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HEALTH AND WELLBEING OF KANGAROOS AND OTHER MACROPODS IN NSW

AN ANIMAL LIBERATION SUBMISSION

We acknowledge **the Traditional Owners of country** throughout Australia and recognise their **continuing connection to land, waters and culture**.

We acknowledge that this document was written on **land stolen from and never ceded by the Gadigal People**.

We pay our respects to their Elders past, present and emerging.

DOCUMENT DETAILS

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ABOUT ANIMAL LIBERATION

Animal Liberation has worked to permanently improve the lives of all animals for over four decades. We are proud to be Australia's longest serving animal rights organisation. During this time, we have accumulated considerable experience and knowledge relating to issues of animal welfare and animal protection in this country. We have witnessed the growing popular sentiment towards the welfare of animals, combined with a diminishing level of public confidence in current attempts, legislative or otherwise, to protect animals from egregious, undue, or unnecessary harm. Our mission is to permanently improve the lives of all animals through education, action, and outreach.

INTELLECTUAL PROPERTY RIGHTS

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26 April 2021

Portfolio Committee 7
PortfolioCommittee7@parliament.nsw.gov.au

We present this submission on behalf of Animal Liberation.

Animal Liberation is grateful to Portfolio Committee No. 7 for the opportunity to provide the following submission in response to the Terms of Reference ('TOR') provided.

We request that it be noted from the outset that the following submission is not intended to provide an exhaustive commentary or assessment in response to the issues contained within the TOR.

Rather, our submission is intended to provide a general examination and responses to select areas of key concern. As such, the absence of discussion, consideration or analyses of any particular aspect or component must not be read as or considered to be indicative of consent or acceptance. For the purposes of this submission, Animal Liberation's focus covers aspects that we believe warrant critical attention and response.

Alex Vince
Campaign director

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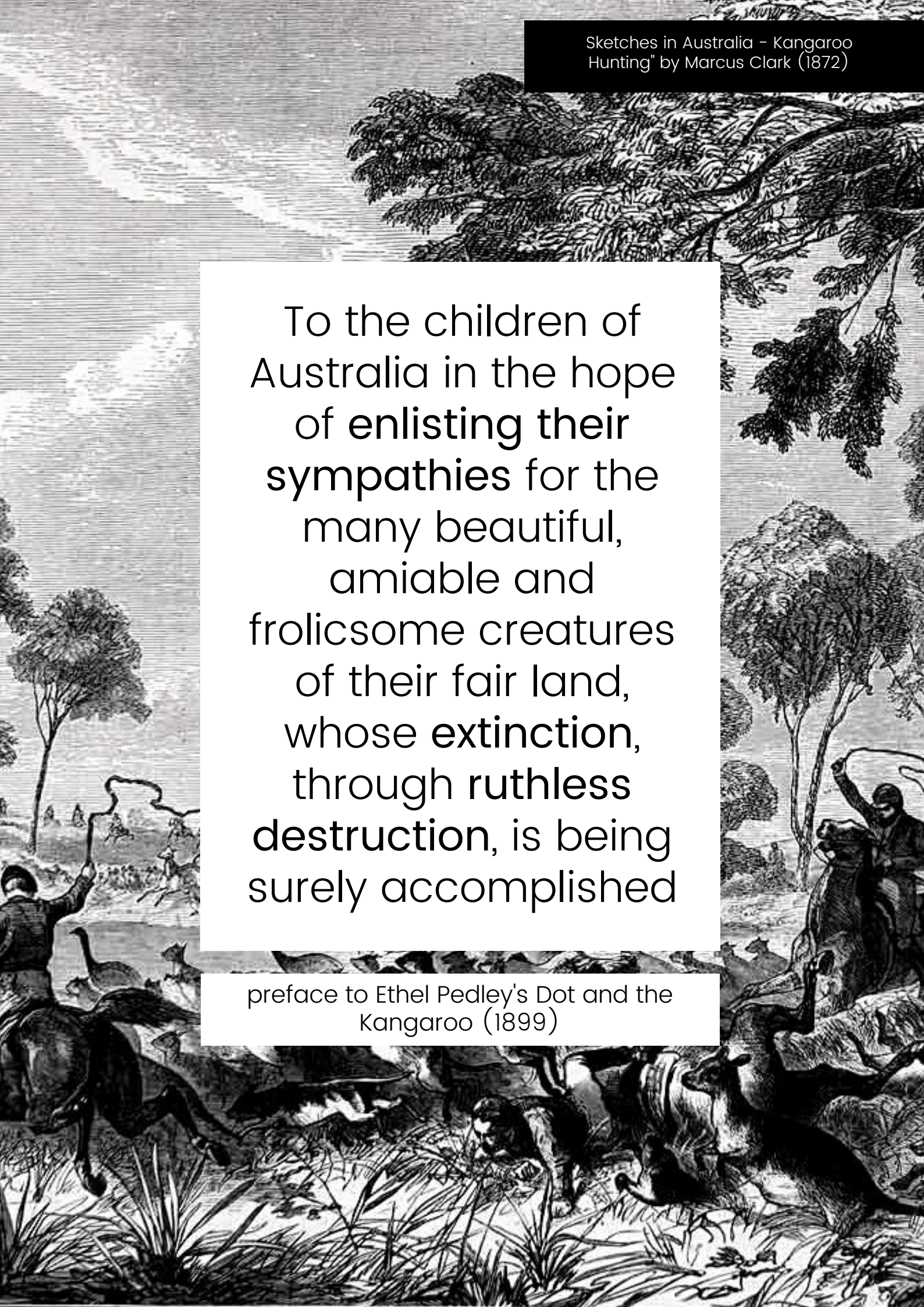
Regional campaign co-ordinator

OUR MISSION

To permanently improve the lives of all animals through education, action and outreach.



Sketches in Australia - Kangaroo Hunting" by Marcus Clark (1872)

To the children of Australia in the hope of **enlisting their sympathies** for the many beautiful, amiable and frolicsome creatures of their fair land, whose **extinction**, through **ruthless destruction**, is being surely accomplished

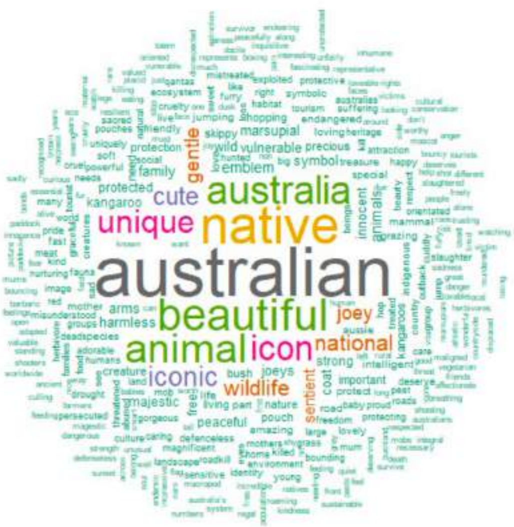
preface to Ethel Pedley's Dot and the Kangaroo (1899)

1 BACKGROUND

1.1 Despite accounting for only 5% of the world's landmass, Australia supports almost 8% of all known floral and faunal species (Geoscience Australia n.d.; Chapman 2009; Kearney et al. 2019). Many of these species are found nowhere else on earth (White 1981; Dales 2011; Holt et al. 2013; White 2013;). The relative abundance of unique and endemic species has led to Australia being recognised as one of the worlds 17 "mega-diverse" countries and its listing as one of the "most biologically wealthy" nations (Mittermeier et al. 1997; Lindenmayer and Burgman 2005; Robin 2009; Waldron et al. 2017). Due to their distinctiveness and cultural importance, many of these species are icons of Australia (Commonwealth of Australia 1988; Herbert 2006; Fleming and Bateman 2016; Pouliot 2019).

1.1.1 Macropods, and particularly the kangaroo, are amongst the most iconic and internationally recognisable native Australian species (Harrington et al. 1984; Haywood 1995; Olsen 1998; Steffen et al. 2009; Hatton and Thompson 2010; Simmons 2017; Elligott et al. 2020). Historically, they have been regarded as among the "strangest" of all mammals and have been considered relatively "primitive" insofar as they display some archetypical features other mammals have lost during their evolution (Stonehouse 1977; Dawson 1995; Heinsohn 2010; Dawson 2012). For example, early accounts describe them simply as "a very large leaping rodent" (Archer and Kirsch 2006).

x



ABOVE: Word cloud developed during public consultation on the new Code of Practice ('COP') indicating common immediate responses to the word "kangaroo" (Sharp and McLeod 2020).

1.1.2 Prior to the introduction of ungulates (i.e., domestic animal species farmed for their flesh, fibres or bodily fluids), macropods were Australia's dominant marsupial herbivore (Ramp et al. 2013). They perform an integral role

1.1.2 in natural ecosystems and play an important role in the promotion of native vegetation regeneration Today, they are recognised as Australia's top native herbivore and are considered important ecosystem engineers insofar as they play a vital role in biodiversity maintenance (Jones et al. 1997; Wilby et al. 2001; Iles et al. 2010; Ramp 2013).

2.1 Members of the kangaroo superfamily vary in characteristics dramatically. In size, they range from less than 0.5kg to over 80kg and can be found in diverse environments ranging from wet temperate forests, arid plains and monsoonal tropics (Tyndale-Biscoe 2005; Newsome 2016). Though they can travel vast distances and were once considered to be nomadic, it is now known that kangaroos and other macropods generally choose to live in one area and essentially call it "home" (Laurance and Laurance 1996; Viggers and Hearn 2005; Cowan et al. 2020; Dawson 1995). These families are known as "mobs" and can range from small groups to over several hundred individual animals (Hume et al. 2019). These mobs are known to coexist peacefully with other macropods and other species (Kaufmann 1975).

2.1.1 Within the family structure, juveniles groom and play with mothers (Hume et al. 1989). Pairs are often more frequent than individual animals, a fact that experts believe indicates a gregarious and social tendency that has been historically underestimated (Kaufmann 1975). This is further shown by other social behaviours, such as nose touching or sniffing, which both build unity and decrease friction within the mob (Russell 1970; Chapman 2003). Similarly, bonding between mother and daughter is known to contribute to social cohesion and mob perpetuation (Kaufmann 1974; Dawson 1995). The latter is particularly important given the high mortality rates and low reproductive success evidenced over their lifetimes (Bilton and Croft 2004).

2.1 The following submission intends to provide the Committee with a series of considerations, each based on sound science, that indicate that the killing of kangaroos is unnecessary, cruel and incompatible with available evidence. We believe that the NSW Government must urgently end all programs - commercial and non-commercial - that involve the killing of kangaroos.

2 RESPONSE TO THE TERMS

Term A: historical and long-term health and wellbeing indicators of kangaroos, and other macropods, at the local, bioregional and state levels, including the risk of localised extinction in New South Wales

A1 Since the early colonial era, kangaroos have been killed for a range of reasons, including commercial and recreational (Croft 2005a; Boom and Ben-Ami 2010; Ben-Ami et al. 2014; Cushing 2016). Kangaroos have been described as the penultimate species embodying early European reactions to Australia's unique nature and ecology: simultaneously threatening, unfamiliar, and fascinating (Olsen 1998). Colonial interest led to them being kept as pets, put on display and exported as curios whilst they were synchronously hunted for public consumption (Orpen 1836; Ritvo 2004; Plumb 2010; Taylor 2014). The impact of European invasion on kangaroos and other macropods has led researchers to sequence their histories in terms of pre- and post-European influence (Boom et al. 2012).

A1.1 The coordinated killing of kangaroos began "at exactly the same time" that they were first identified by colonists (Gelder and Weaver 2018). Pragmatism was the initial impetus as kangaroo meat provided an accessible food source for emerging colonies (Norman and Young 1980; Boom and Ben-Ami 2010; White 2013). Soon, they were formally classified and demonised as problematic and expendable "pest" species (Boom et al. 2012). The definition of such a species as "an animal that conflicts with human interests", particularly valued resources, is appropriate and fitting for both the colonial and contemporary period (Olsen 1998).

A2 The development of the commercial industry assisted livestock producers by reducing competition between kangaroos and sheep for vegetation (Livanes 1971; Kirkpatrick and Amos 1985; Robertshaw and Harden 1989; Clark et al. 2018). Hunting clubs were formed to hunt kangaroos for recreation and a special breed of "kangaroo-dog" was developed to assist in the sport (Arthur 1894; Leighton 1978; Denny 1982; Olsen 1998; Gelder and Weaver 2019; Gelder and Weaver 2020a). These hunts provided European settlers with a substitute for the traditional fox hunts of England (Croft 1991).

A2.1 The hunting of kangaroos quickly became a common pursuit, something akin to a social activity, so much so that it became a popular subject of colonial artists (Gelder and Weaver 2020b). Famed biologist Charles Darwin and members of the British royal family joined in a kangaroo hunt in the 1800s (Croft 1991; Franklin 2006). Such a pastime was considered an enjoyable and effective way to consolidate settler ownership of large properties and was "a triumphant announcement of the absolutely dispossession of Aboriginal people" (Oxley 1820; Hornadge 1972; Gelder and Weaver 2020a).

A2.2 By 1997, it was estimated that approximately 3 million kangaroos were killed each year (Sinclair et al. 1997). The commercial industry continues to operate in order to profit from the subsequent manufacture of products or the sale of their flesh and fibres (Boom et al. 2012a). Though the term “cull” is often used to describe the lethal actions taken against the species, this introduces an ideological bias that connotes necessity or some degree of ecological stewardship or benevolence (Martin 1986).

A3 Attitudes to animals, both native and introduced change with time, context, and circumstance. A prime example is “the ever-changing fortunes of the kangaroo” (Olsen 1998). Animal Liberation contends that without urgent legislative reform and an evidence-based, effective, and informed mitigation strategy and plan, there is a real and present risk of extinction of kangaroos and other macropods in NSW at local, bioregional and state levels.

A3.1 The historic and long-term and wellbeing indicators of kangaroos and other macropods have continued to highlight they are in serious trouble. Since European settlement, Australia has acquired an appalling record and reputation with regards to its management, protection of and approach to the welfare of our environment, environmentally sensitive resources, and animal welfare standards. This is notably so with Australian native fauna and flora species. This shameful Australian history is exemplified by our treatment of native animals, such as kangaroos and wallabies, who are intrinsically connected to the Australian landscape and 'country', including inter-connecting ecosystems.

A4 The Australian 2019/2020 bushfires which ravaged several states, claimed an estimated 3 billion native animals, including kangaroos and wallabies (Slezak 2020; WWF-Australia 2020a). It will be many months, possibly years before we have accurate data to confirm the final toll on our kangaroo and wallaby populations, their habitat, and their ability and capacity to survive during future years (Anon. 2020; WWF-Australia 2020b).

A5 NSW has a shameful record in the lack of protection for our native animals. In June 2018 the NSW government announced changes to the way kangaroos are managed as part of a package of drought relief measures (Henderson 2018). Then in January 2019, the NSW south east kangaroo management zone was expanded to include Bombala, and from January 2020, the Griffith commercial kangaroo management zone will also be expanded east to the southeast commercial zone and south to the Victorian border (Anon. 2019; DPIE 2019).

A6 Government continues to use flawed methodology to monitor and record kangaroo and wallaby populations by crude counting to form the basis for commercial harvesting and pest management to suit

A6 farmers. To the best of our knowledge, Australia still has no ecological conservation plan. Government and industry alike continue to proclaim (without evidence) that kangaroos and wallabies are "plentiful" and not endangered — just as governments did with a healthy population of now vulnerable, at-risk, and endangered koalas in the 1920s (Jurskis 2017; Roe 2017; Johnson et al. 2018; KIAA 2020).

A6.1 We are extremely concerned about the failure of the revised and still draft Code to address the evidenced issues associated with female kangaroos or wallabies and their young, the highly questionable population counting methodology and shooting quotas, together with the frequently ambiguous and low "minimum" standards in an environment which lacks adequate oversight, monitoring, and enforcement. There is minimal evidence that is credible or peer-reviewed to confirm kangaroos or wallabies are overabundant or in 'plague' proportion.

A6.2 The NSW Department of Planning, Industry and Environment ('DPIE') claim that they are responsible for protecting, conserving, and managing all protected or threatened species and their habitats (DPIE n.d.-a). Contrary to this responsibility they also claim that the primary goal of its kangaroo management program is conservation, to ensure individual kangaroos are 'harvested' in a humane way and that populations remain ecologically sustainable (DPIE n.d.-b; McLeod 2010).

A7 A lack of evidenced research in addition to the current inadequate lack of policing and enforcement means we have no meaningful or accurate current measure of the true extent of cruelty and suffering of kangaroos and wallabies caused by commercial and non-commercial shooting, the climate emergency, and other human-caused factors (Ben-Ami 2009; Boom et al. 2012; Ben-Ami et al. 2014; Finn and Stephens 2017; RSPCA Australia 2020). The "harvesting" of Australian native species is an abhorrent concept and a shameful practice that cannot be justified on any ethical, ecological or sustainable grounds. It has been shown to be anything but "humane" for adult kangaroos or wallabies and their young (Boom and Ben-Ami 2011). Shooting for non-commercial purposes including hunting and illegal hunting has even less oversight and we have no real or accurate grasp on the animal welfare implications, the lack of compliance with licensing requirements or the numbers involved.

A7.1 Further, in spite of laws that prohibit the killing of native species, exemptions, and government policies via management plans and licensing invariably override animal protection laws; for example, in NSW, a "license to harm" can be readily obtained by providing and permitting for the killing of hundreds of thousands of kangaroos (OEH 2015; Simmons 2017)

A8 In 2018, the NSW Government introduced changes that significantly altered restrictions on non-commercial killing under the guise that making it easier to shoot kangaroos helped landholders during the drought (DPIE 2019). The removal of checks and restrictions now allows volunteer shooters to kill kangaroos on private land without a licence and it was no longer required to keep the physical tags that kept track of the number of animals shot (DPI n.d.-a; Ellicott 2018). By January 2021, 98% of NSW was declared to be drought-free or recovering (DPI n.d.-b). The legal restrictions on the non-commercial shooting of kangaroos have not been reinstated.

A8.1 Studies have found that "a high female harvest" increases kangaroo vulnerability to random yet predictable environmental events (e.g., drought) and "may lead to extinction" (Hacker et al. 2004). Before being allowed to kill kangaroos, wallaroos or wallabies on their property, landholders are supposed to have tried non-lethal 'control' measures (DPIE n.d.-c). However, the absence of monitoring prevents any oversight of this "last-resort" policy and whether it is enforced by government agencies.

A8.2 Animal welfare laws are supposed to apply to macropods, but there is no evidence of these laws being enforced against shooters at the point of killing where the suffering is inflicted. In the last reporting period (2019), no prosecutions of shooters under NSW animal welfare laws were reported.

A9 While national codes of practice ('COPs') for shooting kangaroos and other macropods on a commercial and non-commercial basis exist, they are inadequate and only include minimum standards that completely conflict with "best practice". Both COPs allow inhumane practices, such as shooting mother kangaroos and killing young joeys by blunt force trauma. The COPs don't require shooters to catch and euthanase mobile young-at-foot joeys when their mothers have been killed and have no legal effect in NSW (NSW animal protection laws do not refer to the kangaroo shooting COP). Compliance with the code may be a condition on commercial shooting licences, but this does not apply to volunteer shooters as they are no longer required to obtain a licence.

A10 In spite of the ongoing claims, there is little credible or peer-reviewed evidence that kangaroos and other macropods are overabundant or in plague numbers. In the event that they were, the causes should be investigated and acknowledged. Ultimately, it is human activity that must be modified to manage the impact we have on the environment and the wildlife populations it supports. Only if absolutely necessary, for the welfare of the kangaroos and other macropods, should non-lethal measures directed towards the animals themselves be adopted (e.g., fertility control).

Term B: the accuracy with which kangaroo, and other macropod, numbers are calculated when determining population size, and the means by which the health and wellbeing of populations is assessed

B1 As we are not trained conservation biologists and have not done significant research on population monitoring, we do not have the requisite expertise to provide the Committee with a response to Term B.

B1.1 Animal Liberation does, however, wish to express our concerns regarding what is widely viewed as flawed counting methodology used for population assessment and the corresponding quotas established by Government. The methodology has consistently been challenged by experts and continues to lack transparency,

B1.2 We would further contend that until an evidence-based and peer-reviewed assessment is undertaken to determine an accurate loss of macropods during the 2019/2020 mega-fires, no quotas should be set and the killing of all kangaroos and wallabies for commercial and non-commercial purposes, must cease.

Term C: threats to kangaroo, and other macropod, habitat, including the impact of: (i) climate change, drought and diversion and depletion of surface water sources, (ii) bushfires, (iii) land clearing for agriculture, mining and urban development, (iv) the growing prevalence of exclusion fencing which restricts and disrupts the movement of kangaroos

C1 Despite having one of the worst extinction rates in the world and the development of environmental legislation intended to protect biodiversity and prevent further species loss, studies have found that there is little evaluation of its efficacy despite ongoing destruction or fragmentation of habitat critical for threatened species survival (Ward et al. 2019). Others have challenged the outcomes of a policy intended to control land clearing, noting that despite their enactment rates remain significant (Evans 2016).

C1.1 Agriculture has been positively identified as a key stressor (Hatfield-Dodds et al. 2015). Habitat loss through land clearing for agriculture is a leading threat to terrestrial biodiversity in Australia (Aplin 2005; Millar and Roots 2012; Neldner 2018). It is a primary contributor to low variations in the abundance and diversity of fauna and has been implicated in several species extinctions (Abensperg-Traun et al. 1996; Short 1998; Johnstone et al. 2010).

C2 Australia has sadly become notorious as a nation that exploits to extinction our natural environment, resources, wildlife, and ecosystems for personal, economic, and commercial gain without any thought to the long-term risks, impacts, devastation, and consequences. Climate change and habitat loss are key threatening processes driving global biodiversity loss (Mantyka-Pringle et al. 2012). These issues are becoming increasingly consequential as species attempt to adapt to changing climates in increasingly fragmented landscapes (Wolstenholme and Pedley 2021).

C2.1 Though most studies reporting the impacts of climate change or habitat loss and fragmentation on biodiversity are often examined each in isolation, the combined effects are "greater than those estimated individually" (Brooks et al. 2002; Fahrig 2003; Williams et al. 2003; Parmesan 2006; de Chazal and Rounsevell 2009; Mantyka-Pringle et al. 2012).

C3 Animal Liberation contends credible scientific evidence demonstrates kangaroos and macropods continue to face substantial and avoidable threats. Science confirms our planet is experiencing its sixth mass extinction, and Australia is in danger of perpetuating its record as one of the worst destroyers of animal and plant species (Ceballos et al. 2017; Wintle et al. 2019; Ceballos et al. 2020; Shivanna 2020). While the list of vulnerable, at-risk, and endangered species continues to grow, critics have maintained that the ongoing extinction crisis is demonstrably due to the Federal Government's inaction and poor policy framework to protect Australia's critical habitat (Sanda 2018).

C3.1 A study based on a review of 24,000 scientific papers and published by leading environmental scientists, found that land clearing and over- logging were among the greatest threats to terrestrial species in the Oceania region, that agriculture has changed or destroyed half the woodlands and forests of the country, and that more than two-thirds of the remaining forest is significantly degraded by logging (Kingsford et al. 2009). These woodlands and forests provide the critical habitat, including the provision of safety, feed, and water sources, for a wide array of native animals.

C3.2 Lead author and professor of environmental science at the University of NSW, Richard Kingsford, maintained that "our region has the notorious distinction of having possibly the worst extinction record on earth [and that this trend] is predicted to continue without serious changes to the way we conserve our environment". The publication of the study coincided with a warning issued by the World Wildlife Fund ('WWF') that raised the alarm over figures showing Australia lost 300,000 hectares to land clearing in the year to 2007; the equivalent of clearing about 5 million suburban house blocks (Johnson et al. 2007; Wilkinson

C3.2 2009). Alarmingly our destructive actions have continued with ongoing logging, land clearing, animal agriculture practices, mining and water extraction (Clifford 2021; Cox 2021a; Cox 2021b). These threats have been significantly compounded by the winding back and repeal of animal and environmental protection laws (Cox 2020a; Hannam 2020a; Hannam 2020b; Davies 2021).

C4 Currently, there are more than 1,700 threatened species and ecological communities in Australia (DAWE n.d.-a). However, the government has only identified and supported five critical habitats (Cox 2018; Foley 2020). In order to preserve and protect our native wildlife, far more should be listed. In fact, no critical habitat has been listed since 2005 (Cox 2020b). Jess Abrahams, an Australian Conservation Foundation ('ACF') healthy ecosystems campaigner, explained in a statement: "Our current law provides patently inadequate protection to prevent the destruction of critical habitats" (Sanda 2018).

C4.1 In 2019, a report published by the Wilderness Society assessed the conservation status of federally listed forest-dwelling vertebrate fauna species affected by logging and associated infrastructure development across Australia's regional forest agreement ('RFA') regions in New South Wales, Victoria, Tasmania and Western Australia. The report identified 48 federally-listed threatened species of forest-dwelling vertebrate fauna living in areas subject to state-run logging operations (Wilderness Society 2019).

C5 Over the most recent years, there has been a progressive shift in public awareness and interest, attitudes, and expectations resulting in a global groundswell of public concern manifest in environmental and animal welfare movements, organisations and public protests; a great deal of which has been picked up by mainstream media. Such coverage and the dissemination of personal impacts and first-hand experiences of the cumulative impacts triggered by the climate emergency, including incidents of protracted drought, devastating bushfires, polluted and diminished water supply, and human and animal suffering and death, have increasingly forced us to review and reevaluate how we live and co-exist with our environment, resources and other animal species.

C5.1 The bushfires that commenced in September 2019 and ravaged vast swathes of several states have already claimed or displaced over 3 billion native animals, including kangaroos and wallabies (Slezak 2020; WWF-Australia 2020a). It will be many months, possibly years, before we have accurate data to confirm the final toll on kangaroo and wallaby populations, including damage to their habitat and future viability.

Climate change

C6 Australia has one of the most variable climates in the world (Nicholls and Wong 1990). It has been mostly arid for as long as people have been present on the continent (Head et al. 2014). Climate change is a key contributor to worsening environmental conditions in Australia, including droughts (Steffen 2015).

C6.1 Though climate change has been identified as signaling "an impending environmental catastrophe" for some time, research indicates that most of the changes seen over recent decades will continue into the future (Williams et al. 2003; CSIRO 2020). As this trend continues, native species will continue to face habitat degradation, population declines and extinction (Reisinger et al. 2014). These threats are in conjunction with those posed by land clearing and the direct and cumulative impact this poses (Mantyka-Pringle et al. 2012).

C7 Land-use change poses the single greatest threat to species and ecosystems worldwide" because it leads to significant habitat loss, fragmentation and ecological degradation (Vié et al. 2009). Fragmentation of habitats is one of the driving factors of species decline and extinction and is an expression of the impact that anthropogenic alternations to the structure of the landscape cause to ecological communities (Fahrig 2003; Fischer and Lindenmayer 2007; Gibson et al. 2013). Fragmentation refers to the division of large habitats into smaller, more isolated fragments and is the process by which habitat loss primarily occurs (Didham 2010).

Land clearing

C8 Though this is a global issue, in Oceania habitat loss represents a chief threat to over 80% of all threatened species (Kingsford et al. 2009). Given the rate of species decline in Australia, pressure on biodiversity is a primary national problem often felt at state or local levels (Preece 2017). It has been recognised as "the greatest threat to threatened species" (Neldner et al. 2017).

C8.1 Australia's terrestrial environment has been markedly altered since European invasion (Rolls 1997; Bradshaw 2012; Cook 2021). By the 1890s, a substantial amount of land had been cleared for agriculture (Lunt and Spooner 2005). The clearing of land remains a significant threat to a range of values, including biodiversity and ecological health, to this day (Wintle et al. 2005; Evans 2016). In 2016, over 400 ecologists, including leading conservation scientists, issued a declaration warning of the devastating impacts land clearing has on Australia's imperilled biodiversity (SCBO 2016).

Causes of fragmentation and habitat loss

C9 Most land appropriated for agriculture in Australia is used for the extensive grazing of cattle or sheep (Saltzman et al. 2011). In NSW, agriculture is "the main driver of clearing" (Kilvert 2020). The sector's impact has increased following reforms permitting further clearing. For example, following the Berejiklian government's loosening of laws in 2016, approvals for clearing in NSW increased 13-fold (Hannam 2020a). In 2018, an area 200 times the size of Sydney's CDB was cleared (Hannam 2020b).

C9.1 Much of the continent has low soil fertility (Looney 1991; Orton et al. 2018). This has led to agriculture occurring in the rare fertile and well-watered areas (Anderson et al. 2009). Rangeland grazing and European modes of agriculture are both land uses not present on the continent prior to invasion and colonisation (Henzell 2007). Each was driven by "relatively unrestricted access to land" stemming from the marauding colonial mentality expressed in the doctrine of terra nullius (Banner 2005; Haveman 2005; Pettit 2015; Lesslie and Mewett 2018). Each has since caused considerable damage to the landscape and has contributed significantly to the underlying environmental problems with which climate change is interacting (Young 2000).

C10 Fragmentation and habitat loss threatens biodiversity, impairs the functioning of ecosystems and have been identified as a key contributor to anthropogenic climate change (Reside et al. 2017). Experts have warned that unless the destruction and devastation of remnant native vegetation are halted, kangaroos and other native species will continue to face extinction (Arnold 1990).

Recognition of the threats posed by land clearing: state level

C11 Clearing of native vegetation was listed as a key threatening process ('KTP') on schedule 3 of the Threatened Species Conservation Act 1995 ('TSC Act') in September 2001 (DPIE 2017). The listing identifies several impacts caused by clearing, including:

C11.1 habitat destruction causing the loss of biodiversity and potential total or local extinction;

C11.2 fragmentation causing limited gene flow, reduced ability to adapt to environmental changes and loss or severe modification of interactions between species;

C11.3 habitat disturbance resulting in the establishment or spread of exotic species and;

C11.4 loss of leaf litter, removing important habitat for a wide range of species.

C12 In 2016, the TSC Act was replaced by the Biodiversity Conservation Act 2016 ('BC Act'). One of the purposes of the BC Act is "to assess the extinction risk of species and ecological communities, and identify key threatening processes". Under Schedule 4 of the BC Act, land clearing is included as a KTP under "clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process)".

Recognition of the threats posed by land clearing: federal level

C13 Upon receiving a nomination to include land clearing as a key threatening process ('KTP'), the precursor to the Threatened Species Scientific Committee ('TSSC') acknowledged that the Endangered Species Scientific Sub-committee ('ESSS') found that "land clearance has been the most significant threatening process in Australia since European settlement". However, under relevant legislation at the time, the Endangered Species Protection Act 1992 ('ESP Act'), it was not possible to list land clearance as a KTP as it occurs in and outside Commonwealth areas (DAWE n.d.-b).

C13.1 Under the contemporaneous legislation, the Environment Protection and Biodiversity Conservation Act 1999 ('EPBC Act'), this restriction was removed. Concerning the impacts posed by land clearing, the TSSC re- affirmed the conclusions of the ESSS and advised that it met the relevant requirements under the EPBC Act (i.e., s188(4)(b), s188(4)(b) and s188(4)(c)) (DAWE n.d.-b).

C13.2 The original ESSS assessment provided advice concerning the feasibility of a threat abatement plan ('TAP') for land clearing as a KTP. Such plans are developed when it is considered that their application "is a feasible, effective and efficient way to abate the process" (DAWE n.d.-c). In considering its viability, the TSC cited the "many changes in land clearing policies and regulations" since the nomination was made, including the introduction of the Native Vegetation Conservation Act 1997 ('NVC Act') in NSW, and concluded that a TAP "would not contribute to any additional threat mitigation over and above current initiatives" (DAWE n.d.-b). Despite this, "land clearance" is included as a KTP under the EPBC Act (DAWE n.d.-d).

Exclusion fencing

C14 Removing barriers and restoring accessibility to landscapes is a response to the challenges engendered by habitat fragmentation and loss (see subsection C2). As such, reconnecting fragmented landscape in response to habitat loss is a major challenge and priority in biodiversity conservation (Lindenmayer et al. 2008). It is especially critical in areas that have experienced considerable

C14 change via agricultural expansion or otherwise undergo intensive management (Wolstenholme and Pedley 2021). For example, biodiversity corridors are a way managers engineer reconnections within such landscapes (Soulé and Terborgh 1999; Fitzsimons et al. 2013). However, commercial interests often lead to the erection of exclusion fencing intended to keep unwanted wildlife out of properties and away from the resources contained within (Hampton et al. 2021). Though fences are described as providing long-term management solutions while lethal methods often require continuous short-term responses, there is a range of welfare issues involved in their use (Bradby et al. 2014; NSW Government 2020).

C14.1 Exclusion fencing has been used across Australia in various contexts to prevent predation, environmental damage or resource acquisition by unwanted wildlife for over a century (McKnight 1969; RSPCA Australia 2019). It remains a common tool used to mitigate economic impacts, including eliminating predation by dingoes on farmed animals, preventing crop- grazing by emus and controlling the grazing pressure of macropods (Smith et al. 2020). Its use, however, incurs costs to the welfare of target and non-target animals and the environment itself.

C15 Fencing has become an increasingly used method of kangaroo control. Many exclusion fences erected for kangaroo control have their origins in products marketed for dingo control (NSW Government 2020). Historically, some of these fences have been described as "kangaroo and dog-proof" (Pickard 2007). They are primarily used to reduce damage to crops or pasture where shooting isn't considered feasible (DEC 2009). These are generally erected around clusters of properties (Wilson and Edwards 2019).

C15.1 Kangaroos and other macropods often experience unnatural disruptions and restrictions to their movement and can suffer painful or fatal injuries from different types of fencing. The increasing use of exclusion fencing can severely limit their ability to travel and may trap animals. The use of barbed wire on traditional fencing, predominately in rural areas, often leads to animals being caught, wounded, maimed and enduring significant fear and suffering before dying. According to the RSPCA, many animals "are not killed outright" and "endure a slow painful death" (RSPCA Australia 2019).

C15.2 Kangaroo fencing is considered expensive to erect and maintain (Olsen and Braysher 2000). Though some types, such as electric fencing, are less expensive, these often require ongoing maintenance (Edwards et al. 1994). Though the height of the exclusion fencing and the size of the mesh used often determines the species of animal which are caught, fencing for kangaroos will also exclude other non-target wildlife and thereby involves the threat of imposing adverse impacts on their populations (Shepherd

C15.2 and Caughley 1987). Due to their size, kangaroos are prone to their limbs being caught on the fence with them being trapped and injured, often fatally, on the fence or on the barbed wire (Austen n.d.). Wallabies, emus, echidnas and goannas can also be trapped and frequently die.

C15.3 Fencing erected by animal agribusiness is the most dangerous and causes the most harm. Used to control grazing access on land used for farmed animals raised for private commercial profit, exclusion fencing provides a lethal barrier for other herbivores, including native species who are denied access to their natural food source. In addition to other lethal measures, including trapping and poison baiting, the use of exclusion fencing is openly encouraged by animal agribusiness in order to kill native and introduced animals or to increase productivity. The most obvious example is the use of these deadly fences by sheep farmers to kill dingoes.

C16 Intentionally restricting animals' access to food, water and shelter are not accidental. To control kangaroos, the NSW Government encourages restricting kangaroos' access to water through the use of exclusion fencing (NSW Government 2020). This may result in kangaroos or other non-target species enduring death by dehydration, starvation or exposure (Statham and Statham 2009; Bradfield 2017). Because exclusion fencing is increasingly sturdier and longer than ever, the checking of fence boundaries is less frequent and animals are rarely found alive. Such fencing also poses a risk to animals when fleeing stressful environments or circumstances. During this time, they are far more likely to injure themselves when trying to move through a fence. This may occur when they are being chased, including from human threats, when they are desperately seeking food or water, or when they are trying to escape natural disasters such as bushfires. Across Australia, the suffering of animals trapped in and around exclusion fencing is a prominent emerging animal welfare issue (Edwards 2010).

C16.1 In spite of posing a threat to many hundreds of other animals, notably native species, the NSW Government considers exclusion fencing a type of kangaroo management tool that gives landholders "complete control of grazing pressures" (NSW Government n.d.). The NSW Government provides information on how animal agribusiness should trap, starve and kill animals with exclusion fencing, and they also actively fund this cruelty using public money.

C16.2 A 2016 Government program provided animal agribusiness with exclusion fencing grants of up to $1200 per km (NSW Government 2017). Further details of this program (including total funds distributed and total fencing erected) is not publicly available. However, matters involving animal welfare concerns were not included in the

C16.2 application form Local Land Services ('LLS') required from businesses for the grant. The NSW Government also helped fund the giant Gilgunnia Cluster Fence project, the biggest exclusion fencing project in NSW, including 22 properties south of Nymagee (located 100km west of Condobolin in western NSW) (Gibson 2017). The 26 landholders responsible for the fence gained approximately $560,000 in funding to assist with erecting 210km of exclusion fencing, encompassing an area of around 500,000 acres (LLS n.d.). When the project public day arrived, around 500 pigs had already been found painfully trapped against the fence (Ellicott 2017).

C17 Animal Liberation believes fencing which causes harm and cruelty to animals should be considered to be an offence under existing NSW animal cruelty laws, and that all fencing causing such harm should be removed and prohibited.

Term D: current government policies and programs for kangaroo management, including: (i) the method used for setting quotas for kangaroo culling, (ii) the management of licences to cull kangaroos, (iii) temporary drought relief policies and programs

D1 Concerns about the appropriateness of the methods used to govern the killing of kangaroos have existed for some time. In 1852, some colonists began to express concerns about the issuing of hunting licences "so indiscriminately" that kangaroos became "in all inhabited districts an extinct animal" (Bonyhady 2000). Today, there continues to be "considerable disagreement" regarding the efficacy of quota and licensing systems (Choquenot et al. 1998).

D2 The areas in which kangaroos can be commercially killed in NSW are divided into kangaroo management zones ('KMZs') (DPIE n.d.-b). These KMZs are used to "allocate and issue harvesting quotas" which stipulate the number of kangaroos of each species that can be killed in each zone (DPIE n.d.-c). Not all species can be killed in each zone (OEH 2015). Quotas are reached using estimates of the population from annual population monitoring and reporting. The DPIE maintains that these methods are used to ensure that it can "establish appropriate quotas for harvesting to maintain ecologically sustainable populations of kangaroos" (DPIE n.d.-a). The Handbook for Kangaroo Harvesters states that the quota is quantified each year from "population estimates derived from aerial surveys" (OEH 2015).

D2.1 The killing of any species of wildlife, commercial or otherwise, requires that transparent and accurate monitoring of abundance is practiced in order to ensure that "viable populations […] are sustained" (Grierson and Gammon 2008). Figures indicate that this is not the case.

D2.1 In the decade 2000 to 2010, over 28 million kangaroos of four species were killed from a combined quota of 51.8 million the commercial zones. In a decade impacted by drought, the populations of those four species declined from a total of 57.4 million in 2000 to 25.2 million in 2010 (Ramp et al. 2013).

D3 Australian studies have concluded that some methods, though effective, are impractical based on the costs required to conduct them. For example, the use of "trained observers" using fixed-wing transects has been cited as providing inaccurate figures (Grierson and Gammon 2008).

D3.1 The DPIE acknowledges that reliable population estimates are fundamental. However, the apparent impetus for this is "ensuring the sustainability of the commercial harvest" (DPIE n.d.-a). The RSPCA maintains that "kangaroo management plans treat kangaroos as a sustainable resource available for commercial use, rather than making a decision for control as a result of examining their impact on the environment". It cites the threats posed by climate change, advising that the impacts it engenders causes significant concern about "the impact of the current sustainable use approach" (RSPCA Australia 2020).

D3.2 Aerial surveys are a commonly conducted method used to estimate the abundance of wildlife and/or the rate of change (Steinhorst and Saumel 1989). There is a range of wildlife census and sampling problems. For example, populations may be distributed in a non-random manner (i.e., they favour specific types of habitat not distributed in a random manner) or they may be clustered due to their gregarious nature. Each of these have been identified as making sampling difficult (Lewis 1970).

S121 and S123 licences

D4 Under section 92 of the National Parks and Wildlife Act 1974 ('NPWA'), the chief executive of the Office of Environment and Heritage ('OEH') "shall have the authority for the protection and care of fauna". This authority, and its corresponding responsibility, includes kangaroos.

D4.1 Under sections 121 and 123 of the Act, however, it is possible to seek and obtain a licence to harm native fauna in NSW. Under section 121, the Director General may issue a licence authorising a landholder or occupier to harm, or otherwise permit a person to harm, a specified number of kangaroos. This sections enables the OEH to issue commercial and non-commercial licenses. Each are available upon application. Under section 123, the Director

D4.1 General may issue a licence allowing an "Occupier Harvester" to shoot and kill kangaroos on properties they own or manage.

D4.2 Relating to non-commercial killing, the RSPCA maintains that quotas "do not relate population reduction directly to damage mitigation [non-commercial shooting]" (RPSCA Australia 2020).

D5 Concerns associated with s121 and s123 licences are amplified by the ease with which it has become possible to obtain permission to kill kangaroos without verified or independent assessment.

Term E: current government policies and programs in regards to 'in pouch' and 'at foot joeys' given the high infant mortality rate of joeys and the unrecorded deaths of orphaned young where females are killed

E1 During commercial and non-commercial kangaroo killing programs the dependent young of shot females must be euthanased. This is carried out to preempt suffering and because they would be unlikely to survive without their mothers (McLeod and Sharp 2014). The recommended method used to kill depends upon the age of the orphaned joeys.

E1.1 The method used to kill unfurred pouch young is decapitation or blunt force trauma. The method used to kill partially furred or fully furred in- pouch young is blunt force trauma to the head. The latter is also the recommended technique for joeys at the "in/out stage" of development. Recommendations indicate that young-at-foot joeys are to be killed by gunshot (McLeod and Sharp 2014).

E2 A contemporary study maintains that "bringing the head into contact with a stationary object, such as the tray of the shooters' vehicle, is the most effective method available" (McLeod and Sharp 2014). However, due to the negative public perception associated with these techniques and the belief that they are "cruel and violent", alternatives have been investigated (DPI 2009; McLeod and Sharp 2014; Hampton 2018). These include the use of a captive bolt gun (McLeod and Sharp 2014).

E2.1 Captive bolt guns are a technique used in a range of industries to kill or render animals unconscious (Cohen et al. 2020). Similar devices are used by farmers, abattoir employees or laboratory technicians (RSPCA Australia 2019). The device includes a retractable bolt powered by a spring, air compression, gun powder or a blank cartridge (Hampton 2018; Cohen et al. 2020). Captive bolt devices

E2.1 are placed on a specified area of the animal's head and triggered (Grandin 2020). Studies have indicated that a gunpowder-powered device can deliver a blow up to 40 times greater than other devices (Hampton 2018). Studies evaluating the efficacy of spring-powered captive bolt guns, however, have recorded insensibility in live pouch young in only 13 out of 21 trials (Sharp et al. 2017).

E2.2 Those used to kill orphaned joeys are generally a device similar to those used to stun small rabbit-sized animals (DPI 2009). When used to kill pouch young, the captive bolt can be applied in the pouch of the deceased mother (Hampton 2018). Studies have indicated that a gunpowder-powered device can deliver a blow up to 40 times greater than other devices (Hampton 2018). Studies evaluating the efficacy of spring-powered captive bolt guns, however, have recorded insensibility in live pouch young in only 13 out of 21 trials (Sharp et al. 2017).

E3 Several assessments of the humaneness of the techniques used to kill these orphans have been undertaken. For example, a survey conducted in NSW during the mid-1980s found that "different shooters are making varied and ill-founded assumptions about the biology and reproductive characteristics of does [mothers] and the likely survival prospects of orphaned joeys" (Young and Delforce 1986). Recent studies have documented anecdotal reports indicating that "harvesters either **cannot** euthanise young-at-foot (e.g., they do not see them or they flee) or **will not** (e.g., they do not think it is necessary)" (Sharp and McLeod 2016).

E4 In the decade beginning in 2000, approximately 28 million kangaroos and wallabies were killed with an estimated "bycatch" of up to 8 million joeys (Hacker et al. 2004). The killing of these orphans represents one of the largest welfare issues concerning wild animals in Australia. It is the source of much of the public concern over the commercial industry (RSPCA Australia 2020a). In 2012, male-only harvesting was introduced by some processors based on these public concerns (Borda 2018). Some processors continue to advertise this initiative as a solution to the problems associated with the killing of orphaned joeys. This has been identified as an attempt to invigorate the social licence of the industry following a realisation that public concern about the killing of joeys threatened its viability (Hampton et al. 2020).

E4.1 The RSPCA originally suggested male-only killing as a method to avoid cruelty to joeys by ending the killing of female kangaroos (RSPCA 2002). Generally, commercial shooters prefer to kill large males (Pople 1996; Hacker et al. 2003). However, in the long-term, it is possible that male-only killing will lead to higher average population densities and no reduction in the grazing pressure often cited as a key motivator for the killing to occur (Hacker et al. 2004).

E4.2 Male-only killing may also skew the sex ratio in favour of females, thereby increasing the rate at which populations recover from the impacts of the industry or environmental pressures, such as drought (Hacker et al. 2004; McLeod et al. 2004). An additional consequence of the male-only strategy is that "pastoralists have lost confidence in the capacity of the commercial industry to manage the impacts" of kangaroos (McLeod and Hacker 2020). That this may influence some landholders to recruit the services of a volunteer shooter requires consideration, especially relating to the known threats to welfare that this may incur (RSPCA Australia 2020).

E5 Ultimately, the only solution to concerns about the welfare of kangaroos is an enforceable prohibition on their killing.

Term F: regulatory and compliance mechanisms to ensure that commercial and non-commercial killing of kangaroos and other macropods is undertaken according to the Biodiversity Conservation Act 2016 and other relevant regulations and codes

F1 Regulatory instruments, such as the relevant regulations and codes (discussed further below), are crafted to enable a standardising procedure that allows methods, practices and outcomes to be evaluated and administered. Many of these are operationalised via reference to compliance requirements in legislation (Manning et al. 2021). The inclusion of an ethic of humaneness exists in much contemporary regulation (White 2016). With growing public interest and concern for animal welfare, the role and efficacy of the law in regulating animal protection has become increasingly challenged (Taylor and Signal 2009; Bailey et al. 2016; Ledger and Mellor 2018). This includes animal welfare legislation and the various auxiliary documents, such as codes of practice ('COPs') or standard operating procedures ('SOPs') (Thiriet 2007).

F1.1 Critics have convincingly identified a series of significant weaknesses in the regulatory framework. Critiques include the presence of ambiguous language used in legislation, the use of non-government organisations or charities for enforcement of this area of criminal law and the leniency of punishments or penalties meted out for infringements or offences (Sharman 2002; Boom and Ellis 2009; Ellis 2010; Cao 2015; Morton et al. 2018). These amount to an "enforcement gap", wherein a disparity exists between practices outlined in regulations and actual practices of the regulations themselves (Lo et al. 2012). This means there is "an identified gap between the intentions or goals of written law and the outcomes of the enforcement process [because] the goals are not meeting the expected outcomes" (Morton et al. 2020). The chief goal

F1.1 of environmental or animal protection legislation is preventing harm to the environment or actions that cause cruelty to animals, respectively (see section 3 of the Prevention of Cruelty to Animals Act 1979, for example).

Animal welfare

F2 The impact of humans on the welfare of wild animals generates significant interest (Littin and Mellor 2005; Bekoff 2010; Fraser 2010). This is increasingly including wildlife considered "pests" and/or resources (Gill 2000; Littin 2010; Mathews 2010; Boom and Ben-Ami 2011). There is a general expectation that welfare will be considered an essential criterion in any program involving animals, including wildlife (Kirkwood et al. 1994). Several examples, including the annual slaughter of harp seals in Canada shows that popular objection to the killing of wild animals can be acute (Ben-Ami et al. 2014). National and international concern about the killing of kangaroos has been well known for some time (Commonwealth of Australia 1988).

F2.1 Assessments of what "animal welfare" means to Australians reveals that conservation, principally of native species, is the third most popular or common conception. This is reflected by the fact that cruelty against native species is the most commonly reported illegal act committed upon animals. The acts most commonly reported, for example, are often associated with illegal hunting (Chen 2016). Yet, contemporary Australian regulation of the welfare of wild animals is "marked by definitional and substantive inconsistencies" and analyses have concluded that while there is a general concern for the welfare of domestic animals which is reflected in animal welfare legislation, wild animals "tend to be excluded" (White 2013). This is notable when compared to the regulatory regimes governing the welfare of other species, such as farmed or domestic animals (Harrop 1997; White 2009). As a result, legislated protection of wild animals often "emerges incidentally" from conservation policies and not explicitly in response to a recognition of the threats outlined above (Harrop 1997; White 2013).

F2.2 This differs from animal welfare law enacted elsewhere in the world. In Australia, a generic definition of "animal" is often provided (see, for example, section 4(1) of the Prevention of Cruelty to Animals Act 1979). These animals are "nominally protected" against acts of cruelty (see subsections 5(1) and 6(1) of the aforementioned Act). Other nations, such as Great Britain, have enacted different statutes. Wild mammals are excluded from the Animal Welfare Act 2006; their protection is enshrined in the Wild Mammals (Protection) Act 1996 instead (White 2013).

F3 Welfare issues in the kangaroo industry have been recognised for some time (Commonwealth of Australia 1971; Thorne 1998; Ben-Ami et al. 2014). This has led to significant pressure to either further regulate the industry or phase it out entirely (Anon. 2008; Banks 2013; Towell 2013; McIlroy 2015; York and Bale 2017; Brewer 2019; Dahlstrom 2020; Dalton 2020; McCarthy 2020; Preiss and Cook 2021). As a result, the Australian Government has conducted many reviews into the issue and has attempted to moderate the more socially unacceptable practices through Codes of Practice ('COPs') (Commonwealth of Australia 1988).

F3.1 Despite these developments, however, the killing of kangaroos primarily occurs in remote locations and at night by shooters who often operate on their own (Thomsen and Davies 2007; Boom et al. 2013). Killing occurs at this time because it is when kangaroos are most active (Clarke et al. 1995; OEH 2011; Dawson 2012; Zhang et al. 2015). Thus, when a kangaroo is targeted, shot, and killed in a remote area at night, compliance is not policed and the noted welfare issues continue to occur (Ben-Ami et al. 2011a; Boom et al. 2012).

F4 A stated desire or intention to conserve biodiversity is often used as a justification for disregarding poor animal welfare outcomes to other animals (Fox and Bekoff 2011; Bekoff 2013). Such disregard and the institutions that permit its perpetuation stems from insufficient knowledge of how to concurrently address both issues and is rooted in firmly established positions hostile to new paradigms (Fraser 2010; Vucetich and Nelson 2007). Australia has a lengthy history of poorly planned and deleteriously executed solutions to biological problems (Ramp et al. 2013). This includes the killing of kangaroos, commercial or otherwise (Lunney 2010; Ramp 2013).

F4.1 The welfare consequences of the commercial killing of kangaroos are "considerable" (Ramp 2013). However, because non-commercial shooters are not required to pass a competency test before they are permitted to kill kangaroos, welfare concerns are amplified (RSCPA Australia 2020). Suggestions that the killing of kangaroos causes less bad welfare outcomes than those endured by farmed animals are a product of a narrow view of animal welfare and the concept of humaneness (Fraser and MacRae 2011). For example, the industry relies on relative humaneness and necessity as two key elements in its social licence to operate ('SLO'). Estimates suggest that even if over 95% of animals were killed instantly, more than 1 million kangaroos would still suffer before death. This estimate does not consider the dependent young killed when they are orphaned (Ramp 2013). Commercial kangaroo shooters have acknowledged that it is impossible to ensure a swift and efficient death after each shot. One maintains that "anyone who says they get 100% is lying" (Anon. 2016).

F5 Contemporary Australian legislation is similar to corresponding jurisprudence found in other countries insofar as some laws permit the killing or harming of animals while others protect them from the same actions (Englefield et al. 2019). Despite the limited formal recognition of animal welfare in existing legislation, many of which contain exemptions to the crime of animal cruelty if an activity is done in accordance with auxiliary policies, nature conservation law ensures that some wild species receive protection (White 2013). However, when these species are considered problematic or economic threats to productivity, such protections are removed. Studies assessing the relevant regulations or codes governing the industry have concluded that these may not be compatible with ensuring efficient or effective outcomes and participants "may not always follow the formal rules" (Thomsen and Davies 2007).

F6 Individuals engaging in the commercial killing of kangaroos must comply with the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Commercial Purposes ('COP') as a condition of their licence or permit (Commonwealth of Australia 2008a; Sharp and McLeod 2020). The current COP was published in 2008. It outlines "the standards that need to be achieved to minimise animal pain and suffering" and includes specifications for firearms, ammunition and the euthanasia of injured or orphaned animals (Sharp and McLeod 2020). Though the COP has no legal standing unless or until it is written into relevant state or territory regulations, adherence is a requirement of licenses and permits (Commonwealth of Australia 1988).

F6.1 Since the original COP was published, it has undergone amendments as required. The current COP replaced the 1985 version which was revised in 1990 (Sharp and McLeod 2020). When the Natural Resource Management Ministerial Council ('NRMMC') reviewed the 2008 code, for example, it decided that two separate COPs for commercial and non-commercial killing were required (Sharp and McLeod 2020). Additional reviews have been made following research projects conducted in 2014 and 2015 and a recent project examining the impacts of a "male-only harvesting strategy" (McLeod and Sharp 2014; Sharp 2015; McLeod and Sharp 2020; Sharp and McLeod 2020).

F6.1 The Code stipulates that those engaged in the commercial industry must ensure an instantaneous death via headshot. However, non-fatal body shots are a regular and unavoidable occurrence (Ben-Ami et al. 2014). In 2002, for example, the RSPCA estimated that a significant proportion of kangaroos are wounded but not killed each year (Boom and Ben-Ami 2011). These cause significant injury and cause prolonged suffering (Ben-Ami 2009).

F7 In 2018, the NSW Government announced a series of changes to non-commercial kangaroo killing, including the removal of drop-tags, the ability for more than two shooters to operate under a landholders licence, shooters no longer needing to be listed on the

F7 licence at the time of application and permission for carcasses to be removed for "personal use" (DPI n.d.). The changes were framed as a component of the drought relief package (DPI 2018).

F7.1 In order to engage in non-commercial killing, a landholder first applies to the National Parks and Wildlife Service ('NPWS') for a Licence to Harm Kangaroos. An allocation of the number of kangaroos that may be killed under each licence is then provided and landholders can obtain details of volunteer shooters from the Local Land Services ('LLS') Shooters Register. The guide that accompanied the changes explained that it "streamlined non-commercial kangaroo management" by "standardising the number of kangaroos that may be culled, based on property size" (DPI 2018).

F7.2 Under the changes, volunteer shooters are required to comply with the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-Commercial Purposes (Commonwealth of Australia 2008b).

F8 Ultimately, due to the fact that these COPs have no legal standing and their contents are rarely enforced or policed, they are ineffective and have been described as "producer friendly" (McEwan 2011).

Health and hygiene

F9 Up to 75% of pathogens are zoonotic (i.e., infectious diseases that are transmitted between vertebrate animals and humans) (Gebreyes et al. 2014; Wang and Crameri 2014; Cuthbert 2020; WHO 2021). It is estimated that these zoonotic pathogens are two times as likely to be associated with emerging diseases than non-zoonotic pathogens (Taylor et al. 2001).

F9.1 As wild animals, kangaroos and other macropods can harbour a range of parasitic, bacterial, fungal and viral diseases (Humphries 1987; Garner and O'Brien 1988; Bensink et al. 1991; Robson et al. 1995; Delroy et al. 2008; Holds et al. 2008; Parameswaran et al. 2009; Potter 2011; Potter et al. 2011; Rupan et al. 2012; Reed 2014; Spratt and Beveridge 2018). Some of these, such as Q fever, can lead to "acute and chronic illnesses in humans" with severe cases requiring hospitalisation as "death may occur" (Flint et al. 2016).

F9.2 A number of epidemics have been reported and documented in wild kangaroos. Some of these have caused periodic "die-offs" in large populations in north

F9.2 western New South Wales (Ben-Ami 2009). An unknown disease triggered an epidemic in 1988 and caused declines of between 42-72% of grey kangaroos (Curran 1999). Similar epidemics, historical and contemporary, have caused the loss of significant percentages of populations across Australia (Ealey and Main 1967; Newsome 1977; Clancy et al. 1990; Speare et al. 1991; Gilroy et al. 1999; Hooper et al. 1999; Rose et al. 2012). Many of these remain largely unidentified or poorly understood (Olsen and Braysher 2000; Ben-Ami 2009).

F10 As kangaroos are killed and marketed as meat for human consumption, this represents a significant public health risk, especially if care is not taken while eviscerating and handling the carcasses (Sinclair et al. 1997; Ahl et al. 2006). Free-ranging wild kangaroos are shot and "partially eviscerated in the field" (Ben-Ami et al. 2014). Carcasses are subsequently taken to a field chiller or container for temporary storage, where they are held until they are transported to a processing plant (Spiegel and Wynn 2014).

F10.1 In 2009, a report commissioned by Animal Liberation concluded that "the hygiene standards surrounding the production of kangaroo meat do not presently meet the Australian nor the European standards [and] the scale of the kangaroo industry and slaughter process used will most likely preclude the kangaroo industry from meeting these standards in the future" (Ben-Ami 2009). The previous year, Animal Liberation obtained samples from biopsies performed on carcasses found in remote chillers. The independently assessed samples found levels of Escherichia coli so high that they warranted Australian Quarantine and Inspection Service ('AQIS') alerts to be issued (AQIS 2008).

Term G: the impact of commercial and non-commercial killing of kangaroos and other macropods, including the difficulty of establishing numbers killed by landholders since the removal of the requirement for drop tags

G1 Though they are a protected species under various state laws and regulations, kangaroos and other macropods have encompassed a wide array of identities and purposes pre- and post- European invasion (c. 1788) (Stubbs 2001; Boom et al. 2012). These include "food, scientific curiosities, sporting trophies, economic commodities, pests, national emblems and subjects of conservation" (Chen 2016). As is the case with other species, such purposes can, and often do, override legislated protections (Melzer et al. 2000; le Mar and McArthur 2001; Brink et al. 2019; Dahlstrom 2020; Taylor and Ashman 2020).

G1.1 From the bounties of the early twentieth century to the current commercial industry that began in the 1960s, kangaroos have been and continue to be legally and illegally killed for commercial and noncommercial purposes (Grigg 1989; Lunney 2010; Ramp et al. 2013). Currently, four species of kangaroo are commercially killed in NSW: the red kangaroo (M. rufus), the eastern grey kangaroo (M. giganteus), the western grey kangaroo (M. fuliginosus) and the common wallaroo (M. robustus) (DPIE n.d.; Sharp and McLeod 2020). These species are included in the commercial kill, while others may be killed ostensibly to reduce environmental damage or competition for resources with farmed animals (Ramp et al. 2013).

G1.2 The commercial kangaroo industry is "the largest consumptive mammalian wildlife industry in the world" and is responsible for killing "ten times the number of harp seals" during the infamous annual Canadian seal hunt (Boom et al. 2012). Over a decade, it is estimated that an average of 3,000,000 adult kangaroos are killed in the rangelands (Altman 1984). Estimates indicate that up to 1,000,000 orphaned joeys are killed each year as "collateral" (Hacker et al. 2004; Ben-Ami and Boom 2010).

G2 The loss or decline of biological diversity ('biodiversity') has been globally recognised as "one of the most severe human-caused environmental problems" (Ceballos et al. 2017). Human behaviour has been recognised as "the major driver of biodiversity decline and extinction" (Lenzen et al. 2012; Maxwell et al. 2016; Driscoll et al. 2018; Selinske et al. 2020). These impacts show no signs of abating (Woinarski et al. 2016). The perpetuation of exploitative industries, such as the commercial kangaroo industry, further complicates and exacerbates these threats.

G2.1 Global assessments indicate that at least one-fifth of wild mammalian species are at risk of extinction (Hoffmann et al. 2011). These extinctions typically have ecological drivers (e.g., habitat loss and climate change) or are caused by the impacts engendered by overexploitation or agriculture (Evans et al. 2011; Foden et al. 2013; Maxwell et al. 2016; Woinarski et al. 2016). Agriculture is also a major driver of global greenhouse-gas emissions, the most important driver of anthropogenic climate change (Grossi et al. 2019; Lynch et al. 2021). The development of new infrastructure, such as roads, to enable agricultural expansion also increases threats associated with increased incidences of bushfires and habitat fragmentation (Laurance et al. 2009). Because agricultural activity or expansion primarily occurs in fertile areas with naturally high levels of biodiversity and ongoing habitat destruction caused by agricultural enterprises, this sector continues to represent a significant threat (Anderson et al. 2009; Cox 2020; Hannam 2020). Conserving biodiversity has thus become a widely

G2.1 accepted and popular concept worldwide (Lunney 2017). Australian studies have concluded that "habitat loss is the greatest threat affecting [81% of] extant threatened species" (Evans et al. 2011).

G2.2 Since European invasion Australian biodiversity has suffered tremendous losses (Johnson and Isaac 2009). Worldwide, Australia has the worst record of extinction and declines of native mammals (Banks et al. 2018; Ward et al. 2019; Wilson et al. 2020). Despite being one of only 17 countries that together contain more than 70 percent of known biodiversity on earth, between 1996 and 2008 Australia was also among the top 7 countries responsible for 60 percent of the world's biodiversity loss (Common and Norton 1992; Preece 2017). Extrapolated, this figure means Australia is one of 7 countries responsible for over half of all biodiversity loss worldwide (Kilvert 2017). Over 10% of Australia's endemic terrestrial species have gone extinct since European settlement and projections suggest that between one and two species will continue to face extinction each decade (Woinarski et al. 2015). Despite policy and legislation ostensibly crafted to curb the threats posed by land clearing and habitat fragmentation, Australia remains "a global hotspot for deforestation" (Evans 2016). Deforestation, including the clearing and/or modification of native forest for agriculture and urban or industrial development, continues to represent a substantial threat to Australia's remaining biodiversity (Hoffmann et al. 2011; Evans 2016).

G2.3 Prior to European invasion, there were over 70 distinct species of macropods in Australia; since, at least six and as many as 18 species have become extinct (Tyndale-Biscoe 2005; Smith 2007; Roache 2011; Woinarski et al. 2015). Though the precise reason or amalgamation of stressors responsible for known post-1788 extinctions remains a topic of debate, human activities have been determined to have caused "the dramatic decline and sometimes extinction of many of the continent's unique species" (Johnson and Wroe 2003; Reed and Arnold 2017; Kearney et al. 2019). Reducing or minimising the rate of extinctions has thereby been recognised as one of the most important yet challenging contemporary issues (Allek et al. 2018).

G3 Today, kangaroos continue to be a prominent feature of Australian cultural symbolism, including a strong presence in tourism marketing materials (Hill et al. 2001; Higginbottom et al. 2004; Hatton and Thompson 2010; Deutsch and Murakhver 2012; Taylor 2014). Despite this recognition, and the appearance of the kangaroo on the national coat-of-arms and other state or territory emblems, such prominence offers no guarantee that their welfare will be promoted (Englefield et al. 2019).

G4 Popular support for the protection and conservation of kangaroos has been apparent for some time (Rawlinson 1988; Croft 1991; Preuss and Rogers 1995; Franklin and White 2001; Wilson and Croft 2005; Sinclair et al. 2019b). Those that do continue to support the industry do so on the basis that it is necessary, humane and effective (Mills 2006; McLeod and Sharp 2014; Sinclair et al. 2019a). The relevant sections of this submission will endeavour to illustrate that none of these prerequisites are met by either the commercial or non-commercial killing of kangaroos. This has coalesced into vocal condemnation of their continued killing, particularly within the commercial industry, and the welfare implications it triggers (Thorne 1998; Ben-Ami et al. 2014).

G4.1 This support is increasingly challenging the validity of the practices social licence to operate ('SLO') (Hampton and Teh-White 2018; Hampton et al. 2020; Khadem 2021). As such, kangaroo management is subject to political scrutiny and governments recognise the influence of advocacy groups in depreciating or damaging the industry's SLO (Sinclair et al. 2018; Sinclair et al. 2019b; Sinclair et al. 2019c; NSW Government 2020). In 2014, this was identified as "the biggest challenge" to the industry in a study commissioned by the Commonwealth Government (Williams and Pattinson 2014). In response to public pressure, government departments have expended significant institutional effort and substantial funding in promoting the kangaroo industry (Boronyak et al. 2013).

G4.2 Millions of subsidies and funds are allocated to research and development ('R&D'), marketing, promotion and efforts to expand market access (Boronyak et al. 2013). For example, in 2015 questions to the Rural and Regional Affairs and Transport Legislation Committee revealed that several projects, including "PRJ-000695: Maintaining the kangaroo industries freedom to operate", had been conducted (without publication). The stated aims and objectives of this project were described as "ongoing dissemination of positive media and factual information on the kangaroo industry to improve its public image and enable further growth in market size and value". The total cost of this project was listed at over $70,000. Other projects, such as "PRJ-002302: Taking the kangaroo industry to the internet community" (value: $110,000) and "PRJ-008967: Characterising the Australian public and communicating about kangaroo management" (value: $60,000), were identified as having similar objectives. For example, PRJ-002302 cited its objective as "ensur[ing] that [internet] sites are loaded with positive messages about the kangaroo industry and its products". See Appendices for an overview of these projects.

G5 In line with recent societal progression regarding the treatment of animals, such support is likely to continue and expand (Lieberman 2014; Chen 2016; McGreevy et al. 2019; Park and Valentino 2019). Such support is also likely to consolidate and expand with the rising

G5 concern for environmental issues as evidence suggests a strong connection between "pro-environment" and "pro-animal" attitudes (Peek et al. 1996; Kruse 1999; Uyeki 2000; Jerolmack 2003). This rising public support signals changes in social values and indicates an opportunity to develop progressive and ecologically sustainable policies aligned with contemporary expectations and sound science (Moskwa 2015; Kotzmann 2019).

G5.1 In 2008, the Australian Law Reform Commission ('ALRC') published a media release stating that "increasing concern for animal welfare […] is likely to trigger the next great social justice movement in Australia" (ALRC 2008). Since the Commonwealth Government has further invested in investigating changing attitudes towards animals. Consider, for example, the Commonwealth commissioned report Commodity or Sentient Being? Australia's Shifting Mindset on Farm Animal Welfare (Futureye 2018). Despite these progressive developments, however, Australia continues to rank poorly on international assessments of legislation and policy commitments to animal protection (WAP 2021).

G6 Currently, four species of kangaroo are commercially killed in NSW: the red kangaroo (M. rufus), the eastern grey kangaroo (M. giganteus), the western grey kangaroo (M. fuliginosus) and the common wallaroo (M. robustus) (DPIE n.d.). These species are included in the commercial kill, while others may be killed ostensibly to reduce environmental damage or competition for resources with farmed animals (Ramp et al. 2013).

G6.1 The latter is a frequently cited reasons for reducing kangaroo populations (i.e., their alleged competition with livestock for resources and their increased abundance due to the creation of artificial waterholes) (Grigg 1989; Stubbs 2001; Hacker et al. 2004; OEH 2017; Wilson 2018; NSW Government 2020; RSPCA Australia 2020). As such, proponents of the commercial industry have argued that "the wild harvest of kangaroos […] contributes to the sustainability of rangeland landscapes and communities" (Thomsen and Davies 2006). However, evidence to support such claims is "minimal" (Boom et al. 2012).

G6.2 Management programs have not correlated with increased productivity and long-term observations in NSW have found that kangaroos and livestock compete when resources are scarce (i.e., when pasture is impacted by drought) (Boom et al. 2012; Ben-Ami et al. 2014). Instead, evidence suggests that when resources are available and there are minimal environmental pressures (i.e., drought), kangaroos avoid livestock and present no threat to the productivity of wool or lamb production (Edwards et al. 1996; McLeod 1996). Similarly, reliance on production infrastructure, such as artificial water sources, is over-

G6.2 estimated (Montague-Drake and Croft 2004; Croft et al. 2007).

Term H: current and alternative measures to provide an incentive for and accelerate public and private conservation of kangaroos and other macropods

H1 The role of humans in the extinction of other species necessitates an urgent reappraisal of contemporary conservation efforts (Ash 2007). Support and engagement of landholders in nonlethal and noninvasive ecotourism could offer an economic incentive to promote the protection and conservation of kangaroos (Higginbottom et al. 2004).

3 CONCLUSION AND RECOMMENDATIONS

Conclusion

G6 It is reasonable to maintain that if we are responsible for causing problems, including those involving threats to wildlife or incompatibilities between ecology and industry, we are responsible for rectifying them (Marks 1996; Spedding 2000). Similarly, we have a moral imperative to use the information available when considering decisions that will impact the environment (Ramp 2013).

G6 Though Australian environmental and animal law is heavily influenced by the organisation of norms and values that systematically suppress or discount the significance and influence of particular species, there is increasing awareness that the need for lethal management of kangaroos has been exaggerated (Croft 2005a; Croft 2005b; Ash 2007; Ben-Ami et al. 2011; Ramp et al. 2013). This is shown by the selective use of available data or information, including that providing significant scientific evidence exists that kangaroo populations generally do not need to be reduced or controlled in order to achieve positive conservation outcomes (Croft et al. 2007; Ben-Ami et al. 2010; Mjadwesch 2011). Similarly, strong evidence exists to suggest that kangaroo populations represent a small and highly variable economic cost to landholders and any such costs can be effectively reduced in a range of other ways (Arnold et al. 1989; Arnold et al. 1993). Despite this, such valid and evidenced concerns are commonly met either with "illogical, misleading or dismissive arguments" or are "simply ignored" (Ramp 2013).

G6 Ultimately, the NSW Government must urgently initiate an orderly phase-out of the commercial kangaroo industry and extend valid and enforceable protections to all macropods. The following and final section of this submission will briefly outline a series of modest recommendations for the Committee's consideration. We expect these to be thoroughly and transparently considered, addressed and included in any forthcoming report derived from this inquiry.

Recommendations

R1 **The NSW government must formally recognise that kangaroos are not widespread pests (i.e., they do not cause sustained environmental damage or compete with farmed animals for resources) and must endorse policies informed by best practice, sound science and prevailing community expectations.**

Every day policymakers make decisions that affect the lives of wild animals (Ramp and Bekoff 2015). Many of these decisions, though framed as conservation measures, involve the infliction of deliberate harm and suffering (Bekoff 2010). Though there are a range of elements to the debate regarding the killing of kangaroos, the consumptive exploitation of kangaroos is an ethical question (Thorne 1998; Irvine 2012). This question comprises the exploitation of wildlife in an attempt to ameliorate poor agricultural choices (Ramp 2013). While the kangaroo industry focuses on the "sustainable use of wildlife", the history of attitudes towards kangaroos as a "pest" species remains entrenched in the perceptions of some Australians, making it "impossible for the industry to meet welfare standards" (Boom et al. 2012).

This will necessarily include prohibiting landholders from applying lethal control (via permitting shooters to kill kangaroos on their properties) and ceasing all licences that allow such killing to occur (including the volunteer scheme). Such prohibitions should not be made with an intention to promote the production of kangaroos as an alternative to other farmed animals. Despite the existence of some indicators suggesting that doing so represents an improvement, especially insofar as it reduces the production of greenhouse gas emissions when compared to those produced by traditional farmed animal species, there are several identified problems with any such proposal. First, studies assessing the feasibility of such a replacement indicate it would be logistically problematic and provide little incentive for landholders (Russell 2008; Baumber et al. 2009; Ben-Ami et al. 2010; Ramp 2013; Ramp et al. 2013).

Second, there are considerable disparities between the quantity of meat produced by kangaroos and other farmed animals. Kangaroos produce far less meat than other species, such as sheep and cattle, primarily due to their smaller size and slower growth rates (Hardman 1996; Munn et al. 2008; Ben-Ami et al. 2010; Dawson 2012). They are also comparatively slow reproducers (Arnold et al. 1991; Bilton and Croft 2004). This would necessarily require more kangaroos to produce the same or a similar amount of meat from animals currently farmed in Australia (Ramp et al. 2013). There is no indication or evidence available showing that the commercial killing of up to three million kangaroos each year has caused any reduction in livestock production (Ampt and Baumber 2006; Ramp 2013). Third, such a transition would therefore impose substantial welfare costs for kangaroos (Ben-Ami et al. 2011; Boom and Ben-Ami 2011). As one of the principal reasons for the development of industrial agriculture is rising demand from a growing global population, promotion of such an alternative is naïve and short-sighted (Ponting 1991).

Recommendations

R2 **Australia currently lacks any valid form of federal governance or leadership in animal protection. Under Australia's constitutional arrangements, responsibility for animal protection law and enforcement is principally held by state and territory governments. In the absence of Federal governance, states must provide clear strategic direction in policy and reform, facilitate appropriate standards informed by sound science. It must commission and transparently consider independent expertise in the formulation of such policy and enforce its principles. To this end, the NSW Government must consider and implement the development of an Independent Office of Animal Welfare ('IOAW') to ensure best practice is adhered to unencumbered by conflicts of interest.**

Studies have indicated that in order to minimise or prevent species decline or loss "informed, empowered and responsive governance and leadership is essential" (Martin et al. 2012). Governance refers to the physical exercise of determining influence. Leadership represents the institutional capacity to galvanise and stimulate others to secure "purposeful change" and is an essential component of governance (Manolis et al. 2009; Kenward et al. 2011). It is essential that both governance and leadership seek to secure complimentary outcomes. Despite the availability of expert advice, contemporary examples of other species declines illustrate the deleterious outcomes incompatibility between these functions can cause (Martin et al. 2012). As it applies to macropods in New South Wales, leadership must recognise the threats current policy presents to their viability and governance must ensure that these threats are appropriately regulated. Every effort should be taken to minimise or remove these threats.

R3 **Processes that secure, formalise and guarantee institutional accountability must be developed.**

Contemporary examples of species decline indicate that merely monitoring declining populations without an intent to formulate and operationalise proactive policy simply "document extinction" (Martin et al. 2012). While extinction events are largely driven by ecological pressures or environmental stressors, they are also influenced by policy. That is, policies may be incompatible or antithetical to conservation outcomes. They may be inadequately designed, poorly resourced or badly implemented (Woinarski et al. 2016).Therefore, monitoring must be undertaken under the rubric of an adaptive management framework that explicitly identifies and states definitive actions which will be undertaken (McDonald-Madden et al. 2010; Keith et al. 2011). These decisions must be made while the opportunity to act exists. Delayed decision-making has been identified as "a key contributor" to the failure of endangered species recovery programs and ultimately removes these opportunities and thereby risks species' extinction (Clark et al. 1994; Martin et al. 2012). Failure to act is more than a policy predicament: it threatens vulnerable species with becoming one of the two Australian species predicted to face extinction each decade (Woinarski et al. 2015).

SOURCES AND REFERENCE MATERIAL

For full reference list, please contact us using the details provided

APPENDIX: SAMPLE OF PROJECTS FUNDED

ID	Project	Principal Investigator (researcher)	Project Total	Published Report	Research Organisation (name of the recipient)	Project Aims/Objectives Summary
PRJ-000089	Kangaroo meat awareness marketing research for foodservice and consumer	Nathan, Mel	$84,900.00	The outputs of the project were "improving communication with Kangaroo meat via magazine editorials, in foodservice and consumer publications, trade fair participation and chef discussions". Roocipes is an output of this project https://rirdc.infoservices.com.au/items/10-186	Food Companion International	Would see kangaroo meat editorial and marketing research and analysis into a cross section of various foodservice and cooking magazines, newsletters, chefs association newsletters and chef focus groups.
PRJ-000303	Kangaroo and the China Free Trade Agreement	Kelly, John	$32,100.00	No RIRDC publication due to nature of project	Lenah Consulting	Creating the most favourable possible regulatory environment in China for the sale of kangaroo products.
PRJ-000315	Obtain perceptions of consumers & foodservice operators regarding Kangaroo meat	Ellis, Mark	$32,600.00	https://rirdc.infoservices.com.au/items/09-126	Sensory Solutions Pty Ltd	To research Foodservice decision makers in the mainstream restaurant trade to establish barriers/opportunities to be addressed in marketing to this important market sector. To provide insights to two objectives as outlined in the Kangaroo Industry Strategic Plan 2005-2010: 1) Informing Chefs about the industry and it's products 2) Develop improved product image via increased communication within various industry publications.
PRJ-000681	Choosing kangaroo: product and industry attributes and consumer choice beha	Ampt, Peter	$81,600.00	https://rirdc.infoservices.com.au/items/06-026	University of New South Wales	1. Identify key attitudes and issues concerning the use of kangaroo meat by smallgoods and other meat manufacturers. 2. Ascertain which attributes of meat and smallgoods in general are important for consumer choice and determine how kangaroo is perceived on these attributes. 3. Investigate choice behaviour and potential demand among meat consumer segments to identify the triggers for increased consumption of kangaroo based on the attributes identified in objective 2. 4. Determine the change in the choice behaviour of smallgoods manufacturers based on the previous findings.
PRJ-000693	Kangaroo Meat Marketing Support	Nathan, Mel	$5,000.00	No RIRDC publication as awareness raising article in the Food Companion International was deemed appropriate	Food Companion International	Support domestic kangaroo meat market development To raise awareness with chefs and epicureans in the Australian meat. Campaign will include launch of Spring edition of Food Companion international + front cover feature on kangaroo including full summaryon 'culinary name for Kangaroo giveaway' competition recipes interviews and nutritional advice.
PRJ-000694	Extending the sustainable management of kangaroo	Kelly, John	$46,440.00	https://rirdc.infoservices.com.au/items/09-056	Lenah Consulting	The project will seek to extend the sustainable management of kangaroo populations into regions not currently covered by Federally approved Management Plans such as Victoria the Northern territory and parts of NSW and SA.
PRJ-000695	Maintaining the kangaroo industries freedom to operate	Kelly, John	$71,609.00	No RIRDC publication. Industry were considering publishing.	Lenah Consulting	Ongoing dissemination of positive media and factual information on the kangaroo industry to improve its public image and enable further growth in market size and value. In particular the project will ensure key personnel and decision makers in government and major industry clients (such as Adidas) are regularly updated with factual information on industry developments in order to maintain a positive impression of the kangaroo industry. This project addresses an Objective in the current Kangaroo Industry Strategic Plan given a highest priority ranking.
PRJ-000854	Nutritional Composition of Kangaroo Meat	Turne, Ron	$48,514.00	https://rirdc.infoservices.com.au/items/08-142	CSIRO Food and Nutritional Sciences	Determining the nutrient composition of specific fat components in four muscle cuts of two different species of kangaroo from two geographic locations. The work will provide the industry with information they require regarding specific nutrients in their products.
PRJ-000855	Research and Development for the US Market for Kangaroo meat and skins	Topper, Brian	$34,481.00	No RIRDC publication due to nature of project	Al Topper & Co	Assist the researching and development of effective material dealing with the history and lack of need for this legislation
PRJ-002302	Taking the Kangaroo Industry to the internet community	Kelly, John	$110,000.00	No RIRDC publication as outcome of project included cooking demonstration videos, industry video, photos on photobucket, 6 industry newsletters, facebook groups.	Lenah Consulting	The new wave of threat to the kangaroo industry comes from unchallenged material on contributor generated internet sites such as Youtube, Myspace, photobucket, Wikipedia and others. Or is this in fact an opportunity? This project will enable the kangaroo industry to ensure these types of sites are loaded with positive messages about the kangaroo industry and its products. It will also ensure ongoing resources are available to counter anti-industry campaigns and spread positive industry messages in more traditional media.
PRJ-002352	Comparative carbon footprint for kangaroo products	Begley, Richard	$40,180.00	No RIRDC publication as it was decided that the results had not been peer reviewed and could not be substantiated at the time.	ACIL Tasman Pty Ltd	To assess the greenhouse gas emissions of kangaroo products – focusing on table meat and leather production. To compare these to more traditional sources of red meat and leather.
PRJ-003120	Research to assist market development for kangaroo products in California & NY	Kelly, John	$236,664.00	https://rirdc.infoservices.com.au/items/10-220	Lenah Consulting	California is the largest single economy in the US. Sale of kangaroo products has been legalized in California via a short term amendment to their laws. This expires at the end of 2009, at which time the legislation will revert to its previous prohibition. This project aims to research mechanisms and provide supportive documentation to enable continuing sale of kangaroo products past 2000.
PRJ-003129	Kangaroo survey in south east South Australia	Stokes, Peter	$6,305.00	No RIRDC publication. Results of this project published by SA Govt. Report can be found **http://www.environment.sa.gov.au/Home/Search_Results?dlv_Site Wide Search Results=(keyword=2012 commercial kangaroo)**	Department for Environment and Heritage, SA government	To determine kangaroo density in the south east To use this density information to support a trial extension of the commercial harvest zone
PRJ-004103	Improving the welfare and humaneness of commercially harvested kangaroos.	McLeod, Steven	$240,068.00	https://rirdc.infoservices.com.au/items/13-116	The Department of Primary Industries, an office of the Department of Trade and Investment, Regional Infrastructure and Services, NSW	To provide scientific knowledge and other information on the animal welfare impact of kangaroo harvesting methods with the aim of determining the most appropriate euthanasia methods for young kangaroos which reduce, as much as possible, unnecessary pain, distress and suffering. This will be achieved by: • Reviewing the literature, with an emphasis on current understanding of acceptable methods of euthanasia. The review will aim to address issues that were not covered adequately by the 2006 Hopwood report and will include current information on the development of conscious perception of pain and the implications for humane killing; • Determining the humaneness of current methods used to euthanase pouch young and young-at-foot including decapitation and a heavy blow to head; • Comparing currently used methods of stunning with a spring-operated captive bolt gun that has the potential for use in the field by kangaroo harvesters; • Determining the fate of orphaned young-at-foot that escape capture. Note that although this objective a is essential if we are to provide practical strategies to reduce the welfare impact on orphaned young-at-foot, because of the experimental methods used RSPCA Australia cannot endorse it, in its present form. Therefore completion of this component is dependent upon securing additional funding from DEWHA and the Australian Animal Welfare Strategy (AAWS). We have included it here for completeness; • Evaluating the attitudes of commercial kangaroo harvesters as well as the general public and other relevant stakeholders (e.g. hunters, animal protection groups) toward animal welfare and humane killing; • Making recommendations to the kangaroo industry and Government management agencies to improve the welfare of euthanased pouch young and orphaned young-at-foot; and • Provide information for education of the general public.
PRJ-004385	Advanced Meat Hygiene Training for Kangaroo Harvesters	Kelly, John	$89,105.00	This project was terminated and unspent funds transferred to PRJ-005549	Lenah Consulting	Maximising kangaroo meat hygiene standards.
PRJ-005198	Exploring new products, technologies and markets for kangaroo leather	Bois, Michael	$20,000.00	Project Terminated	Swarvie Saint	To increase the trade of kangaroo skins to these manufacturers for use in their existing product offering To develop the world's first completely kangaroo leather shoe sole
PRJ-005549	Kangaroo wildgame industry training initiative	Mawson, Amanda	$420,000.00	https://rirdc.infoservices.com.au/items/11-123	Safe Food Production Queensland	The funding would be used to extend the Rural Industries Research and Development Corporation's current kangaroo harvester training program. The additional funds will be used to accelerate training delivery, update and enhance training materials, develop a competency-based qualification and on-the-job assessment framework to facilitate ongoing training, and retrain and assess skills and knowledge of harvesters This training will ensure that kangaroo harvesters have the skills to meet international requirements and changing market conditions. All kangaroo harvesters receive training before they are first licensed—this program builds on that training to upgrade their skills on an on-going basis. A key part of the training will be the inclusion of a practical skills assessment where harvesters will need to demonstrate their competency through one of a number of assessment methods, such as an on-the-job demonstration. The project objectives include: 1. To provide extension training for wild game field harvesters and field depot operators on hygienic dressing and storage and handling of carcasses that links into a competency based framework for demonstration of skills and knowledge. 2. To develop and implement an on-the-job assessment framework for assessment and verification of wild game field harvester skills and knowledge; and 3. To identify national wild game field harvester and field depot operator competencies / identified Industry Skill Sets to be used as the basis for future training programs and industry development.
PRJ-007258	The effect of Sulphur Dioxide on the Thiamine content of fresh kangaroo meat	Hall, Duncan	$52,000.00	https://rirdc.infoservices.com.au/items/13-006	BIOLOGIC PTY LTD	1. To provide guidance regarding the concentration of SO2 required to achieve an acceptable shelf life for fresh kangaroo meat. 2. To measure the impact of various concentrations of SO2 on thiamine in kangaroo meat over the normal product shelf life. 3. To indicate the degree of thiamine supplementation necessary to counter the inactivation of thiamine in kangaroo meats preserved with SO2, to ensure that the minimum nutrient level for thiamine in pet meat is met, as specified by the globally accepted nutrient guidelines for dogs and cats (AAFCO 2009b; AAFCO 2009a). 4. To provide the Kangaroo Industry Association of Australia (KIAA) with a selection of communication resources to allow efficient and widespread communication of the research findings within the industry.
PRJ-008154	Kangaroo Meat Sulphite and Thiamine	Hall, Duncan	$49,924.00	https://rirdc.infoservices.com.au/items/13-006	BIOLOGIC PTY LTD	1. To assess the relationship between various concentrations of SO2 and thiamine concentrations in kangaroo meat over the normal product shelf life (deemed 28 days). 2. To explore the the degree of thiamine supplementation necessary to counter the inactivation of thiamine in kangaroo meats preserved with SO2, to ensure that the minimum nutrient level for thiamine in pet meat is met at levels consistent with current industry practice.
PRJ-008402	Kangaroo sulphur dioxide and thiamine relationship study (supplement)	Hall, Duncan	$24,400.00	https://rirdc.infoservices.com.au/items/13-006	BIOLOGIC PTY LTD	To elucidate the relationship of sulphur dioxide and thiamine in chilled kangaroo meat for pet consumption, building upon the previous RIRDC funded study (RIRDC project: PRJ-007258), completed in August 2011.
PRJ-008460	Kangaroo sulphur dioxide and thiamine relationship study Supplemental study # 2	Hall, Duncan	$30,000.00	https://rirdc.infoservices.com.au/items/13-006	BIOLOGIC PTY LTD	To elucidate the relationship of sulphur dioxide and thiamine in chilled kangaroo meat for pet consumption, building upon the previous RIRDC funded studies (RIRDC project: PRJ-007258 and PRJ-008420)

WE THANK THE COMMITTEE FOR READING AND CONSIDERING OUR SUBMISSION

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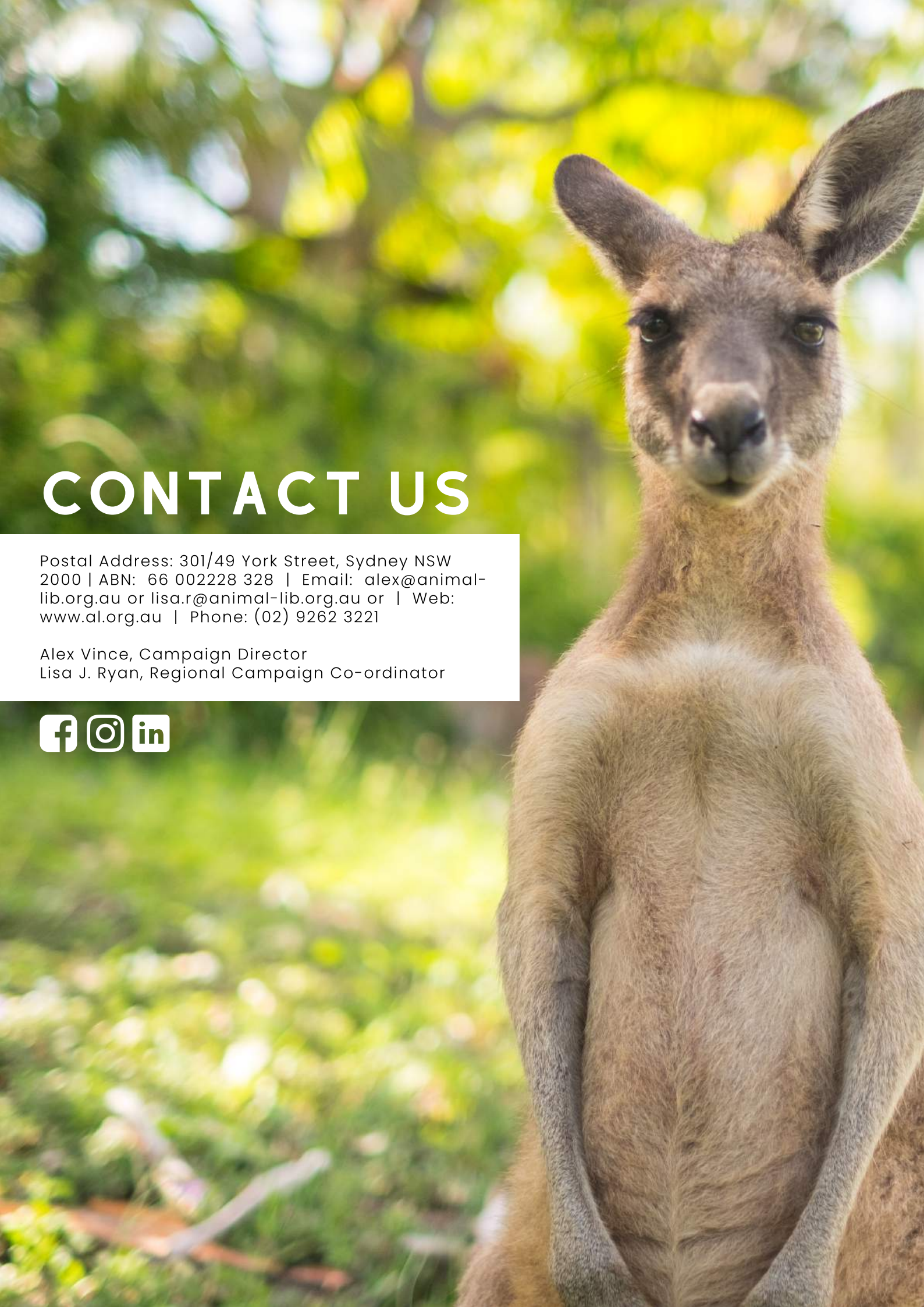

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