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2000/2 15 February 2000

Possum control

Executive summary

- The two main threats from possums are damage to native ecosystems and the spread of bovine tuberculosis. These have different control priorities, target areas, control agencies, and appropriate control methods. The agencies cooperate but a single cohesive possum control strategy does not exist.

- Possum control for conservation and bovine tuberculosis purposes and related research currently requires an ongoing annual expenditure by the Crown of $42.7 m, and by the private sector of $74.8 m. Direct economic losses to the private sector from possums are estimated to be as high as $60m per year. The total of all of these figures is $117.5 per year.

- Current pest control funding allocated to Vote:Conservation provides possum control for an estimated 45% of the native forest area nationwide that is at high risk from possums.

- Bounties and markets for possum products can be good incentives to kill possums, but not to kill enough possums in the right areas. Where possum control using trapping and cyanide is effective in achieving conservation objectives, there is also an incentive to meet population reduction targets.

- Few countries have a vertebrate pest problem of a scale to match New Zealand's (both possums and other species), and no other country in the world uses as much 1080 for animal control as New Zealand. Application of 1080 by air, which has attracted local opposition on environmental and social grounds, is used on about a fifth of the control area.

- Given high risks from possums and the apparently low risk of adverse environmental effects from 1080, agencies have continued with its large-scale use. Biocontrol alternatives are being researched and the most feasible options involve the use of genetically modified organisms.

The problem

Possums are a serious problem in New Zealand for two main reasons: damage to native ecosystems, and the spread of bovine tuberculosis. They can also cause damage to pasture, crops, commercial forests, soil conservation plantings and home gardens, and contribute to the spread of waterborne diseases such as *Giardia* and *Cryptosporidium*.

Possums cause damage to native ecosystems primarily through selective browsing, which can eliminate species such as rata, kamahi and mistletoe from the forest and reduce the food supply for native species. Possums also feed directly on the eggs of native birds and on native invertebrates, and compete with kiwi for nest sites. Dramatic examples of forest and bird recovery following Department of Conservation possum and rat eradication programmes are visible on islands such as Kapiti and Rangitoto. Possum damage to native ecosystems combines with many other impacts, all of which need control; habitat loss through clearing and fire; other browsers and predators (deer, goats, rodents, mustelids, cats); and invasive weeds.

Possums contribute to bovine tuberculosis (BTb) by acting as wild vectors (carriers) of the disease. There are a number of other wild vectors, including feral deer and cattle, mustelids and wild pigs. Management of livestock is also a factor in the buildup and spread of the disease, through such means as movement of infected stock, grazing in BTb infected areas, inadequate testing and record-keeping, and grazing near forest areas. The incidence of BTb in cattle increased from 1980 to 1994, but following tightening of livestock movement control and increased possum control from 1994 to 1999 the number of infected herds decreased by 53% for cattle and 58% for deer.

The widely quoted estimate of 70 million possums nationwide is an educated guess dating from the 1980s. With extensive control operations in recent years the national population may be lower. Such estimates can be misleading as it is the density of populations in sensitive areas rather than the total national count that is critical. An ongoing effort is required to keep possum populations below damaging levels in sensitive areas, even if the population has been successfully reduced.

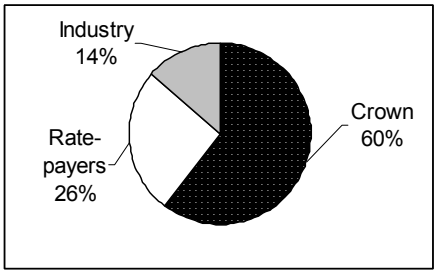
Agencies and expenditure

The principal agencies involved in large-scale possum control are the Department of Conservation (DOC) for protection of native ecosystems and the Animal Health Board (AHB) through contracts with regional councils for BTb control. The main consent agencies for major poisoning operations are the district and regional councils, the Medical Officers of Health, and DOC. Small-scale possum control is undertaken by individual landholders. Agencies cooperate, but a single cohesive possum control strategy does not exist. Aligning the conservation and BTb objectives is considered to be too difficult.

Currently the public money spent on possum control for conservation and BTb purposes is $31.7 m per year and funding of possum control research another $11 m. Industry and ratepayer expenditure for BTb control is $11 m and for research $ 3.8 m. Direct economic losses from possums have been estimated to be as much as $60 m per year. The total of all of these expenditures is $ 42.7 m for the Crown and $74.8 m for private sources, or a total of $117.5 m per year.

The AHB considers that 90% of new herd BTb infections are from wild vectors, and vector control is the largest part (58% in 1998/99) of the total BTb control programme budget. The shares paid by the Crown, ratepayers, and industry are shown in Figure 1. Vector control funding was $27.706 m in 1998/99, up $3 m from 1997/98. The majority of this is for possums, but up to 10% covers

Figure 1: Animal Health Board BTb vector control funding sources, 1998/99

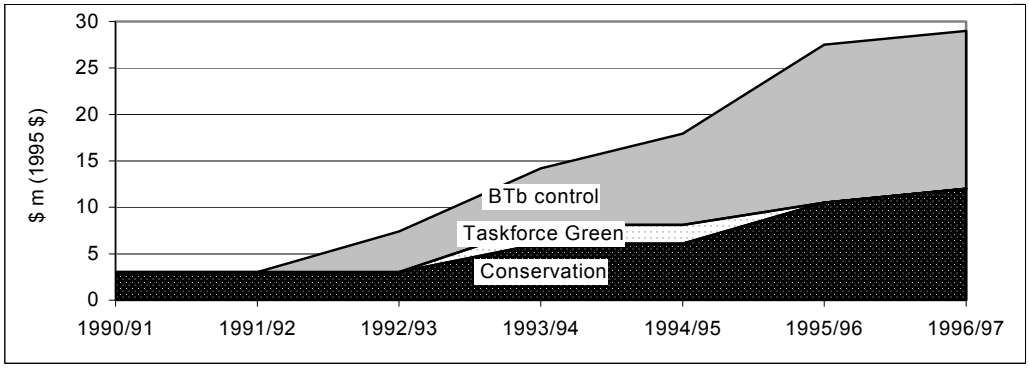


Source: Animal Health Board Annual Report 1998/99.

control of ferrets and other BTb vectors. This level of funding covers some 3 million hectares. The AHB estimates that the potential cost if BTb is not adequately controlled would be $1.3 billion over 5 years (loss of export earnings plus extra BTb control costs).

The possum control funding allocated to DOC has increased significantly since 1990/91 (Figure 2, Conservation portion). In 1998/99 the Department of Conservation spent $15 m on possum control. For the 1999/00 year, 256,200 ha is targeted for possum control operations, part of a total 886,000 ha of high risk areas benefiting from long-term sustained management. This area is approximately 11% of the conservation estate and an estimated 45% of the native forest at risk of canopy collapse due to possums. The portion spent for BTb control is for DOC land adjacent to BTb priority areas, and does not necessarily target DOC's high priority areas for possum control.

Figure 2: Crown funding for possum control on the DOC estate, 1990/91 to 1996/97 ($m in 1995$)



Source: *Possum Control by the Department of Conservation 1993-1995*, DOC 1997, Table 2, p. 12.

Control strategies

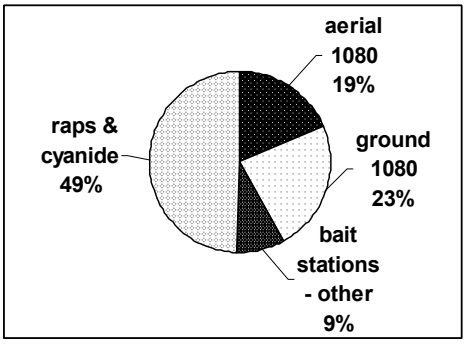
Areas at high risk from possums for conservation reasons (rata/kamahi and mixed hardwood forests, isolated forest remnants) are often in quite different locations from those posing a high risk for BTb control reasons (mixed forest/scrub, tree-lined waterways in farmland, open pasture). Control methods appropriate for one type of area are not necessarily appropriate for the other.

Except in the few small areas where eradication or exclusion is possible and affordable (e.g. on some offshore islands, or in fenced areas such as the Karori Sanctuary and Cape Brett), successful management of possum damage is only possible through ongoing control to keep possum numbers at acceptable population density thresholds. For large-scale operations this is done mainly through a combination of aerial drops of 1080 poison baits, and ground control using toxins (1080, cyanide, brodifacoum or phosphorus) and trapping. Frequently an intensive "knockdown" operation is followed by an ongoing control programme to keep the possum population below the damage threshold.

Aerial application of 1080 was used on 387,031 hectares or 22% of the possum control area in 1993/94 by both DOC and AHB (most recent analysis available), and for DOC from 1991 to 1998 the proportion was 19% (Figure 3). In the period from 1993 to 1999 the use of brodifacoum increased by over 300%, but together with cyanide this still represents a very small proportion of the toxins used for possum control (Figure 4). The use of 1080 peaked over the 1994-1996 period, and in 1998/99 was comparable to usage in 1993 and the late 1970s (Figure 5, page 5). It is estimated that trapping and shooting accounts for some 10-15% of the possums killed.

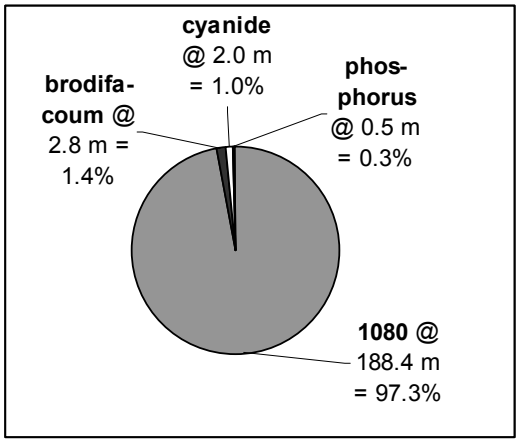
Individual farms requiring BTb protection can be suitable for landholder-managed trapping and bait station initiatives. Trapping trials on farms in the Wellington region have had promising results, and Locally Initiated Programmes under the Animal Health Board involved 2,700 landholders in 1998/99. Private individuals are not able to use 1080 or phosphorus, but can use traps, cyanide, brodifacoum, cholecalciferol, and shooting.

Figure 3: Proportion of DOC possum control by method 1991 to 1998, by mean of hectares controlled.



Source: *Current practices in sequential use of possum baits*, DOC 1999, Table A2.1, p.46.

Figure 4: Possum control toxin use 1998/99, both DOC and AHB, by potential possum kill in millions



Source: B. Simmons, Animal Control Products pers.comm. 2/2000. Weight of active ingredients x toxicity ÷ average possum size = potential kill of possums. Apparent "overkill" (194 m fatal possum dose equivalents vs 70 m possums) due to bait spoilage and technical difficulties in targeting.

Risks from possum control methods

The current approach by the possum control agencies incurs heavy ongoing control costs, the risk of killing or causing harm to non-target animals (both with poison and traps), and the risk of creating populations of bait and poison-shy possums. After a detailed investigation in 1994, the Parliamentary Commissioner for the Environment concluded that over the short to medium term the risks from existing control methods were justified by the benefits from possum control, but in the long term more control alternatives were needed.

Monitoring of surface water and public water supplies for 1080 is now a standard condition for consents to apply 1080 from the air. Of 41 operations monitored from 1990 to 1998, 29% had one or more samples test positive for 1080. Of these positive samples 93% contained an amount of 1080 well below the recommended level of 2 μg/l (over 1000 times lower than the level at which adverse effects are known to occur) and the remainder were considered to pose a negligible risk.

In 1998 residues of brodifacoum (sold as Talon or Pestoff) were found in 8% of wild pigs and deer tested by MAF at game packing houses, and DOC analysis also confirmed residues in native birds including kiwi, morepork and weka. DOC has imposed its own restrictions on use, and MAF has proposed new restrictions on use to the Pesticides Board.

Traps used for possums pose the risk of injury or death to non-target species, including native birds, and up to 50% of the kiwi population in some areas has been injured by traps. Many trappers also use cyanide, which has also killed weka and kiwi. In 1999 a Medical Officer of Health announced his concern about

the potential risks to public health from cyanide misuse and proposed stricter licensing. Animal welfare concerns have been expressed about the use of traps and some poisons.

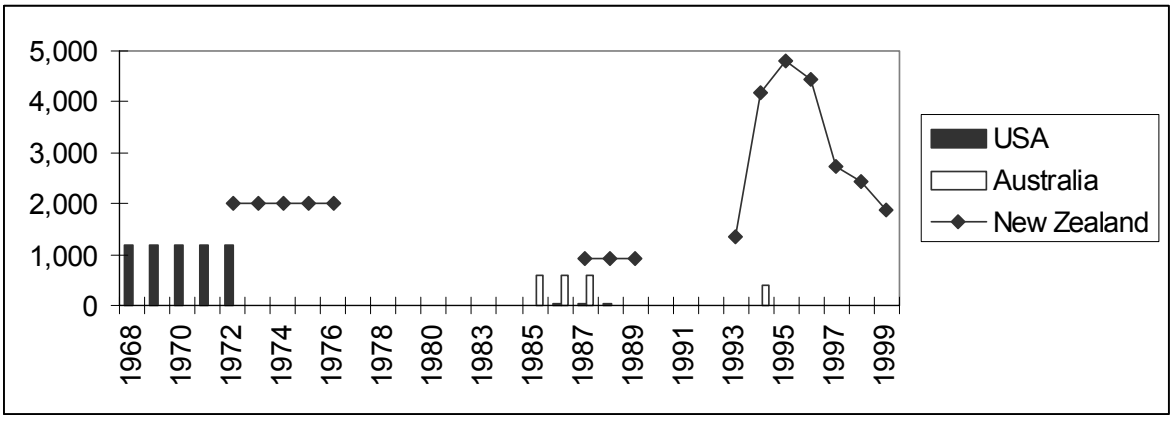
Overseas comparisons

No other country in the world has a pest control problem like that of the possums in New Zealand. In Australia, the country of origin of the brush-tailed possum, it is a protected native species (although in Tasmania limited culling is allowed to protect trees in pastoral areas). There are several species of opossum in North and South America, but they are native there and unrelated to the Australian possums. Threats to indigenous ecosystems from non-native species occurs on islands elsewhere (e.g. Hawaii and the Galapagos) but these are on a much smaller scale than in New Zealand.

The UK and Ireland have problems with badgers acting as BTb vectors, but badgers are a native species there. Most possums in Australia do not carry BTb, and it is thought that this is because they are much rarer than in New Zealand and predators cause them to stay in trees where they are not in contact with livestock.

No other country uses as much 1080 as New Zealand does in the open environment. In 1993/94 the estimated 3,400 tonnes of 1080 active ingredient used in New Zealand (for possum, rabbit, deer, wallaby and wasp control) was over ten times the estimated 300 to 400 kg used in Australia (for rabbit, fox, wild dog, wild pig, dingo and rabbit control) (Figure 4). One of the reasons other countries do not use as much 1080 is that it is effective against many native non-target mammals and predator birds that could be at risk. The field use of 1080 in America, previously allowed for wild rodent and livestock predator control, is now restricted to species-specific targeting (e.g.: in collars on livestock, to target only predators such as coyotes).

Figure 4: Estimated usage of 1080, 1968 to 1999 (where data available), by kg of active ingredient.



Source: *Possum Control in New Zealand* , Parliamentary Commissioner for the Environment 1994, Table 5.4, p.54, and B. Simmons, Animal Control Products, pers.comm. 2/2000. This includes all 1080 use for USA and Australia; for New Zealand it is all use before 1993 (mainly possums, but also rabbits and other species), and only possum use from 1993 to1999.

Public perceptions

There is opposition to the use of poisons both here and in some key countries where we market our produce, particularly when there is a perception of risk to human health. Locally this opposition has focused largely on the aerial application of 1080, on the grounds of the potential risk to public health, *mauri* and *wairua* (life forces) of forests, employment opportunities (ground control alternatives), and game species such as deer.

A detailed investigation of public views on the possum problem and possum

control technologies was conducted in late 1994. A majority of the respondents agreed possums were a threat to native bush (95%), a threat to bird life (80%), carriers of BTb (80%) and a risk to overseas trade (70%). A majority (64%) agreed they were personally concerned about the possum problem. A minority believed that possums were native (12%) and harmless (10%).

Respondents in focus groups considered that the current policy emphasis was on BTb control, but their preferred priority was protection of the nation's heritage in the conservation estate. There was also support for a greater emphasis on employment opportunities in possum control and fur harvesting.

The most favoured possum control methods were shooting (82%), trapping (67%) and a possum specific poison (69%). The least favoured were aerial drops of 1080 (27%), use of other non-specific poisons (28%), and an introduced possum-specific virus or bacteria (33% or 34%). Moderate support was present for a genetically modified organism specific to possums (47%), a possum-specific parasite (41%), and ground laying of 1080 (37%).

Two thirds of the respondents had heard of biological control of pests, but only a third of these understood it. Development of a biological control agent that "stopped possums breeding" was supported by 86% of respondents, but only with appropriate safeguards to protect humans and ecosystems. There was also a gender difference in the response: women tended to place greater emphasis on the safety and acceptability of controls whereas men placed greater emphasis on the affordability and effectiveness.

Bounties and commercial trapping

Groups and individuals have in recent years strongly advocated the introduction of a bounty on possums, training of the unemployed in possum trapping, and a coordinated programme marketing possum products overseas.

New Zealand had a bounty on possums for nearly ten years, from 1953 to 1961 (approved 1951, enacted 1953). The bounty of 2s 6d equates to some $5 per possum in 1999 dollars. It was on possums killed but not skinned, and there was also a subsidy for the sale of skins. During this period a total of some 8.2 million bounties were paid and the number of possums killed in 1961 had doubled from 1951, but the possum population continued to expand. The bounty was removed because it was considered unsuccessful in controlling possums.

In April 1999 the Primary Production Select Committee reported to the House on two petitions, calling for a bounty on possums, which between them attracted 35,025 signatures. The Committee made no recommendations, but noted the significant concern in the community about ways to solve the possum problem and the need for possum control agencies to better explain their objectives and practices to the public.

At peak possum skin prices in 1979-80 ($25.50 per quality skin in 1999 dollars) 3.5 million possum skins were exported, representing an estimated kill of 5 million possums. This is half the estimated annual possum kill required today to effectively reduce BTb and conservation risks from possums. Possum skin prices in New Zealand in recent years have been $1.50 to $2.50.

The current possum meat market is primarily in Asia, where it is called "kiwi bear". With the risk of poison and BTb exposure, the possums must be captured live and quarantined to meet food safety requirements, and consequently the price is high ($17/kg in 1998). Farming rather than wild capture is likely to be required before the market can substantially expand.

In recent years wool and possum fur blend products have been successfully introduced to the luxury end of the garment and souvenir trade. Some 40 tonnes of possum fur were used in 1999, ten times the amount used in 1994. The local production of plucked fur is unable to meet demand, and importing possum fur from Tasmania has been proposed. With the recent development of possum fur plucking machines suitable for use in the field the collection of plucked fur may become easier. The price per kilo of plucked fur was $36/kg in 1997, which at 14 to 20 possums per kilo of fur was $1.80 to $2.50 per possum.

Bounties and markets for possum products can be good incentives to kill possums, but not to kill enough possums in the right areas. As possum populations decrease the effort required to kill additional possums increases, and trappers will prefer to move to areas of higher population. With a market for possums there is also an incentive to keep a reasonable population present for harvesting. Such population levels are too high for protecting vulnerable native ecosystems and preventing BTb infection. There will also be a tendency to take possums from areas with easy access. While many of these possums may be in BTb risk areas, few will be in high-risk native forest areas.

Ground based controls have proven effective as a possum control method in many parts of the conservation estate and BTb control areas, and some 80% of DOC's control efforts used ground crews over 1991 to 1998 (Figure 3). However, successful operations also have performance contracts for meeting a specified possum population reduction target. To obtain such employment in future trappers will need to develop monitoring and contract management skills.

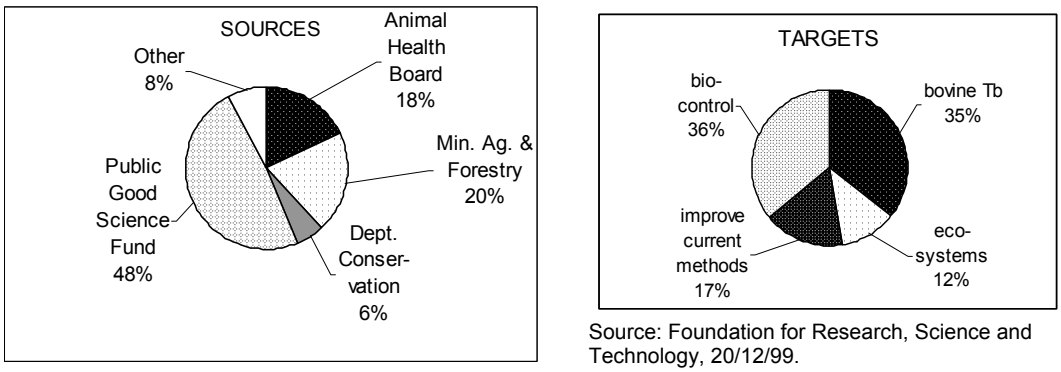
Research on control methods

Research in the areas of improving existing control methods (e.g. better targeting, poisons, traps, baits, and monitoring), comparing the cost-effectiveness of different methods, and defining the critical population thresholds for possum damage is ongoing. Over the last five years increasing effort has also gone into searching for biocontrols which may be able to permanently affect possum numbers (see the “biocontrol and GMO technology” section below).

Research is also underway on means to vaccinate possums against BTb, thus reducing their local risk as BTb vectors. Vaccine delivery via aerosol spray at bait stations is one method being investigated. Successful vaccination could significantly lower BTb risks but would not assist in protecting native ecosystems.

The level of research funding relating to possum control for 1999/00 is 14.84 m, 4% down from 1998/99 but almost four times higher than in 1993/94. The largest funding source is the Public Good Science Fund and the major research targets are biocontrol and bovine tuberculosis (Figure 5).

Figure 5: Sources and targets for possum control research funding, 1999/00.



Source: Foundation for Research, Science and Technology, 20/12/99.

Biocontrol and GMO technology

Scientists in New Zealand and Australia have been investigating the possibility of a 'permanent' impact on the New Zealand possum population through interfering with their ability to reproduce. This 'immunosterilisation' and 'immunocontraception' research is looking at ways to interrupt possum egg production, fertilisation, embryo development, sexual organ development, or milk production. They are looking for reproductive hormones that are unique to possums (i.e. they would not affect other species) and ways to modify and deliver them only to possums in New Zealand (via diseases or organisms unique to possums, baits, aerosols at bait stations, or genetically modified plants).

The 'proof of concept' stage has now been reached for genetic modification of possum hormones to interrupt possum egg production. The next step would be several years of controlled testing, which requires ongoing funding and the assurance of public acceptance. There is also a theoretical concern that natural selection and variation will limit the success of biocontrols in the field.

Considering the significance of both the ongoing risk from possums and public concerns about risks from genetically modified organisms, the Parliamentary Commissioner for the Environment is currently investigating the attitudes and beliefs of New Zealanders about the possible future use of these new technologies, and exploring the information and public communication aspects. A report to Parliament is expected before July 2000.

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