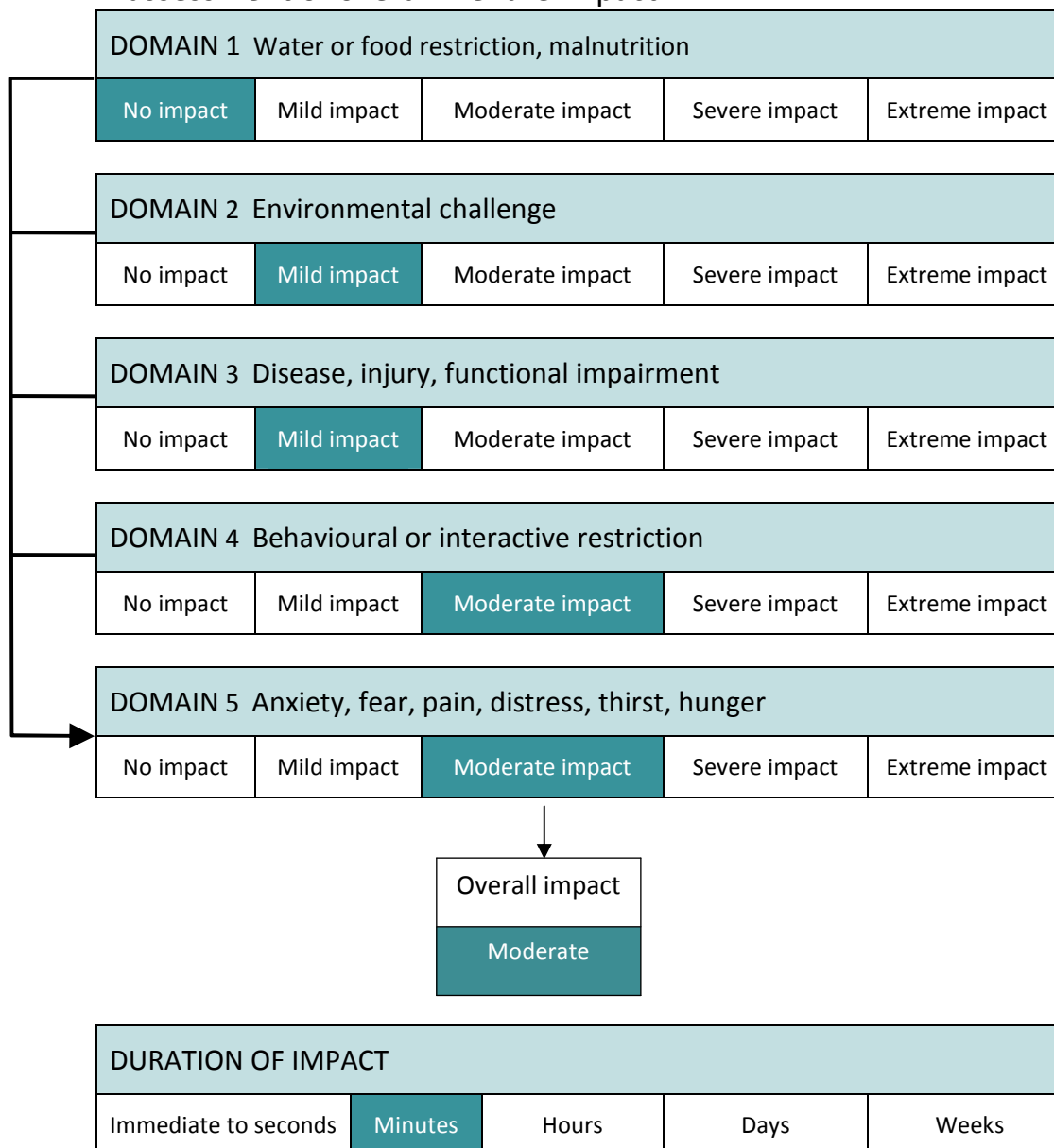


Control method: Aerial shooting of feral horses

| | |
|--------------|---|
| Assumptions: | <ul style="list-style-type: none"> ▪ 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



| | |
|--------------------------|--|
| 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 – | <p>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 hypoxaemia². 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.</p> <p>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.</p> |

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 consciousness². Severe haemorrhage in humans is also associated with anxiety and confusion⁶.

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 suffering³.

Summary

| | |
|---|--|
| CONTROL METHOD: | Aerial shooting of feral horses |
| OVERALL HUMANENESS SCORE: | 4C |
| <p>Comments</p> <p>Wounding rates with aerial shooting</p> <p>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".</p> <p>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 English⁷. 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'.</p> <p>Response to helicopter</p> <p>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 Linklater¹ 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.</p> <p>Hydrostatic shock</p> <p>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 mechanism¹². 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 incapacitation¹³.</p> <p>Anecdotal reports by hunters maintain that some species are more susceptible to this shock effect</p> | |

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}.

Bibliography

1. Linklater, W.L. & Cameron, E.Z. (2002). Escape behaviour of feral horses during a helicopter count. *Wildlife Research* **29**, 221-224
2. Gregory, N.G. (2005). Bowhunting deer. *Animal Welfare* **14**, 111-116
3. American Veterinary Medical Association (2001). 2000 Report of the AVMA Panel on Euthanasia. *Journal of the American Veterinary Medical Association* **218**, 669-696
4. Gregory, N. (2004). *Physiology and behaviour of animal suffering*. (Blackwell: Oxford, UK).
5. Longair, J. et al. (1991). Guidelines for euthanasia of domestic animals by firearms. *Canadian Veterinary Journal* **32**, 724-726
6. Zajchuk, R. (1995). Anesthesia and Perioperative Care of the Combat Casualty. Chapter 4 - Hemorrhage, Shock and Fluid Resuscitation. (Office of The Surgeon General at TMM Publications, Borden Institute, Walter Reed Army Medical Center: Washington, DC).at <http://www.bordeninstitute.army.mil/published_volumes/anesthesia/ANfm.pdf>
7. English, A.W. (2000). *Report on the cull of feral horses in Guy Fawkes River National Park in October 2000*. (Veterinary Clinical Sciences, Faculty of Veterinary Science, University of Sydney: Sydney).
8. Courtney, M. & Courtney, A. (2008). Scientific Evidence for Hydrostatic Shock. 0803.3051 at <<http://arxiv.org/abs/0803.3051>>
9. Suneson, A., Hansson, H. & Seeman, T. (1990). Pressure Wave Injuries to the Nervous System Caused by High-energy Missile Extremity Impact: Part I. Local and Distant Effects on the Peripheral Nervous System-A Light and Electron Microscopic Study on Pigs. *The Journal of Trauma* **30**, 281-294
10. Suneson, A., Hansson, H. & Seeman, T. (1990). Pressure Wave Injuries to the Nervous System Caused by High-energy Missile Extremity Impact: Part II. Distant Effects on the Central Nervous System-A Light and Electron Microscopic Study on Pigs. *The Journal of Trauma* **30**, 295-306
11. Wang, Q., Wang, Z., Zhu, P. & Jiang, J. (2004). Alterations of Myelin Basic Protein and Ultrastructure in the Limbic System at the Early Stage of Trauma-Related Stress Disorder in Dogs. *The Journal of Trauma* **56**, 604-610
12. Courtney, A. & Courtney, M. (2009). A thoracic mechanism of mild traumatic brain injury due to blast pressure waves. *Medical Hypotheses* **72**, 76-83
13. Courtney, A. & Courtney, M. (2007). Links between traumatic brain injury and ballistic pressure waves originating in the thoracic cavity and extremities. *Brain Injury* **21**, 657-662
14. Courtney, M. & Courtney, A. (2007). Sheep Collisions: the Good, the Bad, and the TBI. 0711.3804 at <<http://arxiv.org/abs/0711.3804>>
15. Shaw, N.A. (2002). The neurophysiology of concussion. *Progress in Neurobiology* **67**, 281-344