# Euro-Australian culture and dilemmas within the science and management of the dingo, *Canis lupus dingo*

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ABSTRACT

Past research on dingoes *Canis lupus dingo* indicated that 'pure' populations were threatened by hybridisation with domestic dogs, *C. l. familiaris*. Other work showed that methods of control affected their social systems. Understanding the ecology of dingoes can help to engender the use of adaptive sustainable management techniques rather than a reversion to lethal control. Reports of impacts of dingoes on livestock production have neglected the role of dingoes as a hypercarnivorous trophic regulator.

This study proposes that dingo predation on livestock can be managed by adapting livestock husbandry to suit Australian environments. Livestock enterprises affected by predation should be encouraged to:

• Reduce local attractants, such as unspayed domestic dogs; and

• Increase use of deterrents, such as guard animals.

Culling by appropriate authorities of troublesome individual dingoes involved in persistent predation of livestock should be an option only if the pastoralist has reduced attractants and increased deterrents. It is anticipated that adaptive management of livestock, in association with recent understanding of dingo biology, will reduce conflicts, assist objectives for conservation and improve biological stability in unstable Australian ecosystems.

Key words: Attractant, conflict, deterrent, frontier, livestock, sustainable

## Introduction

many present day Australians see the dingo *Canis lupus dingo* as a threat to humans and to agricultural production systems that needs to be effectively controlled (Corbett 2001; Fleming *et al.* 2001). However, recent research has shown that dingoes may be a keystone species for conservation of biodiversity in Australian landscapes (Glen *et al.* 2007; Johnson *et al.* 2007; Wallach and O'Neill 2008; Wallach *et al.* 2008; Dickman *et al.* 2009; Johnson and VanDerWal 2009; Ritchie and Johnson 2009; Purcell 2010a; b). In addition, dingo conservation has been identified as a way to improve human civilisation by contributing awareness of holistic approaches to landscape management (Parker 2006). This range of contemporary views creates a dilemma of how best to conserve this iconic Australian mammal while reducing the threat to livestock enterprises.

A submission to amend the New South Wales *Rural Lands Protection Act (1998) Wild Dog Control Order* indicated that public concern for extant wild dingo populations was increasing, and dingo conservation areas were scheduled (Anon. 2000). This submission showed that the culture of dingo management in parts of Australia was changing, although the dilemma in livestock production zones remains. The current study investigates the underlying reasons that have caused dingoes to be lethally managed by European colonists in Australia. A new hypothesis is proposed for consideration, where livestock management is adapted to coexist with extant dingo populations and be consistent with objectives of sustainable land management.

### Summary of past dingo research and current methods of dingo management

The dingo in Australia is a primitive (one annual breeding cycle), hypercarnivorous canid (Boitani and Ciucci 1995; Carbone *et al.* 1999; Corbett 2001; Macdonald and Sillero-Zubiri 2004; Wang *et al.* 2004; Van Valkenburgh 2007; Purcell 2010a, b). Animals were most probably traded by south-east Asian seafarers with indigenous Australians for the last 5000 years before European colonisation of

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Australia (Corbett 2001). Following the introduction of livestock agriculture, dingoes have been persecuted due to their predatory capabilities. However, some studies indicate that dingo control may increase the frequency of dingo movements in pastoral areas (Allen and Gonzalez 1998), increase the frequency of predation on livestock (Allen and Miller 2009; Wallach *et al.* 2009), and also interfere with unregulated predation of large herbivores (Caughley *et al.* 1980; Letnic 2000; Pople *et al.* 2000). Conflicting views about dingo control make conservation and management of this species difficult. New management models need to be developed to accommodate these shifting paradigms.

During the 1970s and 1980s, research on dingo ecology showed that:

1. 'Pure' dingoes may be threatened with introgression by domestic dog genes (Newsome *et al.* 1980);
2. Dingoes in New South Wales *did not* travel 20-40 km to kill livestock, and a buffer zone *may* control troublesome dingoes (Harden 1985); and
3. Dispersing dingoes in Western Australia *inhabited* buffer zones and perturbations in social systems altered their patterns of movement (Thomson *et al.* 1992a).

Since those studies, dingoes have supposedly been managed according to their level of 'purity' and 'wild dogs' have been lethally managed where they are perceived to be a problem to livestock enterprises (Fleming *et al.* 2001). For most Australians, 'wild dogs' include dingoes, dingo × domestic dog *C. l. familiaris* hybrids, and feral domestic dogs. In this study, however, the term dingo includes all wild dogs because of the difficulties in finding populations that are free from hybridisation and that truly comprise 'pure' dingoes; feral dogs, in contrast, are wild living domestic dogs with biannual reproductive cycles (Boitani and Ciucci 1995; Boitani *et al.* 1995). 'Purity' also is a human construct (Purcell 2010a; b). Lethal management of dingoes has been identified as a risk to livestock enterprises in Queensland (Allen and Gonzalez 1998) and South Australia (Allen and Miller 2009) because both movements of dingoes and livestock depredation increase post-baiting. Using preliminary data, Allen and Miller (2009) stated that dingo control did not appear to reduce calf losses or return an economic benefit for the livestock enterprise.

Other studies published during the 2000s have shown that:

1. Extinctions of native Australian marsupials are directly related to the distribution of sheep (Johnson *et al.* 2006);
2. Wild dingoes living in optimal conditions selectively depredate prey species during different stages of their annual biological cycle and do not actively seek livestock as prey (Purcell 2010a; b); and
3. Dingoes, as the hypercarnivorous top-order terrestrial mammalian predator in Australia, may be a keystone species for preventing loss of biodiversity (Glen *et al.* 2007; Johnson *et al.* 2007; Wallach and O'Neill 2008; Wallach *et al.* 2008; Dickman *et al.* 2009; Johnson and VanDerWal 2009; Ritchie and Johnson 2009; Purcell 2010a, b).

Why then do wildlife and land management organisations, and some Australians, continue to lethally manage dingoes?

## Effects of Euro-Australian culture on Australia

In 1770, Australia was inhabited by Aborigines and Australian landscapes had relatively natural transpiration rates. Indigenous Australians were probably using observations and stories about dingoes to sustain resources, as they had done for millennia (Parker 2006, 2007). In 1788, colonists brought agricultural, pastoral and construction methods to the country, which have damaged natural ecosystems (Letnic 2000).

During the 1800s, Europeans explored the 'unknown' frontier of Australia. Stories of their exploits imparted from generation to generation have created a cultural trait known as Australian Frontier Nationalism (AFN), where "*the land and its wildness is female and it is through the conquest of this feminized wild that men realize both their masculinity and civilization*" (Marcus, p. 15, 1989). In essence, that means the Euro-Australian culture is male-dominated and that contemporary Australians have been encouraged to triumph over the Australian frontier to accommodate the populace. Indigenous Australians have been implicated in causing the extinction of some species and changing landscapes through their land management practices, such as firestick farming (Flannery 1994); however, alternative hypotheses indicate that other environmental variables have contributed to the declines of some animal populations (Kohen 1995; Johnson and Wroe 2003). Compared with Aboriginal culture, which lasted for 40-50,000 years (180-226 times longer than Europeans at the time of writing) and accommodated a much smaller population, the Euro-Australian culture permitted landscape modification to promote modern industrial economic growth and support more people, but with unknown effects on the Australian biome.

Construction of a 5320 km long dog-proof fence (Fleming *et al.* 2001) in the 1880s illustrated the power of AFN. Separating the states of New South Wales (including the Australian Capital Territory) and Victoria in the fertile south east from most of Australia, this fence provided and continues to provide some livestock enterprises with country that has a reduced abundance of dingoes. The fence may also have created a subliminal sense of comfort for Euro-Australians that the Australian frontier had been defeated. Introduced pest species, including all forms of domestic livestock (feral and captive), cats *Felis catus*, European red foxes *Vulpes vulpes* and rabbits *Oryctolagus cuniculus*, and some native species have benefited from the modified habitat, sometimes at the expense of less adaptable native species (*cf.* Johnson *et al.* 2006).

In the process of conquering the Australian frontier, Australia as a nation rose to economic success 'on the sheep's back' (Michalk 1980; Robin 1999). Both the lamb roast and the Aussie BBQ have become iconic feasts for most Australians. During the 2007 summer holidays, satirical television advertisements even told viewers that it was 'un-Australian' if they did not eat lamb during that festive season, especially on Australia Day when Australians celebrate the colonial invasion of

1788. The tourism industry also promotes the vast desert frontier for domestic and international travellers who simultaneously seek photos or footage of the apparently elusive dingo. Opposing views exist about whether dingoes are either an iconic Australian mammal or a pest to the livestock industry (Corbett 2001; Fleming *et al.* 2001). This love/hate relationship from the public leaves wildlife and land management organisations with the difficulty of finding common ground by which to manage and conserve the dingo.

## Conflicts of interest

Around the same time that opposing views on the dingo were emerging (1970s and 1980s), the first research on dingo biology and ecology was initiated. Funded by the Agriculture Protection Board of Western Australia, the Rural Credits Development Fund and the Australian Meat Research Committee (Australian Meat and Livestock Corporation), researchers concluded that dingoes were adaptable, opportunistic predators and identified them as a potential threat to the Australian livestock industry (Harden 1985; Corbett and Newsome 1987; Thomson 1992b; Corbett 2001; Fleming *et al.* 2001). Most recently, research on 'wild dogs' has been funded by the Wool Innovation Cooperative Research Centre in collaboration with organisations that make pest control products, and this showed 'wild dogs' to be a major cost to the Australian agricultural industry (Gong *et al.* 2009). However, the cost of funding control operations and developmental research to improve control techniques, often referred to as 'best practice management', must be a significant part of the cost of dingoes on the economy. Downturns in the livestock industry may have a more significant effect on its viability (Berger 2006; Curtis 2009; Purcell 2010b) and have not yet been compared with data on the effectiveness of dingo control programs.

In years 1996, 2001 and 2006, National Australian State of the Environment reports indicated that land clearing and agriculture has had a more detrimental impact on biodiversity in 200 years than dingoes had in 5000 years (Anon. 1996; 2001; Beeton *et al.* 2006). Dingoes were mentioned only in the 1996 report in context to:

1. The threat of hybridisation of dingoes with domestic dogs and loss of genetic 'purity';
2. The effects of dingo control in modified landscapes, which has exacerbated the negative effects of increased grazing pressure; and
3. As beneficiaries of increased prey and water resources.

Agricultural and pastoral industries, however, have regularly been implicated as an environmental pressure with possibly disastrous effects on Australian landscapes (Anon. 1996; 2001; Griffiths 2001; Lunney 2001; Quinn 2001; Beeton *et al.* 2006; Steinfield *et al.* 2006). Effects include extinction of up to 24 native mammal species, increased risk of dryland salinity and desertification. Short term economic gain by pastoralists and government from dingo control also fails to account for the broader questions regarding effects of carbon emissions or climate change.

## Is perpetuation of dingo control for over 100 years solving the problem?

We propose the following hypothesis:

> *If livestock enterprises monitor local dingo populations regularly, then they will be able to adapt management of their livestock to minimise predation by dingoes and reduce the impact of their livestock on Australian landscapes.*

Australia includes many fragile ecosystems for which drastic measures are needed to reduce the impact of agriculture and livestock. Instead of funding dingo control, relevant industries should be reflecting on their impact on Australian landscapes, dingo biology and ecology, and adapting their industry to suit Australian environments. Studies have shown that canids learn behaviours through observation (Slabbert and Rasa 1997; Pongrácz *et al.* 2003) and, in the wild, use a duplex processing system of cognition and instinct (Frank 1980). This is consistent with studies showing that livestock depredation by dingoes increased after baiting campaigns, possibly as a result of lost social ties (Allen and Gonzalez 1998; Allen and Miller 2009; Wallach *et al.* 2009). Population suppression of any communal living canid will therefore cause social perturbations and limit opportunities for individuals to learn apposite behaviours.

Management of dingoes should instead consist of adaptations to extant livestock husbandry practices, as opposed to dingo control. Livestock enterprises affected by dingo predation should be encouraged to learn more about their local dingo population, in some cases extending as far as consistent monthly or seasonal monitoring of dingo activity on or adjacent to their property. To assist entrepreneurs to manage their livestock accordingly, an audit of affected enterprises may be beneficial to recognise other factors such as:

1. Where is the enterprise positioned in relation to dingo territories?
2. Where and when does the local dingo pack/population breed?
3. How do the activity patterns of dingoes fluctuate per season, where is activity highest and where is activity lowest, on or adjacent to the property?
4. Are there many attractants for dingoes such as unspayed domestic dogs or littering of livestock corpses and offal?
5. Are there many deterrents for dingoes such as guard animals, shepherds or electric fences?
6. Are optimal living conditions for dispersing/lone dingoes made available adjacent to the enterprise by control programs?
7. Whether domestic dogs are responsible for attacks on livestock?

If dingoes continue to depredate livestock after the enterprise has complied with an audit of dingo attractants and deterrents, then targeted culling by appropriate authorities of the troublesome dingo or dingoes could be used as a final option. It is recommended that this option

be used only if all other techniques have been exhausted (*cf.* Green and Woodruff 1980; Boitani *et al.* 2004; Sillero-Zubiri *et al.* 2004; Fox 2006).

Minimising conflicts of interest, whether they be cultural or financial, will open a new era for the science behind dingo management. It is anticipated that adapting management of livestock to dingo biology will reduce conflict with dingoes, assist objectives for dingo and landscape conservation, and improve biological stability in degraded Australian ecosystems. With appropriate management regimes in place, then the potential exists to reintroduce the top-order mammalian predator for the maintenance of biodiversity in Australian landscapes from where they are currently excluded.

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## POSTSCRIPT 20 March 2012

Since preparation of this manuscript, a number of articles on dingo ecology and management relevant to this research have been published (see postscript references list), as has the Australian Biodiversity Conservation Strategy 2010-2030 and the 2011 State of the Environment Report (Anon. 2010; 2011). In particular is the scientific debate about the advantages and disadvantages of enabling dingoes to have a functional ecological role in Australian ecoscapes as trophic regulators (Allen 2011, Allen *et al.* 2011 a, b; Fleming *et al.* 2012; Letnic *et al.* 2011a, b, c, d; Wallach *et al* 2010). Consistent with the hypothesis presented in this paper, Bowman (2012) has also called for a renewed approach to management of dingoes due to their ecological role as predators of large herbivores. Although *'human social and economic niches are highly variable across the ecosystems where dingoes are present or proposed*' (Fleming *et al.* 2012), humans retain the highest ability to adapt to changing circumstances and are the most dependent on facilitating an efficient transition to maintain environmental and economic stability. Consistent with statements by Purcell (2010b), Allen and Fleming (2012) advocate using more sensitive and descriptive techniques to manage dingoes, although they strongly cautioned against the positive management of dingoes. Purcell (2011) provided an additional global context of carnivore management and ten recommendations that will benefit dingo management including:

1. Amend all state and territory legislation to provide protection to dingoes, as defined by their functional ecological role in Purcell (2010), to be consistent with the definition of a native animal in the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*;

2. Establish programs to monitor local dingoes, identify numbers of breeding pairs (that define a pack), and quantify the scale of the threat of dingo predation to livestock within their range;
3. Develop management strategies based on scientific data collected rather than using anecdotal information;
4. Identify and mitigate barriers to dingo migration to maintain genetic diversity;
5. Develop a management plan to coexist with dingoes that is ecologically sustainable;
6. Educate and train livestock producers and government agencies in the use of ecologically sustainable carnivore management techniques to minimise livestock depredation;
7. Commence scientific research to investigate differences in the ecology and behaviour of dingoes undisturbed by lethal control and those populations disturbed by lethal control;
8. Increase community education, awareness and involvement in dingo management;
9. Establish an independent committee to review legislation, policies and management plans involving wild dogs and dingoes; and
10. Increase collaboration with international wildlife research institutions working on conserving wild canids in areas where livestock production enterprises exist.

Information on dingo diet also should be reviewed due to recommendations by Allen (2010) and Purcell (2010a) that scat content and scats could be confounded by scavenged carcasses and by false identification of the predator scat respectively. In our view dingoes in eastern Australia are less likely to prey upon small arboreal mammals that dwell in tree hollows, compared with lace monitors *Varanus varius* that have been observed hunting juvenile brushtail possums *Trichosurus vulpecula* (Cole 2011).

It is highly recommended that livestock losses per enterprise be recorded more accurately and reported by an independent authority (outside of natural resource management boards, livestock, pest and industry based authorities). Records should include non-predator related loss (old age, perinatal mortality, trauma, starvation, disease, weather [including drought, flooding and fire] and other/unknown) where possible, and specific predator related loss (feral pig, domestic dog, fox, cat, eagle, monitor lizard [*Varanus* spp.], human [roadkill, poaching]) (*c.f.* Chadwick 2010).

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