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Understanding conflict among experts working on controversial species: A case study on the Australian dingo

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Abstract

Expert elicitation can be valuable for informing decision-makers on conservation and wildlife management issues. To date, studies eliciting expert opinions have primarily focused on identifying and building consensus on key issues. Nonetheless, there are drawbacks of a strict focus on consensus, and it is important to understand and emphasize dissent, too. This study adopts a dissensus-based Delphi to understand conflict among dingo experts. Twenty-eight experts participated in three rounds of investigation. We highlight disagreement on most of the issues explored. In particular, we find that disagreement is underpinned by what we call "conflict over values" and "conflict over evidence." We also note the broader role played by distrust in influencing such conflicts. Understanding and recognizing the different elements shaping disagreement is critical for informing and improving decision-making and can also enable critique of dominant paradigms in current practices. We encourage greater reflexivity and open deliberation on these aspects and hope our study will inform similar investigations in other contexts.

KEYWORDS

carnivore, conservation social sciences, dissensus, evidence, human-wildlife conflict, values, wild dog

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1 | INTRODUCTION

Experts are individuals "regarded or consulted as an authority on account of special skill, training, or knowledge" (www.oed.com), whose opinions are valued and sought to inform decision-makers on critical conservation and wildlife management issues (Mukherjee et al., 2015). For example, expert opinions have recently been elicited to inform the management of hybridization between wolves (*Canis lupus*) and dogs (*C. familiaris*) in Europe (Donfrancesco et al., 2019). Similarly, the expert views of conservation professionals have been investigated to help inform strategies for coexisting with large carnivores (Lute et al., 2018, 2020), as well as for setting management priorities for other taxa (Branco & Cardoso, 2020; Donlan et al., 2010).

Such studies have primarily embraced a focus on consensus. Nonetheless, there are multiple drawbacks of a strict focus on consensus: (i) it can reify and reinforce the *status quo*, which can be problematic for various reasons (Peterson et al., 2005, 2006, 2013). For instance, seeking win-win solutions, such as trying to reconcile environmental concerns with the dominant paradigm of economic growth, can lead to issues such as "greenwashing" and fail to actually address conservation problems at their roots (Adams, 2017; Scheba & Scheba, 2017; Swyngedouw, 2011); and (ii) it can discount minority or unpopular views, calling into question the social legitimacy of practices and restricting management options to decision-makers (Matulis & Moyer, 2017; Peterson et al., 2005).

Considering dissensus is important because: (i) it can provide an understanding of the social and political context in which one works and is imbued (Sandbrook et al., 2013); (ii) it can elucidate the plurality of views on particular issues and possibly challenge dominant paradigms in current practices (Peterson et al., 2005; Sandbrook, 2015; Swyngedouw, 2011); and (iii) it can help shed light on the values that underlie different perspectives, allowing their broader exploration and acknowledgment and promoting agonism (i.e., the embracing of conflict and the recognition of minority perspectives, fostering transformative environments) over antagonism (i.e., the disregarding of value differences and of uneven power relations, fostering hostile environments) among actors (Holmes et al., 2021; Matulis & Moyer, 2017). On this latter account, recently there has been increasing attention paid to the value-based aspects fuelling conflicts on conservation and management issues, which require deeper efforts for their understanding and recognition (Boyce et al., 2022; Pooley et al., 2021; Yanco et al., 2019). In conservation, analysis has entailed different but related concepts of "values," including exploration of (1) something's perceived worth (e.g., in an economic sense), informing whether it is perceived as good or bad; and (2) environmental values underpinning moral principles, shaping whether something is perceived as right or wrong (Kempton et al., 1995; Luque-Lora et al., 2022). Both conceptualizations inform judgments about the appropriateness of conservation or management actions. Recognition of the wide breadth and diversity of values surrounding conservation issues globally calls for increasingly pluralistic practices whereby irreconcilable differences should be made explicit and deliberated rather than suppressed in the name of inclusivity (Sandbrook et al., 2019).

In this study, we adopt a dissensus-based variant of the Delphi method (Argument Delphi; Mukherjee et al., 2015) to explore conflict among dingo experts, including wildlife managers and researchers, with some individuals aligning with both of these roles. This Delphi variant is particularly useful for exploring conflicting views and "delv[ing] deeper into the motivations underpinning the participant's opinions" (Mukherjee et al., 2015). No such application of the Delphi has been addressed in contexts of species conservation or management, to our knowledge, in contrast to the approaches more concerned with consensus building (cf., Mukherjee et al., 2015, 2018). As such, this study also contributes to ongoing discussions on the value of emphasizing and understanding dissent in conservation and wildlife management (Chapron & López-Bao, 2020; Matulis & Moyer, 2017; Peterson et al., 2016). The Delphi method is one of several key social science techniques for eliciting views and judgments (Mukherjee et al., 2018). Other approaches such as Q-method (Zabala et al., 2018) are also useful toward such ends, although the Delphi is particularly valuable for its anonymous iterative approach that allows participants to reflect on each other's answers over a series of rounds, enabling deeper engagement with and exploration of points of agreement and disagreement (Mukherjee et al., 2018).

2 | THE DINGO CASE

The umbrella term "wild dog" is widely used in Australia and is defined as "all wild-living dingoes, dingo-dog hybrids and feral dogs" (AWI, 2020; Cairns et al., 2021; Fleming et al., 2001; Purcell et al., 2012). Here, we use "dingoes" to refer to the wild-living descendants of canids living in Australia prior to European contact (see notes on nomenclature below), and "dogs" to refer to modern breeds of *Canis familiaris* that have undergone intense and recent anthropogenic selective breeding (i.e., within the last ~2000 years).

TABLE 1 A summary of the issues contended in the debate on dingoes.

	Description	References
Taxonomy	Dispute over whether dingoes and dogs are taxonomically different	Crowther et al., 2014; Jackson et al., 2017; Jackson et al., 2019; Smith et al., 2019; Zhang et al., 2020; Jackson et al., 2021; Cairns, 2021; Shipman, 2021; van Eeden et al., 2021; Field et al., 2022; Krofel et al., 2022;
Hybridization	Dispute over whether hybridization between dingoes and dogs is a conservation issue	Claridge and Hunt (2008); Jones, 2009; Claridge et al., 2014; Stephens et al., 2015; Allen et al., 2017; van Eeden, Dickman, et al., 2018; Cairns et al., 2019; Crowther et al., 2021; Cairns et al., 2021
Cultural value	Uncertainties on the extent to which dingoes are valued by the broader Australian society	Smith & Litchfield, 2009; Hytten, 2011; Fleming et al., 2012; Archer-Lean et al., 2015; Probyn-Rapsey, 2015; van Eeden et al., 2021
Ecological impacts	Contested evidence on how dingoes affect local wildlife populations, including native and nonnative species, and livestock production	Wallach et al., 2009; Letnic & Dworjanyn, 2011; Allen & Fleming, 2012; Johnson & Ritchie, 2012; Letnic et al., 2011, 2012; Moseby et al., 2012; Ritchie et al., 2012; Allen, Fleming, et al., 2013; Fleming et al., 2013; Hayward & Marlow, 2014; Nimmo et al., 2015; Morrant et al., 2017; Fancourt et al., 2019; Allen et al., 2021; Castle et al., 2021; Emmott, 2021; Kreplins et al., 2021
Management practices	Dispute over how to manage dingo populations and their impacts	Glen et al., 2007; Allen, 2013; Allen, Allen, et al., 2013; Smith & Appleby, 2015; Doherty & Ritchie, 2017; Johnson & Wallach, 2016; Allen, 2017; Newsome et al., 2017; van Eeden, Crowther, et al., 2018; Campbell et al., 2019; Allen & Hampton, 2020; Ballard et al., 2020; Behrendorff, 2021; Fleming et al., 2021; Smith et al., 2021; Claridge et al., 2021; Kennedy et al., 2021; Philip, 2021

Dingoes are wild-living canids that have been present in Australia for a minimum of 3500 years and are the largest nonhuman terrestrial predator across mainland Australia (Balme et al., 2018; Cairns & Wilton, 2016; Corbett, 2001; Smith, 2015). There are conflicting opinions on the definition of dingoes, their ecological importance, and how they should be managed and conserved (Table 1; Dickman et al., 2021). Disagreement over dingo taxonomy and nomenclature (names proposed and in use include: *Canis familiaris, C. familiaris dingo, C. lupus familiaris, C. lupus dingo*, and *C. dingo*) reflects debate over differences and similarities between dingoes and dogs (Cairns, 2021; Crowther et al., 2014; Jackson et al., 2017; Jackson et al., 2019; Jackson et al., 2021; Shipman, 2021; Smith et al., 2019)—as defined above—and whether dingo-dog hybridization represents a conservation issue (Allen et al., 2017; Cairns et al., 2019; Cairns et al., 2021; Claridge et al., 2014; Crowther et al., 2021; Jones, 2009; Stephens et al., 2015; van Eeden, Dickman, et al., 2018). Further debate focuses on the dingo's status as a native species (Fleming et al., 2012; Hytten, 2011) and its varying cultural values to Australian people (Archer-Lean et al., 2015; Probyn-Rapsey, 2015; Smith & Litchfield, 2009; van Eeden et al., 2021).

The ecological roles of dingoes are also debated, particularly with regard to their ability to suppress abundant herbivores, including kangaroos (specifically *Osphranter* and *Macropus* species), emus (*Dromaius novaehollandiae*), feral goats (*Capra hircus*), European rabbits (*Oryctolagus cuniculus*), feral pigs (*Sus scrofa*), and smaller predators including feral cats (*Felis catus*) and European red foxes (*Vulpes vulpes*) (Allen, Fleming, et al., 2013; Emmott, 2021; Fancourt et al., 2019; Fleming et al., 2013; Letnic et al., 2011, 2012; Moseby et al., 2012; Ritchie et al., 2012). These proposed ecological functions potentially provide conservation benefits for threatened species (Allen et al., 2021; Allen & Fleming, 2012; Hayward & Marlow, 2014; Letnic & Dworjanyn, 2011; Morrant et al., 2017; Nimmo et al., 2015; Wallach et al., 2009) and in some cases livestock production (Allen & Gonzalez, 1998; Emmott, 2021; Forsyth et al., 2014; Prowse et al., 2015). Concurrently, however, dingoes may also suppress and have negative impacts on threatened species, such as northern hairy-nosed wombats (*Lasiorhinus krefftii*), bridled nail-tailed wallabies (*Onychogalea frenata*), greater bilbies (*Macrotis lagotis*) and potentially others (Allen & Fleming, 2012; Augusteyn et al., 2021; Johnson & Ritchie, 2012; McHugh et al., 2022).

Debates surrounding dingoes also concern the appropriateness of methods used to manage them (Allen, 2017; Allen & Hampton, 2020; Ballard et al., 2020; Fleming et al., 2021; Johnson & Wallach, 2016; Smith et al., 2021; van Eeden, Crowther, et al., 2018). Dingoes are protected in some Australian states and territories (or parts within), while in other areas they are regarded as unprotected wildlife or declared pests (Fleming et al., 2021; Smith & Appleby, 2015).

3 | METHODS

The Delphi method is an iterative, anonymous, and expert-based approach that is particularly valuable to investigate complex and controversial issues (Mukherjee et al., 2015). That is because this approach provides an anonymous intellectual space for participants (usually between 2 and 58; Mukherjee et al., 2018) to express their views, without having to worry about how they would appear to others. Although possible downsides of using this method include that it is more time-consuming and might have higher dropout rates or poorer response rates (Mukherjee et al., 2018).

This study adopted a dissensus-based variant of the Delphi method (Argument Delphi), designed to explore and understand discordant viewpoints rather than to build agreement on key issues (Mukherjee et al., 2015). There is considerable variation in Delphi formats based on the purpose of the study in question (Mukherjee et al., 2015). In our case, rather than the more conventional approach of asking the same questions across rounds expecting different outcomes based on the new information, we focused attention on the most discordant and controversial perspectives emerging from each round and elicited views in specific response to them in the following rounds (Miller & Cuff, 1986; Mukherjee et al., 2015).

The predetermined length of our Delphi was three rounds, which is the most common duration (Mukherjee et al., 2015). Between each round, the experts were sent a report summarizing all the anonymous responses from the previous round to allow them to read each other's perspectives and consider them in the following rounds (Mukherjee et al., 2015). The topics of the questions for the first round were based on a literature review focused on particularly controversial or disputed issues (Table 1). The questions for the second and third rounds were derived from the responses received to the first and second rounds, respectively, with a preference for those introducing novel perspectives or discordant viewpoints. Some questions were also specifically addressed at understanding how the respondents perceived the disagreement itself. None of the questions were compulsory. All questions were open-ended and aimed at collecting qualitative data. Some questions also included multiple choice prompts (e.g., yes/no) in addition to requesting participants to provide an open-ended answer.

To identify potential participants, we performed a literature search in Scopus using the query (TITLE-ABS-KEY [dingo* OR "wild dog" AND conserv* OR ecolog* OR gene*]) AND PUBYEAR >2009 AND (LIMIT-TO [AFFIL-COUNTRY, "Australia"]). Their contact information (i.e., email addresses) was found online. The potential participants were not approached directly or individually but through Qualtrics (Provo) using a general introductory email. Understanding that some experts may not be visible in the scientific literature, to ensure we were capturing experts actively engaged in the field, during the first round of invites we also asked participants to forward the survey invitation to other experts they knew (i.e., snowball sampling; Vogt & Johnson, 2011).

Qualtrics was used to run the whole survey, and participants were always invited to respond to the questions directly on the platform's website. For each survey round, experts were given 3 weeks to respond and were sent two reminders. From the first round onwards, only participants who replied to the previous round were invited to the next. Participants were all asked the same questions and self-specified their own information at the end of the survey (i.e., affiliation type, main area of expertise, experience in the field, degree level, and gender). These latter data were collected purely informatively for a coarse understanding of the demographics of the participants involved in this study. Participants were also asked to enter their names in a separate document after completing each round, to track which experts had completed the round while still ensuring the anonymity of the responses.

Data from all three rounds and all participants were included in analyses. Data were analyzed through an inductive thematic analysis that involved organizing unstructured text into conceptual nodes or themes (Crotty & Crotty, 1998). The respondents quoted in the Results are associated with a specific ID code that is indicated in brackets by a letter and a dash followed by the round number in which the response was given, such as "(X-R1)."

The survey was designed, implemented, and analyzed by three moderators who did not participate in any of the rounds. While acknowledging the subjectivity of the moderators in influencing the Delphi process, this study was conceived from a viewpoint common in the social sciences that absolute objectivity is never achievable (Moon & Blackman, 2014). With this in mind, neutrality was actively pursued by the moderators, in particular by:

(i) being introspective and aware of their own biases and always exercising greatest effort to minimize them; and (ii) involving two additional researchers with different perspectives in the data analysis and interpretation.

Ethics clearance for this study was obtained from the University of New South Wales Human Research Ethics Committee (HC200171). Participation in the Delphi survey was based on written informed consent, which was collected from every participant at the beginning of each round.

4 | RESULTS

Fifty-two experts were identified by the Scopus search and invited to participate. Thirty-three experts completed the first survey, including three recruited via the snowball sampling, though not all continued through the three rounds, resulting in 29 experts participating up to the second round and 28 taking part in all three rounds (Table A in Data S1). Five hundred and ninety-nine answers were thematically analyzed across the three rounds.

4.1 | Round I

We found there were two main overlapping themes on which opinions were polarized on how to define a species (Table B in Data S1). The first was the aspects (e.g., genetics, ecology, biology, cultural significance) that should be considered for such definition. Respondents who supported using multiple aspects believed this was a more nuanced approach better able to overcome the limitations of using single aspects on their own, whereas support for the various single aspects was mainly justified in terms of a greater perceived reliability or practical value. The second polarization of views revolved around the extent to which management implications (e.g., benefits to or consequences for conservation priorities) should be taken into account when defining species. Some participants believed species definitions should take into account management implications, such as aiming to maximize the conservation of biodiversity and ecological functions (i.e., management-oriented definition). While others thought that species should only be defined based on objective and scientific criteria regardless of any potential management implications (i.e., strictly scientific definition). In specific relation to the dingo taxonomy issue, the scope for individual's values and the perceived values of others to link with preference for a name was apparent. For example, a respondent (A-R1) believed that "[r]esearchers who still chose to classify the dingo as *Canis familiaris*, do so largely for political reasons. These scientists tend to be pest control managers, whose priority is to protect livestock production and agricultural interests. By labelling the dingo as *Canis familiaris* and placing them in a broad category of 'wild dog', the pest control scientists sidestep issues such as the cultural and ecological significance of the species." Another respondent (B-R1) said "[s]pecies must not be recognised for management or conservation convenience as this is not science. This a fundamental problem in the Dingo debate by those who suggest the Dingo should be recognised as a distinct species."

We also documented disagreement on how ecologically valuable nonnative species should be managed, particularly on whether they should be eradicated (Table B in Data S1). Views in support of eradication valued the preservation of natural ecosystems, were skeptical about the extent to which science can inform us on the ecological impacts of nonnative species, and considered eradication an acceptable approach. For example, one participant (C-R1) noted how "[e]very non-native species has negative impacts on ecosystems. Just by being present in a foreign ecosystem, a non-native species disrupts the natural balance of that ecosystem. It is not for us to pick and choose whether we perceive that disruption is negative or positive." Respondents who opposed eradication viewed nativeness as unimportant or less relevant than ecological functions and questioned the feasibility and acceptability of eradication programs. For instance, one respondent (D-R1) said "[i]t is over-simplistic to argue that native is good and introduced is bad. Native species can be harmful in some situations (e.g. over-abundant kangaroos), and introduced species can be beneficial (e.g. biocontrol agents, for weeds; pollinators for crops or native plants)." Similarly, another respondent (E-R1) believed that "[n]ativeness of itself is a weak value. What is more important is the sum of genetic and phenotypic diversity represented in a natural community. This will usually be best preserved by placing highest value on native species, but maintaining nativeness itself should not be the overriding goal of management."

Concerning anthropogenic hybridization, both generally and specifically in relation to hybridization between dingoes and dogs, participants had different views on whether it should be addressed and why (Table B in Data S1). The mitigation of anthropogenic hybridization was endorsed by some participants to conserve the uniqueness, cultural value, and ecological functions of populations and ensure their survival. Additionally, some participants specifically valued the preservation of natural traits in wild populations and believed that anthropogenic hybridization should be addressed because it affects these. Though there was also criticism of too much emphasis on naturalness when managing hybridization. For instance, a respondent (F-R1)

thought that "the distinction between 'natural' and 'anthropogenic' hybridization is arbitrary (and arguably meaningless), so hybridization should probably not be mitigated or permitted based on these labels alone." Similarly, another respondent (G-R1) stressed that it is not about whether hybridization is natural or anthropogenic but rather about the ecological consequences that would follow from it.

With regards to the criteria to adopt for defining the hybrids, there was a range of views, including using genetic, ecological, or morphological criteria, or a combination thereof (Table B in Data S1). For example, ecological criteria were supported on the basis that "it's more about impacts rather than hybridisation" (H-R1), or that "behaviour and function is what matters" (I-R1). Similarly, another respondent (J-R1) said "it's about ecosystem function. It's a romantic notion to think of dingoes on one hand, and wild dogs on the other." While views in support of using genetic aspects emphasized the preservation of genetic purity and the use of baselines, although recognizing the arbitrariness of such approaches. Morphological criteria were primarily considered in relation to cultural and esthetic reasons. Some respondents also believed that defining such criteria did not matter, because they did not see hybridization as an issue, they considered discriminating among hybrids impossible and argued for a focus on prevention, or thought that we should let the dingoes decide for themselves.

On the more specific question about the ecological role played by dingoes, there was a lot of uncertainty mostly related to the lack of data on this issue. Overall, dingoes were seen as having both positive and negative ecological impacts, depending on the context. Despite the uncertainty concerning their ecological role, everyone nonetheless agreed that dingoes have a significant cultural value for the broader Australian society (Table B in Data S1).

There was disagreement about whether there should be active government involvement to promote dingo conservation, and on where or when dingoes should be conserved (Table B in Data S1). Some respondents believed that dingoes should be conserved across Australia for their ecological, cultural, and economic values. For example, a respondent (K-R1) remarked that "[d]ingoes are a vital part of the past 5000 years of Indigenous heritage in Australia. [...]. I would like to see them have protected status full stop. There are more humane, ecological ways of protecting animal domesticates from dingoes - and perhaps criminalising their killing would force those who want to control them to [use] these other methods." Another respondent (L-R1) also considered how "dingoes can additionally provide economic benefits in many instances, say for tourism but also importantly for industry." While others believed that dingoes should only be conserved in public and some private lands (e.g., where livestock is not kept, and adjacent to national parks). That was primarily to address the impacts of dingoes on people and livestock production. For instance, a respondent (M-R1) noted that "dingoes/wild dogs will never coexist naturally with sheep." Another one (N-R1) said that "[d]ingoes should be preserved in national parks, and on private lands where sheep/goats are not kept." Some participants also considered dingo conservation irrespective of land tenure but rather based on the local effects of the dingoes, such as their impacts on native species and people. For example, a respondent (O-R1) said: "dingoes' conservation and/or control should be informed by their local impacts in light of other competing interests, and not the tenure of land they occupy." Some views were also in support of conserving dingoes in public lands only. For instance, a participant (P-R1) said "landholders can control dingoes on their properties (they can do what they want on their properties it is their right)." Lastly, some respondents thought dingoes should not be actively conserved, because they "are thriving without government intervention" (Q-R1), because they are introduced/non-native species and "conservation dollars [should] be directed to endemic, isolated threatened species as a priority" (R-R1), and they would not meet IUCN criteria (reduction in range and population size) (S-R1).

4.2 | Round II

A particularly contentious topic that emerged from analyzing the responses from the first round was the terminology to use (Table C in Data S1). In the second round, we addressed a specific question on this issue. We documented a polarization of views regarding the use of the terms "dingo" versus "wild dog," which was underpinned by different reasons. For example, those preferring "dingo" commonly did so because the term acknowledged a distinct cultural and/or ecological identity and because "wild dog" had negative cultural connotations, whereas those who preferred "wild dog" did so because it was comprehensive (i.e., includes feral dogs and hybrids) and because they considered the term to accurately describe the animals it refers to (i.e., dingoes are dogs living in the wild). Some participants also reported a more interchangeable use of the two terms. Regarding whether or not resolution on terminology would imply any changes in practices, some respondents believed it would, as it would provide more credence to efforts to conserve dingoes and would possibly reduce their lethal control. While others believed that it would not, as they saw terminology as having no bearing on management. Some participants were also unsure.

Based on the disagreements observed in the first round on the various issues addressed, in the second round, we addressed specific questions to understand how the disagreements were perceived by the respondents. We asked whether further research may help bridge the observed disagreements. Responses were split on this issue, with some participants believing that it would help as it would clarify ecological aspects, while others were less optimistic and did not think more research would help, as lack of evidence is not the issue but rather the debate is too polarized and value-laden (Table C in Data S1). For instance, one respondent said: "whether it would resolve disagreement - I have my doubts in the polarised debate I can[']t work out why either group would care" (A-R2). Similarly, another participant said: "many parties in this debate are not objective, and no amount of additional scientific research will change anyone's beliefs or opinions, as they will just ignore studies that don't find the results that support their belief" (B-R2). Some respondents also conceded that more research will help bridge disagreement, but with some caveats. For instance, a participant said "Yes. However, I think both sides of the argument need to be b[r] ought together to gain an agreed research methodology that can be used in each location. This will allow better comparison of data. It is also more likely to result in the conclusions being accepted by both sides" (C-R2).

Following on from the above, we then asked the experts what they perceived as being the most divisive issue and why. Respondents identified four main issues (ecology, taxonomy, management practices, hybridization). Conflict on these issues was conceived as being value-laden, due to data gaps or driven by vested interests, inter alia (Table C in Data S1). For example, one participant said: "many researchers receive their funding from the agricultural industry, and so cannot even consider that dingoes are unique and have a positive ecological role, because that would lead to arguments for protection of the dingo, which they could never support" (D-R2). Similarly, another respondent raised the problem of how "researchers who have been part of the debate for decades continuing their dislike/distrust of each other's research" (E-R2). A participant also purported lack of scientific integrity, noting "confusion between correlation and causation, failure to acknowledge and address methodological deficiencies and consequent overselling of research results" as causes of conflict (F-R2).

One respondent in the first round (T-R1) emphasized the need to better consider issues of animal suffering in current practices of dingo management. In the second round, we addressed a specific question on this topic. We documented different perspectives on this issue, ranging from those considering animal suffering as a possible hindrance to the achievement of practical management outcomes, to those valuing it as a key aspect of any management decision (Table C in Data S1). These conflicting opinions may mirror elements of contemporary debate about the ethics of lethal animal control in conservation (i.e., "compassionate" vs. "traditional" conservation; see Coghlan & Cardilini, 2022, van Eeden et al., 2020, Wallach et al., 2018). A respondent (G-R2) particularly critical of a focus on animal welfare said: "this question is underpinned by subjective, anthropocentric, individual-specific, animal rights/welfare gobbledegook which can and frequently does derail important conservation programs focused on saving species as a whole, and ecosystems as a whole." In contrast, another respondent (H-R2) believed that considerations of animal suffering should be made a central tenet of current practices: "the asset value in this Australian system is measured by the end product (meat for slaughter, wool for market) rather than in the intrinsic value of the animals themselves, (the traditional 'live' stock market). As a consequence, animal cruelty is prevalent on all sides - in the treatment of wildlife, the treatment of stock, the treatment of farm workers. The system needs to be designed to make the avoidance of suffering a central tenant for all levels of resource and environmental management."

In the first round, some respondents highlighted the importance of considering how decisions are made to inform effective dingo management. In the second round, we included a specific question on this issue. Several respondents noted that agricultural business and corporate lobbies currently hold too much power and influence, while environmental and cultural concerns tend to be poorly represented. However, others also mentioned that for them it is people not affected by dingoes who have too much influence (Table C in Data S1). For instance, one respondent (B-R2) said: "some groups/individuals have too much say in decision-making in some regions, particularly as these groups/individuals are not affected by dingoes, and are merely voicing their opposition because they 'like dingoes'. A range of parties should be involved in decision making, but disproportionate weight should not be granted to groups/individuals that are not affected by dingoes."

4.3 | Round III

Based on the mixed views from the second round on the value of further research for influencing views and policies, in the third round we asked whether bridging science-policy gaps was something needed, and how to eventually address that (Table D in Data S1). Not everyone felt it was needed, as some respondents were happy with the current policies which they already considered

evidence-based. In contrast, others believed that there is scope for improving current policies, and that this could be achieved through approaches such as ameliorating relations between scientists with opposing views and thus through more collaborative research, better communication with decision-makers, greater public engagement, and more representative and unbiased decision making.

In the second round, some respondents raised the issue of a particular tension between government and academic scientists working on the dingo issue. In the third round, we explored what the experts thought about this issue and how to eventually promote greater collaboration between government and academic scientists. As above, not everyone viewed this as a concern. Some respondents believed either that such collaborations already occur or that they are unnecessary. While others considered it valuable and proposed various ways to address it (Table D in Data S1).

Some participants in the second round highlighted the need to make decision-making processes more inclusive. In the third round, we explored the experts' views on this issue and how it could be eventually addressed in practice. Not everyone agreed that greater inclusivity was needed. Some respondents were happy with current decision-making processes, while others believed they could and should be improved and suggested possible ways forward in that direction (Table D in Data S1).

5 | DISCUSSION

This study adopted a dissensus-based Delphi to explore and understand disagreement among dingo experts. We found disagreement on most of the issues explored, underpinned by what we define as "conflict over values" and "conflict over evidence," which were influenced by feelings of distrust among the experts.

Acknowledging that expert views can be underpinned and influenced by different values, and gaining awareness of such values, are key checkpoints for improving decision-making and should be given proper consideration (Yanco et al., 2019). In the present investigation, we highlight the social construct of the culture-nature dichotomy as an element underpinning part of the conflict over values. This refers to seeing and valuing nature as separate from or including humans, the former of which is a largely Western conception that is less prevalent in non-Western societies, including among Aboriginal Australian peoples (Ducarme et al., 2020). The culture-nature dichotomy aligns with debates about conservation frameworks, specifically, those that regard humans as separate from nature (e.g., a "compositionalist" concept associated with orthodox conservation, e.g., Soulé, 1985) prioritize the preservation of native species and restoring ecosystems to a "natural" state, whereas frameworks that include humans as part of nature ("functionalist" concept) prioritize ecosystem function or services over species origin (Callicott et al., 1999). In our study, some experts supported preserving native populations to avoid disrupting the "natural balance" of ecosystems, regardless of the kinds of impacts nonnative species would have (cf., Rohwer & Marris, 2021). While others believed that nativeness should not matter and rather the focus should be on measuring aspects such as ecological impacts. Similarly, some experts particularly valued conserving natural traits in wild populations, while others were more critical of natural versus anthropogenic distinctions when addressing hybridization (cf., Donfrancesco & Luque-Lora, 2022). These discussions inform broader ongoing debates on how nonnative species (Cassini, 2020; Shackleton et al., 2022), hybridization (Donfrancesco & Luque-Lora, 2022), and ecosystems (Rohwer & Marris, 2021) should be managed. Moreover, language in this instance may also play an important role. For example, some of our participants felt that depending on the terms used to describe dingoes, different kinds of connotations would be implied (e.g., pure/hybrid, native/nonnative) that would possibly be linked to different management interventions (e.g., legal protection/culling) (Kreplins et al., 2018; Purcell et al., 2012; van Eeden, Dickman, et al., 2018).

Another conflict may be underpinned by the holding of more or less anthropocentric values. Anthropocentrism can be broadly defined as the prioritizing of human over nonhuman interests (Callicott, 1984). For instance, particularly anthropocentric perspectives in our study would align with those suggesting that private landholders should be able to decide for themselves how to manage dingoes on their properties, or that dingoes should be conserved only in protected or public areas where conflict with humans is lower. This might reflect the participants' own anthropocentric priorities or their recognition of the challenge of balancing competing priorities among different stakeholders (who may have anthropocentric interests) involved in debates about management. While non-anthropocentric perspectives would align more with those viewing dingo protection and conservation as the default management approach across Australia. Discussions surrounding anthropocentric and non-anthropogenic values are increasingly recurrent (Kopnina & Washington, 2020; Taylor et al., 2020; Treves et al., 2018; Vucetich et al., 2018; Wallach et al., 2020), and can also get quite heated in the literature (see Dickman et al., 2019 and responses that followed). Better knowledge and recognition of value differences are important to inform decision-making

processes, understand who may benefit from specific outcomes, and engage people with diverse perspectives and values (Boyce et al., 2022; Yanco et al., 2019). This is particularly—though not exclusively—valuable for people working on controversial species (Boyce et al., 2022).

Conflict over evidence occurs in relation to aspects such as research rigor, objectivity and the weighting of evidence. For instance, some experts disputed ecological evidence because of concerns over the rigor of the methodology used to collect the data. Similarly, others argued that the lack of clarity on the local ecological impacts of dingoes underpinned some of the disagreement over dingo conservation. Better and clearer evidence here may be effective at swaying views. However, some experts in our study also felt that new evidence may not be accepted if it clashes with specific values and interests. Some viewed evidence as biased or oversold to align with the values and interests of the investigators. The co-designing and co-production of research by experts with different values, views and interests, as well as transparency and reflexivity on these aspects, can help promote a more agonistic space for research and lead to improved relations and trust among experts (Boyce et al., 2022; Matulis & Moyer, 2017; Young et al., 2016).

6 | CONCLUSION

Our study provided an empirical investigation into why experts may disagree when it comes to the management of a particular species, drawing a distinction between "conflict over values" and "conflict over evidence." We also highlighted areas of agreement among the experts (e.g., on the cultural value of dingoes) that could be used as catalysts for open confrontations and collaborations on the more disputed aspects. We hope our approach can find further application in other contexts of conservation and wildlife management (Redpath et al., 2013).

AUTHOR CONTRIBUTIONS

Valerio Donfrancesco: Conceptualization, methodology, investigation, data curation, formal analysis, writing – original draft, writing – review, editing, and supervision. Lily van Eeden: Conceptualization, methodology, investigation, data curation, formal analysis, writing – original draft, writing – review, editing, and supervision. Kylie M. Cairns: Conceptualization, methodology, investigation, data curation, formal analysis, writing – original draft, writing – review, editing, supervision, and project administration. Malcolm S. Kennedy, Carlo Pacioni, and Stephen M. Jackson: Validation, investigation, and writing – review and editing. Benjamin L. Allen, Rob Appleby, Linda Behrendorff, Gabriel Conroy, Mathew S. Crowther, Christopher R. Dickman, Tim Doherty, Bronwyn A. Fancourt, Christopher E. Gordon, Chris N. Johnson, Loukas Koungoulos, Mike Letnic, Luke K.-P. Leung, Kieren J. Mitchell, Bradley Nesbitt, Thomas Newsome, Justine Phillip, Brad V. Purcell, Euan G. Ritchie, Bradley P. Smith, Danielle Stephens, and Jack Tatler: Investigation and writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

Kylie M. Cairns is a board member of The Colong Foundation for Wilderness and a scientific advisor to The New Guinea Singing Dog Conservation Society, New Guinea Highland Wild Dog Foundation, and The Australian Dingo Foundation. Bradley P. Smith is a director of the Australian Dingo Foundation. Rob Appleby is co-director of WildSpy Pty Ltd.

DATA AVAILABILITY STATEMENT

The raw data are available upon reasonable request to the corresponding author.

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SUPPORTING INFORMATION

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

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