# Appendix I: Mark Fisher's Report on Animal Ethics Issues in the Application

Animal Ethics Issues Associated with the Use of 1080 To Manage Pests

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***Introduction***

There are different views of the ways we should treat and interact with animals and ethics is a way of reflecting on the justification for those views (see Sandøe et al., 1997).

A compassionate and respectful attitude to animals has long been part of humanity (see Preece, 2002). The common view, the culmination of a long tradition of moral reflection, is that our interactions with animals are acceptable provided that those interactions are humane (Banner et al., 1995). That view is further captured in the common sense maxims (Fisher, 1998):

- animals are sentient and it matters to them how they are treated;
- we have responsibilities for animals within our care;
- you should not hurt animals unless it is absolutely necessary;
- if there are less painful ways of treating animals then they should be used; and
- some harms should be prohibited, regardless of their benefits.

However, the management of pests often requires the imposition of harm to an animal (e.g. death) for a good (e.g. the health of the ecosystem). Although there are some philosophical nuances, generally contributions to the animal ethics literature hold to two major principles: (1) a respect for the environment requiring intervention in the face of pest damage, and (2) a respect for the pests requiring consideration of their welfare.

Marks (1999) notes that contemporary philosophical and ethical stances to the welfare of animals have, in part, been derived from concerns with the treatment of animals in science and in intensive farming. These considerations have tended to promote consideration of the welfare of the individual animal. However, in the management of pest animals, although they cannot be ignored, the needs of the individual animal are not paramount – the maintenance of a viable ecosystem is also valued. This means there is a requirement to reduce and minimise animal suffering while being consistent with the aims of managing the ecosystem. Furthermore, effort must be directed towards determining when and how we control pests, with the aim of limiting the potential for inducing pain and distress.

Eggleston et al. (2003) have furthered Marks' ecocentric ethic. They based their approach on three sets of values: (1) duties to protect indigenous biodiversity and natural ecosystems; (2) a duty to minimise animal suffering; and (3) the special significance of human interests (e.g. recreational hunting, aesthetic appreciation). These values gave rise to prima facie principles for managing wild animals:

- we are required to manage introduced animals causing harm, where effective means are available, provided those means do not result in greater harm to the ecosystem;
- we must take the interests of animals seriously and avoid unnecessary harm to them;
- we must also avoid, or if it is unavoidable, minimise, interference in the lives of wild animals; and
- people have a right to pursue their interests on the conservation estate, providing those interests are not detrimental to other people or to conservation.

These sorts of approaches, highlighting the need to consider the animal, the ecosystem, and people, have resulted in the articulation of a number of guidelines which, in addition, demand that the control programmes themselves are effective and efficient. For example, Littin et al. (2004) state that the following should guide the design and execution of pest management:

1. the aims or benefits and the harms must be clear;
2. control must only be undertaken if the aims can be achieved;
3. the methods that most effectively achieve the aims must be used;
4. the methods must be applied in the best possible way;
5. whether or not the aim has been achieved must be assessed;
6. on achieving the aim, steps must be taken to maintain the beneficial state.

Furthermore, Littin et al. (2004) require that the most humane control methods possible are used, and that ways of improving their humaneness and newer more humane methods should be sought.

To sum up, harms to animals must be both necessary and justified, ultimately in terms of conservation and livestock health, and minimised wherever possible. Underlying the use of 1080 to manage pests is a tension between the harm to individual animals from poisoning, and the benefits to other individual animals, ecosystems, and economies resulting from their deaths. The *Application for the Reassessment of 1080* is based on relatively well described conservation and livestock health benefits from the removal of possums, principally, seen as the greater good, outweighing the risks or harms associated with 1080. In fact, the overall evaluation is that "there are no significant risks to New Zealand's environment in a future with 1080." However, like any animal, pest animals (both those dying and those surviving exposure to a toxin) have a capacity to suffer although this fact is often overlooked, or at least discounted, in pest management programmes (Oogjes, 2003).

### *Harms caused by 1080 to animals*

The harms caused by 1080 fall into a number of categories. Firstly, the acute effects in the poisoned animal. Secondly, any chronic effects caused by sublethal amounts of 1080, and finally, any effects not directly caused by the poison but by either the poisoning process, or by modification of the surviving population after the death of affected individual animals.

A broad-spectrum toxin, the use of 1080 in possum control operations has been implicated in the deaths (Spurr, 2000) of:

- possums, deer, goats, pigs, cats, ferrets, rats, mice, stoats, wallabies, rabbits;
- dogs, sheep, cattle, horses, deer, goats, pigs, cats, poultry;
- harrier hawk, weka, pukeko, black-backed gull, kereru, kaka, kea, morepork, rifleman, pipit, whitehead, grey warbler, fantail, tomtit, robin, silvereye, bellbird, tui, kokako; and
- quail, chukor, skylark, hedge sparrow, blackbird, thrush, yellowhammer, chaffinch, greenfinch, goldfinch, redpoll, house sparrow, magpie.

Animals with lethal doses of 1080 usually show non-specific symptoms such as nausea and vomiting, as well as specific signs of poisoning including cyanosis, drowsiness, tremors, staggering, disturbances of the central nervous system, convulsions and coma (see Parton et al. 2001; Eason & Wickstrom, 2001; Sherley, 2002). Death is the result of either heart (e.g. herbivores) or respiratory (e.g. carnivores) failure although the justification for distinguishing between groups of animals on the basis of their symptoms has been questioned (Sherley, 2004).

Common symptoms of 1080 poisoning in birds include a lack of balance, slowness, ruffled feathers, salivation and vomiting. Rats have been noted to be tremorous and hyperexcitable though occasionally observed without apparent excitation. They tend to remain huddled together, heads curled under, and refuse food and water. Convulsions and breathing difficulties also occur. The majority of rabbits appear normal until a few minutes before death when they have convulsive fits, but a proportion also experience lethargy, ataxia and infrequent respiration.

Sheep and cattle may show initial signs of anorexia and depression, followed by staggering, muscle tremors and heart and respiratory abnormalities, convulsions and coma. Horses may experience severe sweating and trembling. Pigs may vomit, become lethargic, or have convulsions but affected animals usually lie quietly and breath slowly and laboriously until death.

Dogs are very sensitive to 1080 and there is a rapid onset of anxiety, nausea and vomiting, followed by fits of wild barking and frenzied running, repeated urination, defecation, convulsions and paddling and increasing seizures. It has been claimed (Gregory, 1996) that because there are similarities between 1080 poisoning in dogs, and disorientation, convulsions and loss of consciousness caused by hyperinsulinism in humans, some symptoms (those associated with central nervous system stimulation) may not be associated with pain. Signs of 1080 poisoning in cats include depression or excitation, vocalisation, salivation, diarrhoea and irregular heart rhythms.

Humans may experience nausea, vomiting and abdominal pain initially, followed by respiratory distress, anxiety, agitation, muscle spasms, stupor, seizures and coma.

Humaneness, or conversely suffering, is dependent on the duration and severity of distress or pain, the number of animals affected, and their capacity to suffer (Gregory et al., 1996). While not all animals experience all symptoms and different species react differently, the following effects of poisons are considered as detrimental to animal welfare and should be avoided: prolonged partial or total paralysis whilst conscious; hyperexcitability or aggression; convulsions where the animal remains conscious; intermittent seizures or convulsions where the animal regains consciousness between episodes; persistent vomiting or retching; and self-mutilation.

Clinical signs of poisoning in possums have been grouped as follows according to the degree of suffering they are assumed to indicate (O'Connor, 2004):

- Minor – occasional retching, occasional abnormal breathing, mostly inactive with reduced awareness, loss of normal behaviour patterns, and short-term minor to moderate pain
- Moderate – vomiting or high frequency of retching, prolonged abnormal breathing or periods of laboured breathing, mostly prostrate or lying with reduced awareness, short-term severe pain or long term discomfort, and recovery from intermittent or short convulsions.
- Marked – prolonged laboured breathing, and recovery from regular or prolonged convulsions.

It is convenient to consider poisoning in three stages (1) an initial lag phase until the onset of clinical signs; (2) a period of sickness during which the animal is most likely in some discomfort, pain or distress; and (3) an unconscious stage immediately preceding death. The average progress of these stages for 1080 is a lag phase of 3 hours followed by 8.5 hours of sickness, and death at 11.5 hours.

Assessment of sickness and hence the welfare of poisoned animals is based on behavioural, physiological and pathological measures and these have been best described in two New Zealand studies. The first summarised the welfare of captive possums (n = 27) poisoned with 1080 (O'Connor et al., 2003):

| Time (hour:min) | Sickness symptoms due to 1080 in possums | Welfare implications |
|---|---|---|
| 1:52 | Onset of sickness – changed appearance | Minor |
| 2:53 | Minor and moderate retching and vomiting | Minor to moderate from abdominal pain after repeated bouts |
| 3:37 | Moderate incoordination (unsteady head movements and walking) | Disorientation or weakness. |
| 4:05 | Minor tremors or spasms | Probably minor as mostly twitches, but could be a concern if spasms caused pain. |
| 5:38 | Prolonged lying or prostrate posture | Could indicate pain, weakness or disorientation |
| 11:26 | Death | Unconsciousness occurred immediately before death. |

Possums displayed signs of potential compromise to their welfare for up to 9.5 hours. Mild or moderate retching was experienced by a number of the animals, most became incoordinated and then all had mild tremors or spasms with a few short-lived, mild to moderate seizures also experienced by some (O'Connor et al., 2003).

The second study described the effects of 1080 poisoning on the behaviour of 13 captive stoats (Potter et al., 2006):

| Lag phase mean (range) | Duration of sickness and symptoms of 1080 poisoning in stoats | Time to death |
|---|---|---|
| 1h:1m (29m – 2h 7m) | 26 min (2 min – 1 h 40 min) of ataxia and hyperactivity<br>followed by<br>58 min (16 min – 2 h) of recumbency with convulsions and rapid breathing<br>followed by<br>33 min (1 – 51 min) of recumbency with limited activity and progressively shallow breathing. | 2 h 36 min (1 h 15 min – 4 h 7 min |

Animals receiving sub-lethal doses of 1080 show mild clinical signs of poisoning (severe depression, anorexia, listlessness, teeth-grinding and weakness), metabolise and excrete 1080 within 1-4 days, and then recover. While some animals surviving accidental poisoning remain unthrifty, there are apparently no residual health problems in pets (Parton et al., 2001) and no long-term effects on reproduction in ewes (O'Connor et al., 1999).

A number of toxicological studies have demonstrated effects of 1080 on tissues, growth and reproduction, at doses where there is no mortality or signs of clinical toxicity. For example, skeletal abnormalities were observed in foetuses taken from rats exposed to 12 days of 1080 during gestation (Eason et al., 1999). Similarly, 90 days of 1080 treatment resulted in pathological changes to the heart and testes in rats (Eason and Turck, 2002). Although morphological and reproductive measures are sometimes used to indicate poor welfare (Broom and Johnson, 1993), the relevance of these results to animal discomfort, pain or distress is not known. Similarly, the relevance of long-term toxicological studies to assessing animal welfare after acute exposure more symptomatic of pest control operations is also unknown. However, they do emphasise the potential for sublethal exposure to 1080 to affect animal welfare.

Consideration of the longer term effects of 1080 should also include the effects of removal of individual animals from a population on those remaining. At one level, for example, the death of lactating animals may affect the welfare and survival of any dependent young. At another level, as with any selective pressure, populations of poisoned animals may develop resistance (Twigg et al., 20002).

Part of humane interactions with animals is that harms should be minimised, and more humane methods researched (Littin et al., 2004). There are a number of different approaches and although not explicitly addressed in the *Application for the Reassessment of 1080*, it is worth noting that the applicants have been, and continue to be, party to these initiatives (e.g. Seawright & Eason, 1994; Royal Society of New Zealand, 1996; National Research Centre for Possum Biocontrol, 2007), an important part of the justification of harms to animals. Examples of such approaches range from investigating the use of bait additives to help alleviate the noxious symptoms of poisoning (e.g. nausea and anxiety; Cook, 1998); to strategies for reducing risks to non-target animals (e.g. screening out small pieces of carrot bait or "chaff" which have been responsible for a large number of the bird deaths; Spurr, 2000); and to integrated pest management programmes designed to prolong the benefits thereby minimise the need for subsequent 1080 applications.

***Harms associated with alternatives***

There are several potential alternatives to the use of 1080 for controlling pests, including the use of other poisons, trapping and shooting. Cyanide, also a broad-spectrum toxin, depresses the central nervous system and death results from respiratory arrest. Symptoms of cyanide poisoning include excitement and generalised muscle tremors, salivation, urination and defecation, gasping for breath, and convulsions. Birds may show signs of panting, eye blinking, salivation and lethargy with breathing becoming laboured and intermittent prior to death. Hyperventilation, headache, nausea and vomiting, weakness and coma have been described in humans (Eason & Wickstrom, 2001). There is a 2 minute lag phase following ingestion, 12 minutes of sickness, and then death at 14 minutes.

The welfare of captive possums (n = 42) poisoned with cyanide has been described by O'Connor et al. (2003) based on data from Gregory et al. (1998):

| Time (mins:secs) | Symptoms of sickness in possums due to cyanide | Welfare implications |
|---|---|---|
| 3:09 (1:11 -6:52) | Onset of sickness – incoordination | Maybe some disorientation |
| | Mild and moderate changes in breathing | Minor as short-lived |
| 6:27 (2:11-13:07) | Loss of response to handling | Unconsciousness. |
| | Convulsions | None or very minor as possums considered unconscious. |
| 17:55 (10:43 – 26:31) | Death | |

There was potentially little more than 3 minutes of potential welfare compromise due to mild abnormal breathing in half the possums (convulsions occurred in all animals after they had become unconscious).

The other poisons used to control possums, phosphorous, cholecalciferol, and especially brodifacoum, appear to be less humane (O'Connor et al., 2003). Phosphorous was associated with up to 10 hours of mild pain, cholecalciferol with abnormal breathing, anorexia and marked weight loss suggesting up to 7 days of compromised welfare, and brodifacoum with haemorrhages of varying sensitivity indicating pain for perhaps 6-7 days before death.

The harms caused by shooting and trapping possums (and other animals) are much more difficult to assess. Shooting an animal in the head at close quarters is considered a humane form of killing animals (Fraser, 2006). However, there is some variation in the accuracy of shooting, as well as the calibre of the firearm, resulting in some animals taking longer to die, requiring more than one shot or escaping wounded to die or recover. For instance, Gregory (2002) cites a number of studies showing:

- 11% of red deer shot by stalkers in the UK required two or more shots and 7% of the deer took more than 2 minutes to die,
- most (88%) kangaroos were shot in the head and a minority in the chest (note that higher prices were paid for less-damaged, head-shot carcasses),
- a number of animals (ducks, beef cattle, cats, dogs) had evidence of having been wounded but had apparently recovered.

The potential forms of suffering in injured animals include:

- inflammation at the wound site, disruption and damage to tissues (acute and chronic),
- dissociative and/or anxiety disorders, and
- disability preventing escape or avoiding threatening situations, keeping up with the social group, or feeding and drinking adequately.

Hunting brings additional stresses if it involves a period of pursuit (or chase) resulting in exertion, fatigue, respiratory distress, exhaustion and fear (e.g. pig-hunting).

The humaneness of trapping is also complex, depending on the method. Traps which contain an animal cause less damage than restraining traps, and kill traps that kill quickly cause shorter-lasting distress than live traps. The risks (for both target and non-target animals) associated with trapping include (Nutman et al. 1998):

- distress and trauma associated with being trapped and killed,
- escape from the trap with trauma,
- inanition and dehydration when held in the trap for long periods,
- a risk of predation, and
- in some species self-mutilation.

Kill traps can have advantages in being more humane, but those that fail to result in a prompt death may result in increased suffering (Nutman et al., 1998). Times to unconsciousness vary from less than a minute to more than 3 minutes, depending on the type of trap (Warburton & Choquenot, 1999). Most possums (89%) held in the most common type of leg-hold trap used in New Zealand, sustained only minor injuries (normal or oedematous swelling, or minor cutaneous or tendon laceration), with the remainder suffering joint dislocations, lacerations, or simple or compound fractures (Warburton & Choquenot, 1999). Possums caught after dark and killed before midday the following day would experience less than 14 hours in the trap. The authors concluded that leg-hold and kill traps had a moderate to severe risk of pain for possums.

### *Discussion*

The *Application for the Reassessment of 1080* indicates that 1080 brings significant benefits to other species, especially at the population level, and to livestock health, without significant environmental risks. It also describes the mode of action of 1080 and the time to death in possums, and the susceptibility of different species; the relative advantages and disadvantages of different poisons; acute toxicity and average kill rates; effects on birds, bats and invertebrates; and secondary poisoning. However, consideration of the harms caused to individual animals, both those dying and those that recover from exposure to the poison, appear to have been overlooked.

1 Clearly, 1080 presents a significant welfare risk – poisoned animals experience several hours of compromised welfare and death, and possible pathological effects in surviving animals. This risk, not just to possums but many other species, should be acknowledged and considered in an assessment of 1080. Given that 1080 is a broad-spectrum toxin, it is essential that the broad spectrum of costs and benefits is considered and not just limited to possums. The intensity of suffering, duration and number of deer, pigs, goats, rats etc affected should also be included if such data is available.

Failure to fully acknowledge the harms to animals is disconcerting, especially amongst public institutions. Pest animals are often labelled as enemies and their capacity to suffer ignored, with control programmes justified in terms of their agricultural and environmental impacts (Oogjes, 2003). Pest control programmes often bring the death of other species – at times some of these species are considered as pests and at times resources (e.g. feral deer and pigs). Other non-targeted species may also be accidentally poisoned (e.g. sheep and cattle). Among these the dog is especially sensitive to 1080, and to the risk of ingesting toxic carcasses long after the target animal has died (Meenken & Booth, 1997). The long and special relationship between dogs and people inevitably means any suffering and death is associated with human suffering.

In conclusion, the justified use of 1080 to control pests must include consideration of the harms caused to target and non-target animals and of the efforts to minimise those harms. Cyanide should be used in preference to 1080 wherever possible, since it appears to be more humane, and research should continue to investigate more humane techniques, methods of targeting pest animals only, reducing the pain and discomfort poisoned animals experience, and making alternatives more humane, practical and economically viable.

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