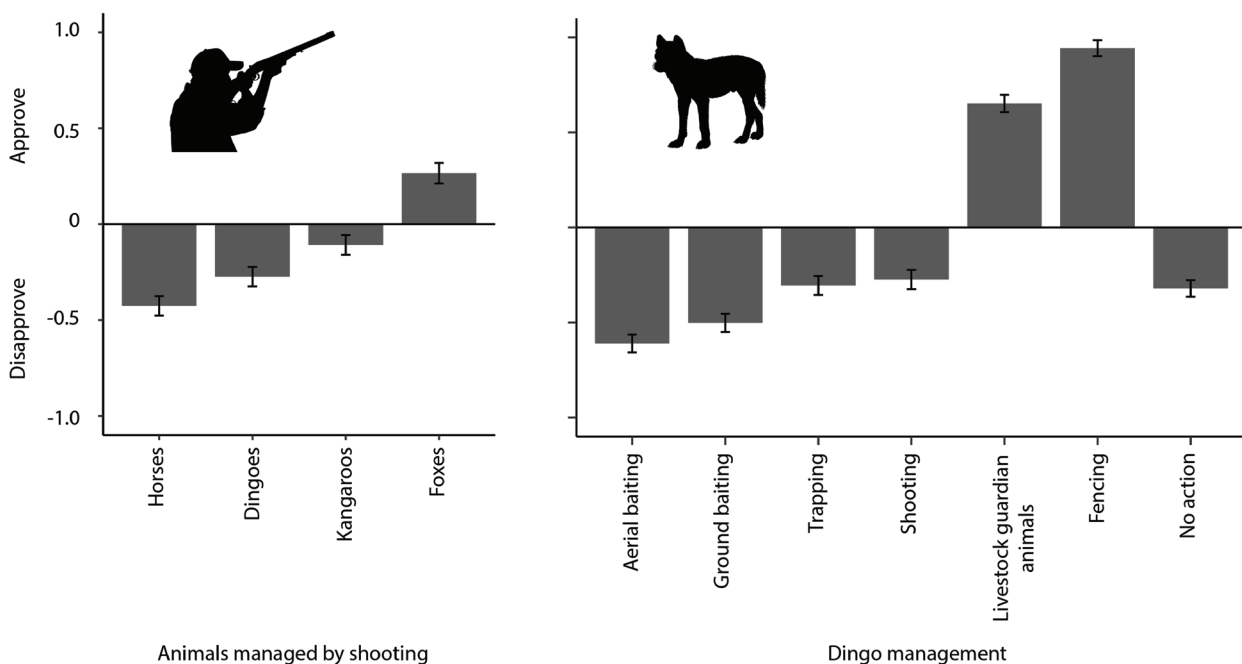


Figure 1 Public approval of (left) shooting from the ground as a management method for controlling horses, kangaroos, dingoes, and red foxes in Australia and (right) various lethal and non-lethal methods that are used for controlling dingoes. Approval scores are derived from Likert-type items which ranged from "strongly approve" (2) to strongly disapprove (-2). Error bars represent +/- standard error.

been much public debate about and opposition towards management (Lunney 2010, McKinnon *et al.* 2018). This may suggest that if public awareness of current dingo management increases, we would see backlash that places restrictions on widely used lethal control methods such as 1080 baiting. When considering justification for killing dingoes, there was support for killing dingoes (and “wild dogs”) when they have attacked livestock or preyed on endangered wildlife. This might suggest that the public oppose lethal methods for killing dingoes in principle, but support killing dingoes where justification for doing so is provided. This suggestion is supported by low public approval of taking no action in managing dingoes. Utilitarian and anthropocentric values are linked with public attitudes towards wildlife management (Teel and Manfredo 2010). Compared with attitudes towards killing dingoes, approval levels for shooting kangaroos may be linked to the fact that their meat is commercially available, as previous research on public attitudes towards kangaroo management has found that the public show a strong preference for the carcasses to be used if they are killed (Lunney 2010, McLeod and Sharp 2014).

Approval of reintroducing dingoes to manage kangaroos and foxes was generally high. Within the broader survey of which this study forms a component, we identified that there was greater public support for reintroducing dingoes to manage kangaroos and foxes than there was for human-mediated lethal control of these species (van Eeden *et al.* 2019), suggesting that the public supports maintaining or restoring dingoes in the landscape as top predators, akin to “rewilding”. This is perhaps because predation by dingoes is seen as natural while human killing of wild animals (like kangaroos and foxes) is not, even though shooting by a professional shooter is likely a more humane death than being killed by a predator like a dingo. Similarly, approval for killing dingoes because they had attacked livestock was higher than approval when the justification was based on predation on endangered native species, perhaps because dingo predation on native wildlife is considered natural. Alternatively (or additionally), predation on livestock is an anthropocentric concern tied up with the moral hegemony of agriculture in the Australian identity (despite our mostly urban population) which limits critical discussion about the animal welfare and environmental concerns about management practices associated with farming (Botterill 2006, Ragusa 2018).

The “wild dog” term and its consequences for public attitudes and awareness

In Australia, as well as internationally, the terms used to describe free-living animals and their management can have more cultural and emotive weight than their literal definitions, influencing stakeholder perceptions. For free-living horses, the term “feral horses” implies that horse management is an invasive species issue and thus removes legitimacy that might be afforded to the horses by terms like “wild horses”, or even “brumbies” in Australia, which

may give horses stronger cultural agency (Ballard 2005, Bhattacharyya *et al.* 2011). While “wild dog” has negative associations for the Australian public, “dingo” may have positive cultural associations because it portrays an image of an animal that may be considered iconic, and perhaps linked with the fact that it originated from an Aboriginal word (similar to “koala” or “kangaroo”). This accords with our findings that most respondents consider dingoes to be native (and therefore belong).

How wildlife and pest management issues are presented to the public shapes public understanding and support (Houston *et al.* 2010, Kidd *et al.* 2019), and a negative image has been constructed around the dingo since European colonisation in Australia (Parker 2007). This is important when considering that attitudes towards “wild dogs” were negative and significantly more so than attitudes towards dingoes, which were positive, yet only around one in five respondents was aware that “wild dog” management included dingoes. Further, respondents showed greater support for killing “wild dogs” than they did “dingoes” in response to attacks on livestock or predation on threatened species. These findings support our hypothesis that use of the term “wild dog” may obscure public awareness about dingo management.

We do not have data on how the terms “dingo” and “wild dog” are presented in mainstream media, but academic literature shows disparity in how different interest groups use these terms, with “wild dogs” typically used in publications about impacts on livestock and “dingoes” used in literature about conservation (Kreplins *et al.* 2018). Community groups lobby their local media with “shocking images” (of attacked livestock) to promote “a highly charged atmosphere for wild dog management” (Howard *et al.* 2018: 249). Building on this framing by wild dog control advocates, negative attitudes towards “wild dogs” might be because the term “wild dogs” renders the dingo invisible and implies the focus is on invasive pest management (i.e., of feral dogs), according with public acceptance of management of introduced animals (Hytten 2009, Letnic *et al.* 2012). Indeed, government biosecurity staff have reported that they’ve been advised by their employer not to use “dingo” in communications specifically because using this term in relation to lethal control may elicit a negative response by the public (unpublished data in van Eeden 2015). Putting aside whether “wild dog” management describes control of dingoes or domestic dogs gone wild, this process of othering strips away agency from animals that might otherwise be viewed as cute, charismatic, and even personally familiar as pets, rendering their extermination acceptable (Hillier 2017).

Implications for future management and communication

Many wild animals are valued by the public, and efforts to manage them should be supported by public values, especially when efforts are funded by governments. As

such, land and wildlife managers have a duty to be transparent about wildlife and pest management (Treves *et al.* 2017). Our results suggest that current actions may not always be supported by the public and that increased public awareness about dingo management could result in public responses that would hinder future actions. If governments continue to focus management on lethal control tools, public backlash scenarios akin to what we have seen for horses and kangaroos in Australia, and for other charismatic species on other continents, may occur for dingo management.

Given public support for non-lethal dingo management tools and positive attitudes towards dingoes, we suggest that: (1) non-lethal dingo management tools should be more actively and visibly explored and supported by government agencies, and (2) the term “dingo” should be used instead of “wild dog” to promote transparency in management. At present, we are not aware of any widespread government support in Australia for implementing non-lethal methods like livestock guardian animals, despite these methods being proven effective (van Bommel and Johnson 2012, van Eeden *et al.* 2018). At the same time, lethal methods like poison baiting and bounties are tax-payer funded, with limited evidence and varied results on their effectiveness (Allen 2013, Glen and Short 2000, van Eeden *et al.* 2018). Further, if the aim of wildlife and pest management on public lands like national parks is to protect biodiversity, then an open discussion should be had about whether dingo conservation, and the ecosystem services they may provide, should be given priority over livestock production on neighbouring private lands. This discussion should include stakeholders outside of pest control agencies and the livestock production industry, for example, representing Aboriginal and Torres Strait Islander and broader Australian public perspectives.

In line with this, appropriate communication about wildlife management should entail transparency about management actions and goals and should be tailored to address public understanding and attitudes. Our results suggest that the public is mostly uninformed about dingo management and the use of the term “wild dog” appears to be contributing

to this. Some conservationists argue that this term should be discontinued given that the majority of wild *Canis* spp. in Australia are predominantly dingoes in their genotype, phenotype, and behaviour (Cairns *et al.* 2019, Smith *et al.* 2019, Stephens *et al.* 2015). Further, while there is limited support for lethal dingo control in general, support may vary depending on the justification for management (i.e., impacts on livestock or endangered native wildlife) so lethal control actions should be justified by evidence that these actions achieve a target (i.e., that impacts on livestock are reduced) and this information communicated to the public alongside management actions.

Finding a balance between dingo conservation, conservation of threatened wildlife, and supporting livestock production systems entails difficult decisions and trade-offs, but these decisions should not be made in isolation from the public. Ignoring public sentiment will likely lead to disruption of management actions, wasted resources, and damaging trust between the public and wildlife managers.

Supplemental Material

1. Survey questionnaire
 2. Demographics and comparison with census
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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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APPENDIX I

Wicked “wild dogs”:

Supplementary Table 1 Demographics of survey respondents compared with the 2016 Australian Bureau of Statistics' Census.

	Current survey	2016 Census
Gender		
Male	49.69%	49.62%
Female	50.31%	50.38%
Age		
18-29	23.06%	21.88%
30-39	19.48%	18.29%
40-49	18.62%	17.03%
50-59	15.41%	15.95%
60-69	15.41%	13.24%
70+	8.01%	13.61%
Household income >\$100k	1.47%	42.51%
Identify as Aboriginal or Torres Strait Islander	2.84%	3.00%
Highest level of education attained		
Postgraduate	11.71%	6.09%
Graduate	25.65%	18.00%
High School	29.47%	17.97%
Location		
Australian Capital Territory	2.59%	1.67%
New South Wales	32.55%	31.96%
Northern Territory	1.36%	1.00%
Queensland	16.89%	20.04%
South Australia	8.75%	7.01%
Tasmania	2.22%	2.12%
Victoria	23.18%	25.71%
Western Australia	12.45%	10.49%
Area spent most of life		
Urban	21.95%	NA
Suburban	59.56%	NA
Rural	18.50%	NA
Both parents born in Australia	46.86%	NA

APPENDIX I *Survey questions analysed as part of this study*

Wild animals are sometimes culled because of the negative impacts they may have on humans, the environment, and agriculture.

In Australia, LEGAL LETHAL CONTROL (killing by shooting, poisoning, lethal injection, etc.) occurs to manage populations of the following species.

These practices are not necessarily limited to professional wildlife managers or pest controllers and may be conducted by lay persons (for some wild animal species). Permits may be required.

Before undertaking this survey, were you aware this occurred for these species?

	Yes	No	Can't say
Camels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dingoes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Foxes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Goats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kangaroos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pigs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rabbits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wombats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What term best describes these species in Australia?

	Native	Non-native	Don't know
Kangaroos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wild horses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Foxes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dingoes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do you consider the following animals to be pests in Australia?

	Yes, always	In some contexts	No, never	Don't know
Kangaroos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wild horses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Foxes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dingoes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please answer true or false for each of the following statements:

	True	False	Don't know
Kangaroos are farmed for meat in enclosures, just like sheep or cattle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In Australia, wild horses occur only in alpine national parks along the eastern mainland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is common for kangaroos to have more than one young (or joey) at different stages of development (i.e., a small one in the pouch and a larger one that is able to leave the pouch)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dingoes, like kangaroos, are marsupials and keep their early-stage young in a pouch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dingoes originate from Asia and are thought to have been brought to Australia by humans thousands of years ago	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Foxes were brought to Australia by European settlers for hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wild horses commonly produced two young (or foals) at birth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scientists generally consider foxes to be one of the greatest threats to native Australian fauna	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX I

We'd like to ask you about your preferences for different management methods to manage KANGAROOS and WILD HORSES

Here, we've outlined some management methods that are used or could be used, and we'd like you to tell us how much you approve or disapprove of them.

Aerial shooting: Kangaroos or wild horses are shot by a professional shooter from a helicopter or light aircraft

Ground shooting: Kangaroos or wild horses are shot by professionals or non-professionals from the ground

****Several nonlethal methods were also included in the survey but not analysed as part of this study****

KANGAROOS

To what extent do you approve or disapprove of the following methods for managing kangaroos?

	Strongly disapprove	Somewhat disapprove	Neither approve nor disapprove	Somewhat approve	Strongly approve	Don't know
Aerial shooting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ground shooting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

WILD HORSES

To what extent do you approve or disapprove of the following methods for managing wild horses?

	Strongly disapprove	Somewhat disapprove	Neither approve nor disapprove	Somewhat approve	Strongly approve	Don't know
Aerial shooting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ground shooting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Similarly, we'd like to ask you about your preferences for different management methods to manage DINGOES and FOXES.

Here, we've outlined some management methods that are used or could be used, and we'd like you to tell us how much you approve or disapprove of them.

Shooting: dingoes are shot by professionals or non-professionals from the ground.

Trapping: Dingoes or foxes are trapped, typically using leg-hold traps, and then shot.

Aerial baiting: Baits, such as meat laced with a poison like compound 1080, are dropped over large areas by helicopter or light aircraft.

Ground-baiting: Baits, such as meat laced with a poison like compound 1080, are buried or placed by hand in targeted locations on/in the ground.

****Several nonlethal methods were also included in the survey but not analysed as part of this study****

DINGOES

To what extent do you approve or disapprove of the following methods for managing dingoes?

	Strongly disapprove	Somewhat disapprove	Neither approve nor disapprove	Somewhat approve	Strongly approve	Don't know
Shooting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trapping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aerial baiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ground baiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

FOXES

To what extent do you approve or disapprove of the following methods for managing foxes?

	Strongly disapprove	Somewhat disapprove	Neither approve nor disapprove	Somewhat approve	Strongly approve	Don't know
Shooting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trapping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aerial baiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ground baiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Many scientists consider that dingoes play a role in keeping ecosystems in balance by controlling some wildlife, including kangaroos and foxes, by eating them, or scaring them away, or competing with them for space and/or food.

At the same time, because dingoes sometimes eat sheep, many farmers try to reduce or eradicate dingo populations.

If it were effective would you approve of releasing dingoes into places they've been removed to control kangaroo or fox populations?

	Strongly disapprove	Somewhat disapprove	Neither approve nor disapprove	Somewhat approve	Strongly approve	Don't know
To control kangaroos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To control foxes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

We'd like to ask you how you feel about some wild animals. Please indicate to what extent you associate these words with DINGOES*:

In general, I think DINGOES are:

- Very harmful
- Somewhat harmful
- Neither harmful/beneficial
- Somewhat beneficial
- Very beneficial
- Very unpleasant
- Somewhat unpleasant
- Neither unpleasant/pleasant
- Somewhat pleasant
- Very pleasant
- Very worthless
- Somewhat worthless
- Neither worthless/valuable
- Somewhat valuable
- Very valuable
- Very bad
- Somewhat bad
- Neither bad/good
- Somewhat good
- Very good

* These same questions were then repeated for WILD DOGS

When we talk about managing wild dogs in Australia, what are referring to? Please select any or all that apply:

- Feral dogs that were once (or have descended from) domestic dogs
- Hybrids between feral dogs and dingoes
- Dingoes
- I don't know