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INTRODUCTION

New Zealand could be regarded as an acclimatisation laboratory, i.e., the consequence of a wide range of animal introductions in the period 1840-1907. Species introduced ranged from camels to hedgehogs, ostriches to sky larks. Fortunately many failed to survive.

The majority of these liberations were made by Acclimatisation Societies or private individuals, often with Government approval and protection. The most damaging species were several species of deer, rabbits, Australian opossums, goats, pigs, tahr, wallabies, and chamois.

The establishment, natural dispersion and colonisation of unoccupied habitat by these animals was successful and surpassed all expectations. Pastoral land development in the early days usually consisted of firing large tracts of indigenous forest and native grassland and this practice assisted the dispersal of some animals, particularly the rabbit.

The impact of these animals was to upset the natural stability of habitat and damage soil and water values. As a result of these liberations a multiplicity of animal control problems have occurred. Organisations were constituted by Government with the responsibility of conducting control. They have in recent years made dramatic progress in reducing some animal populations such as rabbits to tolerable levels. This has only been achieved by positive policy changes over the years, plus the development and utilisation of more effective control techniques, especially in the field of poisoning.

New Zealand consists of two main Islands with a total land area of approximately 26.7 million ha (66 m. acres) of which 14.2 million ha (36 m. acres) is devoted to mainly pastoral farming. The remainder is hill and mountain country, either coated in forest or scrub and rock. An area equivalent to approximately two-thirds the size of the state of California.

It is on the agricultural land that my organisation is responsible for the control of animal pests. The functions of the Agricultural Pests Destruction Council are:

1. Investigate the effect of any animal infestation on agriculture and agricultural production and recommend to Government that any animal be declared a pest of local or national importance.
2. Devise and promote means of control of any pest and generally promote measures for its destruction where it threatens or is likely to threaten agricultural production.
3. Co-ordinate, guide and supervise the activities of pest boards set up to control agricultural pests.

This Council consists of 11 members who represent the farmers, a farmer organisation, all county councils, three Government departments and the union representing pest board employees.

Since this Council's formation in 1967, they have made a number of important policy changes:

1. A policy of control in preference to a policy of eradication, an unobtainable objective at the present time with the control techniques we have at our disposal.
2. An active policy of amalgamating small boards into larger, more efficient boards.
3. A major training programme to ensure all staff are well trained and utilising the most efficient methods of control known today. As well as training senior staff they have cadets who are trained on specific boards for two years.

The Council employs a full time staff of five field personnel plus a small administration section, who in turn guide and supervise the activities of 99 pest destruction boards, who themselves employ approximately 800 full time staff throughout New Zealand.

The agricultural pests they control at the present time are the European rabbit (Oryctolagus cuniculus), Australian opossum (Trichosurus vulpecula), hare (Lepus europaeus), two types of Australian wallabies (Macropus eugeni - Dama or Tamma, and Macropus rufogrisea - red necked or bus), and the rook (Corvus fugliegus).

With the exception of the rabbit, which is declared a national pest, the remainder are declared pests of local importance. When a board requests to the Council that a particular animal be declared a pest of local importance the Council investigates the request before any control work is carried out. After investigation they may make appropriate recommendations to Government for such a declaration.

In essence the pest destruction movement is charged by Government with the responsibility of protecting New Zealand from the depredations of animal pests on rateable land. This entails intensive control operations of the rabbit in the high country of the South Island, the coastal plains and sand dunes of the North Island. With opossums, control is undertaken where they affect agricultural production, protection of erosion control, plantings and commercial exotic forests established for timber production and animal health reasons. Other animals, such as rooks, wallabies and hares are controlled when these pests cause damage to either pasture or crops.

The finance for these operations (total cost of \$7.4 million for the 1976/77 financial year) comes from various sources. All rural land in New Zealand is rated, the amount being dependent on the finance required by individual boards and their ability to pay (maximum rate being 60 cents per ha). This is matched with a \$ for \$ subsidy from Government, plus the Council recommendations for extra grant finance where it is required.

RABBITS

The introduction of rabbits into New Zealand has often been classed as one of the major disasters in its agricultural history. The European rabbit is ideally suited to the climatic conditions in many parts of New Zealand and has bred prolifically. In 1893, 16 million skins and in 1947, over 50 years later, 15 million skins were exported and at that stage, good control was not achieved. It was estimated that in those days, conservatively, over 50 million rabbits populated New Zealand.

Rabbits compete with grazing stock for feed and it is estimated, conservatively, that eight rabbits exert approximately the same grazing pressure as one sheep.

Since 1953 control has been achieved over large tracts of New Zealand, primarily because of the introduction of sodium monofluoroacetate (1080). In the last 25 years this has superceded the less efficient poisons, i.e. arsenic trioxide, strychnine, and, to a degree, phosphorus.

About the time of the introduction of 1080 another break through occurred, the start of utilising aircraft to sow bait material. This was of major benefit as much of New Zealand is inaccessible to wheeled vehicles etc. and could not be covered effectively. These two introductions have in the last decade got large tracts of New Zealand to the stage that rabbits are no longer a problem.

The exception, is some of the high run country, where the rainfall is low, and rabbits still affect agricultural production. It requires large scale aerial and ground operations on a bi- or tri-annual basis to hold rabbits at tolerable levels. They also cause problems where suitable conditions exist, such as river beds, coastal belts, or poorly farmed properties.

Weather conditions continue to play a large part in influencing the increase or decrease in rabbit populations. The low rainfall areas are subject to drought which helps rabbits to increase very quickly. Habitat types also can affect the rabbit population. Heavily stocked or over grazed country will support higher rabbit numbers than lightly stocked country, sheep grazed country is preferred to cattle grazed country.

Rabbit destruction is still the largest part of our total operations with the main method being poisoning both by aircraft and hand operations. During 1976/77 we used approximately 600 kg (1320 lb) of technical 1080 poison applied to carrot, oats, and raspberry flavoured apple jam for rabbit control. The total amounts of pre-feed and toxic baits were approximately 6130 tonne of carrots, 1060 tonne of oats, and 15 tonne of jam.

Aircraft were used to sow 85% of the carrot and 40% of the oats. In recent years the use of a helicopter as a bait applicator is utilised more as the need for accuracy in bait placement becomes more important.

OPOSSUM

The opossums introduced and liberated during the period 1840 to 1898 formed the initial populations from which additional liberations were made. The acclimatisation and spread of opossums up to the decade 1920-30 was accelerated by continued liberations, creating a multiplicity of colonies which served as starting points for the natural dispersion of the animal. From 1930 natural dispersion has resulted in the widespread and nearly complete occupation of suitable forest and pastoral habitat in both Islands. In the North Island distribution is complete except for the northern part of the Auckland Province (Kaitaia to Cape Reinga) and parts of the Coromandel Peninsula. In the South Island opossums are still absent over large areas of South Westland, parts of Western Fiordland, and in the upper catchments of a few rivers in South Canterbury and North West Otago. Opossums are present, however, on a number of islands.

The opossum was initially protected, though in the 1920's the Government allowed a trapping season but demanded payment for a trapping licence plus a royalty for each skin taken. In 1946, due to complaints from catchment boards and other organisations, the royalty system was dropped. In 1951 a bounty system was implemented whereby 25 cents per token was paid, but this had no effect on opossum numbers and between 1951 and 1961 in excess of 8 million bounties were paid and over 4 million skins were sold. In 1961 the bounty scheme was abolished and some pest destruction boards undertook control wherever they caused damage to agricultural production, such as crops, orchards, private exotic forests, and to a degree, pasture.

Opossums are found from 1900 metres (6000 ft) in mountainous habitat to the low lands and even in urban areas. They nest in any dry cover. Their main diet includes the leaves, flowers, fruit and bark of a wide range of indigenous and exotic trees as well as vegetables and pasture. It has been estimated by some people that 10 opossums have a grazing pressure equivalent to one sheep on farm land.

Poisoning is the most efficient method of controlling opossums and in 1976/77 approximately 800 kg (1760 lb) of 1080 poison was used on various types of bait including over 1100 tonne of toxic carrot bait.

Approximately 600 hours of fixed wing and helicopter flying time was used to lay most of this bait. Other baits were 20 tonnes of jam and some 1080 pollard pellets. Additional methods of control are trapping, the use of dogs and nightshooting.

Private hunters sold 14 million skins between 1962-76 and in a seven-month period of 1976, 1.4 million were sold. This increase was mainly due to more hunters working and a more boyant market.

ROOKS

The rook, a native of Great Britain, was introduced in the 1860's. Today they are a problem in a fairly large area in the southern half of the North Island and in parts of the South Island. The main damage caused to agricultural production is from eating and destroying new sown cereal crops, ripening lentils, walnuts, acorns, pumpkin seeds and occasionally potatoes and fruit. They also, at times, pull out pumpkin and maize plants. The only control carried out on these birds is poisoning. Using a slow acting poison (DRC 1339) on a bread and lard bait, large numbers of birds have been killed and generally a satisfactory level of control achieved.

WALLABIES

These marsupials are controlled in two areas of New Zealand, mainly by poisoning with 1080 in a pollard-based pellet, or with a 1080-gel applied to cut broad-leaf stems. Shooting with high powered rifles, sometimes from helicopters is the main method of control over 2,000,000 acres occupied by wallabies in the South Island.

PEST DESTRUCTION

Poisoning, mostly with 1080 is the only really successful method of controlling animal pests in New Zealand at the present time. To do this boards must carry out detailed planning well in advance of their operations. This planning must take into account climatic, seasonal and habitat conditions to ensure that maximum bait acceptance occurs and at least 90% of the target species are killed. The operation requires coordination with owners of properties so that the stock can be moved prior to the bait application. Adverse climatic conditions can affect poisoning and sometimes alternative grazing has to be found or even postponement of operations.

The method of bait application is usually dependent on the topography, size of area involved and manpower available, but the methods include fixed wing aircraft of various types like the Fletcher 400 and other agricultural aircraft. Helicopters are a newer introduction and over the past few years, one company has spent between \$30,000 - \$40,000 on developing an efficient under-slung bait layer (that carries 800-900 kg of bait). Other mechanized machinery includes motorcycles and vehicles fitted with bait laying equipment but some operations rely on hand laid baits. Approximately 750,000 ha (1.8 million acres) of land was poisoned in the last year with costs of between \$2.50 and \$8 per ha, depending on method and amount of application, type of country, and animals involved. The actual size of individual operations ranged from several ha (5 acres) to up to 40,000 ha (10,000 acres). Cooperation between numerous ratepayers is of paramount importance for large operations.

To protect non-target species, all toxic material is dyed green with fairly rigid procedures adhered to. Even so, there is a growing emphasis on environmental problems in New Zealand and conservationists and associated bodies frequently single out 1080 for further intensive scrutiny. This is rather ironic as this emotionalism has never been expressed so heatedly against other more dangerous and less effective poisons used in New Zealand for pest control. We are tightening up our controls on the use of poisons to prevent any problems in the future. We are investigating methods of removing chaff or fines from carrot bait and a broadening of the use of manufactured bait. Efficient destruction of our animal pests depends greatly on the continued use of an effective poison like 1080 under the control of trained and experienced operators.

All other methods of control are less effective than poisoning and they are more costly to obtain the same high percentage kill. They therefore are categorised as follow-up methods only, and include, for example:

Nightshooting: Vehicle or on foot, about 30% or less effective, cost about 55-65¢ per ha.

Nightshooting: Motorcycle, about 30% effective, cost about 30-35¢ per ha.

Dog and Gun: About 10% effective, cost 60-65¢ per ha.

Traps: About 10% effective, cost about \$1 per set.

Until recent years many of the above were the main methods of control. In recent years escalating costs of equipment and materials have forced the industry to look at the relative efficiency and, more importantly, the relative effectiveness of all methods available. Staff numbers have been reduced and ineffective methods phased out. No longer do we carry out demand work, whereby people with a problem, no matter how small, can expect immediate service.

Even further, we are looking at whether some country needs work at all, other than inspection. Though in the long term we must get even more efficient in our methods of control, we have been considering the possible reintroduction of myxomatosis. If supported we will have to prepare an environmental impact report on the proposal, and even then the environmentalist and animal protection agencies are expected to raise objections.

We are also looking for a possible second poison to use with 1080 and perhaps in the long term, to replace it. This poison would need to be more specific to the target animal, be applied easily to the bait, and be of a reasonable cost. We also need a bait, preferably manufactured, that rabbits and opossums will accept more readily than natural bait. We have a problem at the moment in some areas with not all rabbits accepting a natural bait. Further, we need to be able to predict whether control is needed in an area to utilise our manpower, equipment and finance more efficiently.

Whatever we do, as an agriculturally orientated country that obtains over 80% of our income from this source, we must protect the environment and the agricultural production of New Zealand. We are always prepared to change our methods and, in fact, are willing to try new ideas. It is possible that somebody here has an idea that could assist us and I would be very appreciative of any new ideas from personnel at this conference. Thank you.