English 215

Assessment of 1080 Use in New Zealand

Christina Blakey

Abstract

This paper explores sodium monofluoroacetate, F-CH_2-OOO-Na, or 1080 (as it is commonly known) - a hazardous toxin that is used extensively in New Zealand to control feral pests. 1080, labeled as "extremely hazardous" by the World Health Organization (WHO, 2004, p.16), has been banned in the United States by the EPA (except for use in poisoned collars against coyote attacks on livestock) (Weaver, 2003, p.48). Methods of administration in New Zealand include traps and aerial disbursement of poisoned bait. While ground traps are controlled so that only the desired animal is targeted, aerial drops to unmanaged sections of forest administers the poison indiscriminately. All animals are vulnerable to the poison, and this would include the non-target animals that this procedure is designed to protect. If a lethal dose is not primarily ingested, secondary poisoning can take place via ingestion of tainted flesh from a carcass of an animal killed by 1080. Chronic toxicity can occur when sub-lethal levels are ingested over time; this has been shown to lead to serious organ mutation (Weaver, 2006, p. 377). Aerial drops of poisoned bait directly contaminate waterways and watersheds. The Department of Conservation (DoC) and the Animal Health Board (AHB) contend that this poison and method of dispersal are both safe and necessary, stating "the benefits of using 1080 outweighed the adverse effects" ("The Reassessment," 2007, p.22). The DoC also admits that research is ongoing and incomplete (2007, p. 26). Aerial administration of 1080 must be stopped immediately until concrete evidence can support the claims of human safety.

The introduction of mammalian predators and pests to New Zealand has resulted in an ecological nightmare. Stoats, possums, rabbits, cats and ferrets pose serious threats to the native flora and fauna, and many different methods of control have been used to try and manage the problem. 1080 is one method of control that is tremendously popular. This highly toxic poison is used in traps as well as aerial drops. The use of this poison is extremely controversial; while it is effective in controlling local populations of unwanted pests, it kills indiscriminately any animal that ingests a lethal dose. As over 3.2 tons of 1080 are distributed across New Zealand annually (Foronda, N., Fowles, J., Smith, N., Taylor, M., & Temple, T., 2006, p. 85), it is of the highest concern to affirm that it is safe. Unfortunately, this has not happened. The DoC claims that the "benefits outweigh the adverse effects"; however, many independent studies have shown that this might not be the case. Waterways have been shown to carry traces of 1080 (Weaver, 2003, p. 53); secondary poisoning of unintended target animals occurs frequently as scavengers feed on the carcasses of animals killed by 1080 (Lloyd & McQueen, 2000, p. 47); non-target animals, such as birds, domestic dogs and livestock, are frequent victims of 1080 (Fisher, 2007, p. 569), and sub-lethal doses have been shown to lead to chronic toxicity which in turn impacts systems and organs of non-target animals (Weaver, 2006, 377). Until further research is done to prove that 1080 is absolutely safe and will have no long-term effects in humans, aerial drops of this poison should be banned.

Invasive mammalian predators are known to cause harm to local animals, and in some cases, render them extinct. This is abundantly evident in the island nation

of New Zealand. Before human contact, animals in New Zealand evolved in isolation and without mammalian predators (Harada & Glasby, 2000, p. 80); as a result, many bird species became flightless and ground nesting (Pryde & Cocklin, 1998, p. 89). When humans arrived around 800 A.D., they found a land inhabited by ratites (large, flightless birds) as well as other smaller flightless birds. Humans brought rats and dogs with them, and over the next 800 years these three species decimated the bird population (Harada & Glasby, 2000, p.85), extinguishing 34 bird species during this time (Veblen & Stewart, 1982, p. 374; Diamond & Veitch, 1981, p. 499). European colonization began in earnest after 1840, and with this came a new wave of biological invaders (Harada & Glasby, 2000, p. 79, Veblen & Stewart, 1982, p. 374). Feral populations of European domesticated animals (pigs, goats, sheep and cats) devastated native flora and fauna; Europeans also introduced several species of wild animal for sport and fur such as deer, rabbit and possum (Veblen & Stewart, 1982, p. 374). When the rabbit population grew beyond control, the stoat (also known as the short-tailed weasel or ermine) was introduced as a biological control. Unfortunately, the stoats found New Zealand's flightless birds easier prey (Pryde & Cocklin, 1998, p. 89), and they are now "known to kill up to 60% of all North Island kiwi chicks and wreak havoc on other native bird populations, killing far more than they need to survive" ("Media Release," 2001). As a result of these introductions, another 16 land bird species have become extinct in the last 200 years (Craig et al., 2000, p. 63). New Zealanders, wanting to stop the mass extinction of their native birds as well as negative impacts on agricultural production and native forests, began intense chemical warfare against invasive predators and grazers in the 1960s ("The Reassessment," 2007, p.5).

The most wanted of all feral pests is the Brush-tailed Possum (Trichosurus vulpecula), which was introduced in 1837 in hopes of creating a fur trade ("The Reassessment," 2007, p.5). There are an estimated 55 million possums in New Zealand, eating an average of 7 million tons of vegetation annually ("The Reassessment," 2007, p. 7). This is devastating for native forests and for those who inhabit them. They also feed on eggs and chicks of native birds, and are known carriers of bovine tuberculosis (Veblen & Stewart, 1982, p. 389). For these reasons, the Brush-tailed Possum is the main target of 1080. A popular method of application is aerial bait drops, and a portion of the 3.2 tons of 1080 is dispersed via this method. The DoC claims to distribute 1080 over 560,000 hectares annually, and 150,000 hectares of that number are managed aerially ("1080 Questions," n.d., p. 2). The distribution of this much poison over such a large area begs the question of contamination of water and soil and how that might affect humans. There is conclusive research proving that at temperatures of 70°F, the rate of degradation was acceptable (no traces found after 141 hours). However, after the same amount of time in 52°F water, 30% of the poison remained (Weaver, 2003, p.53). This is significant because most mountain rivers in New Zealand have water temperatures well below 70°F, especially during winter when most aerial operations occur. The Environmental Risk Management Authority (ERMA) claims that there is no evidence that 1080 persists in water, but as for soil concerns, "acknowledged that there was little research available on the persistence of 1080…and recommended that further research be done in this area" ("The Reassessment," 2007, p. 19). By their own admittance, 1080 may pose a public health risk due to persistence in soils. Considering the danger 1080 poses to all animals, especially mammals, the acknowledgement that there is little research and information as to the persistence and effects of 1080 available (and the lack of foresight to test 1080 levels in cooler waters) is unacceptable and a policy failure on the part of the New Zealand government.

In the Environmental Risk Management Authority's 2007 reassessment of 1080, the

Committee claims that there is little to no evidence that 1080 harms lizards, bats, insects and frogs; they also claim that 1080's use results in a positive effect on bird population numbers ("The Reassessment," 2007, p. 18). In their study regarding the impact on birds, Burr & Powlesland (1997) concluded that over 30 species of native birds are at risk and are vulnerable to 1080 poisoning (pp. 9-19). Several other bird species are listed as having unknown impacts on their numbers (1997, p. 19). Although 1080 is successful at temporarily controlling local pest populations, the reduction in their numbers put birds at further risk. Stoats and felines, which prey on possums, turn their attention to native birds after "successful" 1080 drops have resulted in drops in possum numbers (Burr & Powelsland, 1997, p. 10). For species other than birds such as bats, lizards, frogs and other invertebrates, techniques and procedures for monitoring effects of 1080 are described as inadequate, biased, in need of improvement, insufficient, invalidated (Burr & Powlesland, 1997, pp. 6-9), and difficult to assess (Lloyd & Mc Queen, 2002, p. 58). In fact, Burr & Powlesland's results published for and by the DoC state that

> The lack of standard, validated methods for monitoring wildlife species has hindered assessment of the impacts of 1080-poisoning for possum control on non-target populations. Initial measurements of bird populations using 5-minute counts…found no evidence of any population impacts from 1080-poisoning. However, 5-minute counts have not been adequately validated…There is an urgent need for research to validate methods for monitoring population numbers of all non-target species…Research is needed urgently on determining the long-term impacts (whether costs or benefits) of 1080-poisoning for possum control on wildlife (1997, p. 27).

This paper was published nearly 40 years after 1080 was approved for use as a pest control in New Zealand. It is highly irresponsible for ERMA and the DoC to claim that there is no evidence of impact by 1080 on non-target populations when either the evidence is clear it has, or they have not researched the issues thoroughly and carefully enough to make such claims.

The World Health Organization declares that 1080 is of "very high mammalian toxicity," and is "very toxic to birds, domestic animals and wildlife. High risk of secondary poisoning to carnivorous and omnivorous species from eating poisoned carcasses" ("Data Sheets," 1975, pp. 2, 3). Secondary poisoning occurs when an animal ingests the flesh of another poisoned animal's carcass. This is quite common; after aerial distribution of 1080, no retrieval efforts for poisoned carcasses are made (the reason given for aerial distribution is that the areas targeted are too remote or too rugged to be "cost-effective" to use other application options) ("1080 Questions," n.d., p.2). Stoats often feast on the remains of possums and are killed as well. In this instance this is seen as beneficial, as stoats negatively impact native bird populations. However, as 1080 is highly toxic to all animals, this poses a serious problem for dogs and other scavengers. Lloyd & McQueen note that "secondary poisoning of carnivores and scavengers is well documented" (2000, p. 47). In their 2000 study of secondary 1080 poisoning of insectivores, Lloyd & McQueen raise concerns about secondary poisoning of insectivores such as birds and bats (2000, p. 51). There have been many instances of dog fatalities from secondary poisoning, and ERMA admits this ("The Reassessment," 2007, p. 22). Dogs have been found to be hypersensitive to 1080 and display symptoms such as "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" (Fisher, 2007, p. 569). There is no antidote for 1080 (Eason, 2002, p.

12). As part of ERMA's reassessment of 1080, new guidelines regarding dog safety are:

> · Signs marking areas where 1080 is used must contain a statement warning the public, including dog owners, about the danger from possum carcasses. This must be readable from a distance of 10 meters.
> · Signs must remain in place for six months after a 1080 operation or until the earlier of either the retrieval of the bait or demonstration that the bait and carcasses are no longer toxic (2007, p. 24).

Despite assurances by the DoC that 1080 has been demonstrated as safe ("1080 Questions," n.d., p. 4), these guidelines make a powerful counterclaim.

So what happens when a lethal dose of 1080 is ingested? Acute toxicity can be described as the result of a lethal dose of poison. This is the intended effect of 1080 on the undesirable pests such as the possum. At the onset of poisoning, nausea and vomiting occur followed by tremors and seizures, paralysis, then coma and death. M.W. Fisher points out that this process takes an average of 9.5 hours for possums, for most of which time they appear to be in distress and experiencing pain or discomfort (Fisher, 2007, p. 567). Should we care that animals regarded as pests suffer for long periods of time due to acute toxicity? Acute toxicity will occur to any animal that ingests enough of the poison, which means they will suffer the same excruciating fate as the target animals. 1080 is responsible for the deaths of not only target animals such as the possum and stoat, and non-target animals such as dogs; it has also claimed the lives of:

> deer, goats, pigs, cats, sheep, cattle, horses, poultry, harrier hawk, weka, pukeko, black-backed gull, kereru, kaka, kea, morepork, rifleman, pipit, whitehead, grey warbler, fantail, tomtit, robin, silvereye, bellbird, tui, kokako, quail, chukor, skylark, hedge sparrow, blackbird, thrush, yellowhammer, chaffinch, greenfinch, redpoll, house sparrow and magpie (Fisher, 2007, p. 569).

Some of the animals at risk are livestock animals, such as cattle, sheep and horses, while others are hunted for sport and food such as the red deer and feral pigs. These animals will inadvertently consume poisoned baits while grazing and browsing. Also, Meenken & Booth (1997) concluded that there was enough 1080 remaining in a possum carcass to be a serious threat to dogs after 75 days of poisoning (as cited in Weaver, 2003, p. 50). However, when livestock are known or suspected to have ingested a sub-lethal dose of 1080, there is a only a recommended 5-day minimum holding period before slaughter, and if there have been observed deaths due to 1080, longer holding periods are recommended (Weaver, 2003, p. 51). Studies on 1080 meat contamination of sheep and goats were done in 1994 by Eason et al., and tests proved that "poison residues were measured in blood, muscle, kidney, and the liver" (as cited in Weaver, 2003, p. 51). This means possible exposure to humans who consume these products. Red deer and feral pigs are hunted for food in some parts of New Zealand, and there is concern about residual levels of 1080 in the meat, organs, and blood. Pigs, which are known omnivorous scavengers, would be especially at risk for exposure to 1080 from eating carcasses of dead animals found in the forest. Sub-lethal doses of 1080, when consumed by deer and pigs, could make them slower and easier prey – an easy target for the hunter. But what happens to humans who could be exposed to low-levels of 1080 for long periods of time?

Chronic toxicity can be described as prolonged exposure to sub-lethal doses of a toxin. Most research conducted by the DoC, the AHB and ERMA focus on acute toxicity, or on what levels are at least near-lethal. There is research that has been done on chronic toxicity, and it is alarming. Sean Weaver, PhD

reveals that

> There are a variety of potential hazards associated with any partial persistence of 1080 including endocrine disruption, which can happen at very low concentrations, acute and chronic hazards to dogs, invertebrates, vertebrate wildlife, fish and other aquatic wildlife, aquatic and terrestrial food webs, and human drinking water supplies – particularly subterranean water flows" (2003, p. 53).

Others found testicular damage, heart problems, and fetal damage in rats after long-term, low-level contact with 1080, and these problems did not correct themselves after exposure to 1080 was stopped (Eason & Turk, 2002, pp. 439, 443, 445; Weaver, 2006, p. 377). Day, Matthews and Waas concluded that "the possibility remains that there may be adverse effects on species that have not yet been assessed" (2003, p. 309). Although there is not a scientific consensus in New Zealand or Australia regarding public health effects, the Environmental Protection Agency in the U.S. has classified 1080 as "a male reproductive toxin" (Weaver, 2003, p. 54). Foronda et al. state that the current NOAEL (no-observed-adverse-effect-level) does not mean that there is no risk, and that after an exhaustive literature review regarding the risk of 1080 on human health, the study found that "the critical effects arising from 1080 exposure were testicular/epidiymis, myocardial toxicity and teratogenicity" (2006, pp. 84, 87-88). Evidence here clearly proves that sub-lethal doses of 1080, consumed over time, can result in extremely negative consequences for animals and their systems and organ, and the poison can accumulate to eventually lethal levels (Lloyd & McQueen, 2000, p. 52).

Little is truly known regarding the long-ranging effects of 1080 on non-target species and on the environment. Regardless, tons of this poison are indiscriminately dropped over hundreds of thousands of acres of forest in New Zealand annually. Waters and soils are contaminated, and though the DoC and ERMA assure that concentrations of 1080 are quickly diluted or biodegraded ("1080 Questions," n.d., p. 3; "The Reassessment," p. 19), they are also quick to admit that more testing needs to be done. Livestock, pets, endangered birds, as well as other animals, are accidentally killed or sickened with every air drop of 1080. Residual poison in the organs and tissues of animals that could potentially be consumed by humans, especially in light of new evidence showing that the poison can accumulate and cause permanent damage to tissues and organs, should be enough to ban the use of 1080 completely. While the poison works at temporarily controlling pests, their populations always rebound. The obvious choice is for New Zealand to ban the use of this poison and try to come up with a better solution, one that is more suited to their "clean, green" reputation. A perpetuity that will always rely on poison as a control is dangerous, careless, and futile.

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