Control method: Aerial shooting of feral horses

Assumptions:	
	▪ Best practice is followed in accordance with the standard operating procedure HOR002. ▪ The shooter is competent and will make accurate decisions about whether the shot can be successfully placed. Competency also applies to the pilot who is required to provide the optimum target presentation for the shooter. ▪ For aerial shooting, chest shots are preferred over head shots (because they are easier to achieve with a moving animal), however there is a provision for an initial head shot if presentation of the animal and other conditions are ideal.

PART A: assessment of overall welfare impact

DOMAIN 1 Water or food restriction, malnutrition				
No impact	Mild impact	Moderate impact	Severe impact	Extreme impact

DOMAIN 2 Environmental challenge				
No impact	**Mild impact**	Moderate impact	Severe impact	Extreme impact

DOMAIN 3 Disease, injury, functional impairment				
No impact	**Mild impact**	Moderate impact	Severe impact	Extreme impact

DOMAIN 4 Behavioural or interactive restriction				
No impact	Mild impact	**Moderate impact**	Severe impact	Extreme impact

DOMAIN 5 Anxiety, fear, pain, distress, thirst, hunger				
No impact	Mild impact	**Moderate impact**	Severe impact	Extreme impact

Overall impact
Moderate

DURATION OF IMPACT				
Immediate to seconds	**Minutes**	Hours	Days	Weeks

SCORE FOR PART A:	4
Summary of evidence:	**Note**: The decision on impact grades reported here are those that were reached by the majority of the panel. Some of the domains were graded higher by one of the invited panel members. These assessments were done at the first meeting of the panel, at subsequent meetings consensus was reached on all impact grades.
Domain 1	No impact in this domain
Domain 2	There is less opportunity to move away from the shooter compared with ground shooting. Exercise challenge is increased as there is likely to be a period of pursuit before being shot.
Domain 3	There is some potential for injury during helicopter pursuit. The wounding rate may be higher with aerial shooting (compared with ground shooting) because animals are shot whilst they are moving, however the range is likely to be much shorter and any wounded animals can be followed up quickly.
Domain 4	There will be a restriction of behaviour since there is no escape for the animal that is being pursued by the helicopter. The long-term effect on the behaviour of any animals that escape and are not killed is unknown.
Domain 5	The presence of the helicopter will induce an escape response that includes running and changing the size and composition of groups[1].

PART B: assessment of mode of death

Time to insensibility (minus any lag time)				
Immediate to seconds	Minutes	Hours	Days	Weeks
Level of suffering (after application of the method that causes death but before insensibility)				
No suffering	Mild suffering	**Moderate suffering**	Severe suffering	Extreme suffering

SCORE FOR PART B:	C
Summary of evidence:	
Duration –	With chest shots, time to insensibility can range from seconds to a few minutes. The time to loss of consciousness and the time to death will depend on which tissues are damaged and, in particular, on the rate of blood loss and hence the rate of induction of cerebral hypoxaemia[2]. Loss of consciousness and death are likely to be quick when animals have been shot in the heart. 'Hydrostatic shock' (see below) may also contribute to rapid incapacitation and potentially rapid loss of consciousness with shots to the chest; however this effect seems to be variable and does not occur in all instances. 'Double tap' shots (two quick shots in succession) are always used with chest shots. With head shots, a properly placed shot will result in immediate insensibility[3, 4, 5]. A follow-up shot to ensure death ('insurance shot') is required in all cases.

Suffering –	Animals that are chest shot and still conscious are likely to have a short period of suffering, though the extent of suffering will vary depending on which tissues are damaged and the rate of blood loss. During haemorrhage there is likely to be tachypnoea and hyperventilation, which, when severe, would indicate that there is a sense of breathlessness before the loss of consciousness[2]. Severe haemorrhage in humans is also associated with anxiety and confusion[6]. If chest shot animals are rendered insensible by the mechanism of 'hydrostatic shock' and they do not regain consciousness prior to death they are unlikely to suffer. When animals are rendered insensible immediately with a well-placed head shot that causes adequate destruction of brain tissue there should be no suffering[3].

Summary

CONTROL METHOD:	**Aerial shooting of feral horses**
OVERALL HUMANENESS SCORE:	**4C**

Comments

Wounding rates with aerial shooting

Statistics on wounding rates for aerial culling of animals are not readily available. Information provided by Tim Fraser, Team Leader of the SA DEH aerial shooting team states that "Animals killed instantly by my team would be better than 90 % and wounded animals less than 5 %". He also explained that "In most cases an experienced shooter knows as he/she touches off the shot whether it is perfectly placed or not, and if there is any doubt, second or even third shots are on their way instantly".

One published account of wounding rates during an aerial shooting cull of feral horses was found. This was in a report on the cull of feral horses in Guy Fawkes River National Park in 2000 prepared by English[7]. The cull occurred between 22 and 24 October 2000, during which time 606 horses were shot. One horse was found alive on 1st November despite having 2 bullet wounds in the killing zone. The report author states that 'many horses received 4 or more shots, but the great majority were killed by the first or second shot' (the actual numbers are not given in the report). Thirty-nine horses were examined after the cull on 2 and 10 November, and also 67 horses were examined by a veterinarian, and 'no evidence of indiscriminate killing away from the target zone was found'.

Response to helicopter

It was noted that there is limited knowledge on the short-term behavioural and physiological responses of horses to the presence of a helicopter. The study by Linklater[1] describes the flight response of running in the context of affecting the accuracy and precision of helicopter counts. The horses were seen to run for up to 2.75 km before leaving the ground observers view.

Hydrostatic shock

With shooting, in addition to the damage caused by the penetrating projectile, there is scientific evidence that organs can also be damaged by the pressure wave that occurs when a projectile enters a viscous medium, a phenomenon known as 'hydrostatic shock'[8]. Experimental studies on pigs and dogs demonstrate that a significant ballistic pressure wave reaches the brain of animals shot in an extremity such as the thigh[9, 10, 11]. It is hypothesised that damage to the brain occurs when the pressure wave reaches the brain from the thoracic cavity via major blood vessels but could also occur via acceleration of the head or by passage of the wave via a cranial mechanism[12]. It is also thought that hydrostatic shock may produce incapacitation more quickly than blood loss effects, however not all bullet impacts will produce a pressure wave strong enough to cause this rapid incapacitation[13].

Anecdotal reports by hunters maintain that some species are more susceptible to this shock effect than others; however no studies were found that confirmed this. However there is some speculation that, if one of the mechanisms that contribute to the effect of hydrostatic shock and subsequent damage to the brain is caused by acceleration of the head, it is possible that some animals may be more resistant to the incapacitating effects of shooting. It is recognised that animals such as head-butting ruminants appear to be more resistant to concussion than humans and are thought to have a higher acceleration threshold which could make them more resistant to traumatic brain injury not only from externally imposed forces, accelerations and blunt force trauma but also from an internal ballistic pressure wave generated by a projectile[14, 15].

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