Table 2. Lethal methods (a) of commercial harvesting, damage mitigation and recreational hunting, and non-lethal methods (b) of damage mitigation of macropods in Australia, and their relationship to the five domains of suffering (D1. Water deprivation/food deprivation/malnutrition; D2. Environmental challenge; D3. Disease/injury/functional impairment; D4. Behavioural or interactive restriction; D5. Anxiety/fear/distress, adapted from Mellor and Reid 1994)

a)

Lethal Method	Summary	Relevant circumstances	Effectiveness of method / Time to insensibility	Domain of suffering D1 – D5	Estimated likelihood of exposure to the domain of suffering (low, moderate, high)
Shooting	Shooting procedures are guided by two National Codes of Practice, encompassing commercial and non-commercial shooting.	• Commercial harvesting • Recreational hunting • Damage mitigation	Accurately placed headshots under ideal environmental conditions are likely to cause instantaneous loss of consciousness or death. 96 – 97 % of macropods are killed by headshot in the commercial industry (Ben-Ami *et al* 2014). Statistics from non-commercial hunting are unknown. Time to insensibility for chest shot macropods is unknown but is unlikely to be instantaneous.	D1. Starvation / dehydration / malnutrition	• High for dependent young not destroyed at the same time as their mother • Moderate for adults that escape after injury
				D2. Environmental challenge	• High for pouch young with insufficient ability to self-regulate body temperature
				D3. Injury and pain	• High in sub-optimal shooting conditions • Likelihood is decreased by shooter accuracy, the use of body shots, movement by the target animal such as when it is fleeing, and when shooting compliance is not assessed (non-commercial shooting)

				D4. Behavioural restriction	• High for animals that escape after injury
				D5. Anxiety, fear or distress	• High when the animal is aware of the danger and fleeing • High for shot animals not immediately rendered unconscious • High when hunting involves predators • Moderate to high for young at foot that must be destroyed after their mother • Low to moderate for stationary animals that are not the first in the group to be targeted
Blunt force trauma	A form of euthanasia that is specified by the National Codes of Practice for both unfurred and furred pouch young	• Commercial harvesting • Recreational hunting • Damage mitigation	Sufficiently forced, and accurately placed blunt force trauma to the head and brain stem are likely to cause instantaneous loss of consciousness or death (McLeod and Sharp 2014).	D3. Injury and pain	• High for sentient young when death or loss of consciousness is not instantaneous • Risk increases when operator is inexperienced or untrained • Risk of suffering increases with advancing developmental stage of the animal
				D5. Anxiety, fear or distress	• High for animals not immediately rendered unconscious • Risk of suffering increases with advancing developmental stage of the animal
Stunning and decapitation	A form of euthanasia that is specified by the National Codes of Practice for unfurred pouch young of small enough size to fit within the palm of the hand	• Commercial harvesting • Recreational hunting • Damage mitigation	Sufficiently forced, and accurately placed stunning is likely to lead to instantaneous loss of consciousness, sufficient for decapitation. Lack of detail in the National Codes of Practice creates uncertainty in the actual effectiveness of stunning in macropod destruction.	D3. Injury and pain	• High for sentient young when death or loss of consciousness is not instantaneous • Risk increases when operator is inexperienced or untrained • Risk of suffering increases with advancing developmental stage of the animal

				D5. Anxiety, fear or distress	• High for animals not immediately rendered unconscious • Risk of suffering increases with advancing developmental stage of the animal
Poisoning	Poisoning with sodium monofluoroacetate (1080). Legal in Tasmania only.	• Damage mitigation	Most animals remain conscious until death (Littin et al. 2009). Time until death is species dependent, and ranges from 12 hr to 131 hr (McIlroy 1982). Symptoms such as retching, hunching and vomiting may occur for several hours prior to death.	D1. Starvation / dehydration / malnutrition	• Moderate short-term risk for adults poisoned with sub-lethal doses • High for dependent young that remain after the death of the mother
				D2. Environmental challenge	• High for pouch young with insufficient ability to self-regulate body temperature after the death of the mother
				D3. Injury and pain	• High between period of symptom onset and insensibility
				D5. Anxiety, fear or distress	• High for animals experiencing symptoms of toxicity
Hunting with dogs	**In TAS only, dogs may be used to flush out wallabies prior to shooting, and for carcass retrieval**	• **Commercial harvesting** • **Recreational hunting** • **Damage mitigation**	**Hunting dogs should not be used to injure or kill**	**D3. Injury and pain**	• **High for animals attacked by dogs that are under insufficient control** • **Unknown risk of post-chase complications (e.g. stress myopathy) for pursued animals that escape**
				D5. Anxiety, fear or distress	• **High for animals being pursued, with possible post-chase residual effects**
Trapping	**In TAS only, wallabies may be caught in Mersey box or Stubby**	• **Commercial harvesting** • **Recreational hunting**	**Not applicable as permissible traps are for non-lethal trapping only**	**D1. Starvation / dehydration / malnutrition**	• **High possibility if traps are insufficiently monitored**

tent / Ivo Edwards tent traps, prior to shooting.	• **Damage mitigation**
D2. Environmental challenge	• **High possibility if traps are insufficiently monitored, or in adverse weather conditions**
D3. Injury and pain	• **Moderate possibility of minor injury**
D4. Behavioural restriction	• **Behavioural restriction is absolute but short term under adequate monitoring regimes**
D5. Anxiety, fear or distress	• **Moderate to high risk of some psychological distress from restricted movement. Level of distress is unknown.**

b)

Non-lethal Method	Summary	Relevant circumstances	Effectiveness of method	Domain of suffering D1 – D5	Estimated likelihood of exposure to the domain of suffering (low, moderate, high)
Surgical sterilisation	A form of permanent reproductive control that either removes the gonads entirely or surgically interrupts successful fertilization.	• Damage mitigation	Reliably effective in permanently preventing reproduction.	D3. Injury and pain	• High with short-term recovery after surgery • Moderate possibility of injury during capture, and complications such as myopathy • Low possibility of post-surgical complications such as infection or wound breakdown
				D4. Behavioural restriction	• Moderate possibility of changes to individual and group behaviour with full gonad removal, although data is lacking
				D5. Anxiety, fear or distress	• High likelihood of fear, anxiety or distress during capture, trapping or initial tranquilisation
Hormonal contraception	A form of temporary reproductive hormonal control that requires surgical placement of an implant releasing either deslorelin (GnRH agonist) or levonorgestrol (synthetic gestagen)	• Damage mitigation	Deslorelin is effective in female *M. giganteus* for up to 24 months (Herbert *et al* 2006) and 12 months in female *M. eugenii* (Herbert *et al* 2004a) and ineffective in male *M. eugenii* (Herbert *et al* 2004b). Levonorgestrol controls reproduction in female *M. giganteus* for up to 6 years (Coulson *et al* 2008) and in female *M. eugenii* for at least 2 years (Nave *et al* 2002b).	D3. Injury and pain	• Moderate with short-term recovery after surgery • Moderate possibility of injury during capture, and complications such as myopathy • Low possibility of post-surgical complications such as infection or wound breakdown
				D4. Behavioural restriction	• Moderate possibility of minor changes to individual and group behaviour following treatment

				D5. Anxiety, fear or distress	• High likelihood of fear, anxiety or distress during capture, trapping or initial tranquilisation.
Immuno-contraception	A form of temporary reproductive control via injection of a reproduction-interrupting vaccine (sperm antigen or zonae pellucidae (ZP) vaccines)	• Damage mitigation	In male *M. eugenii* sperm antigen vaccines effectively control reproduction but require multiple applications (5 vaccinations over 13 weeks) (Asquith *et al* 2006). In female *M. giganteus*, ZP vaccines suppress reproduction for more than one year after a single application (Kitchener *et al* 2009), and at least 3 months in *M. eugenii* (Kitchener *et al* 2002).	D3. Injury and pain	• Moderate possibility of short-term pain from injection • Moderate possibility that injury may occur during capture and transportation for hand-held injection, and complications such as myopathy • Low possibility of post-injection complications such as infection or adverse reactions. The risk is increased for remote injection.
				D4. Behavioural restriction	• Moderate possibility of minor changes to individual and group behaviour following treatment
				D5. Anxiety, fear or distress	• High likelihood of fear or anxiety during capture, trapping or initial tranquilisation.
Relocation	Movement of an individual or group from one location to another	• Damage mitigation	Relocated macropod populations have a 5-year survival rate of approximately 60 % (Clayton *et al* 2014). Effectiveness of addressing damage mitigation is dependent on the remaining population, and the presence of similar problems in the new environment.	D1. Starvation / dehydration / malnutrition	• High possibility if adaptation to the new environment is slow or does not occur
				D2. Environmental challenge	• High possibility if adaptation to the new environment is slow or does not occur

	D3. Injury and pain	• High possibility if predators co-exist in the new environment • Moderate possibility that injury may occur during capture and transportation, and associated complications such as myopathy
	D4. Behavioural restriction	• Moderate possibility of behavioural restriction and challenge from change in home range
	D5. Anxiety, fear or distress	• High likelihood of fear, anxiety or distress during capture, trapping, initial tranquilisation or transportation.