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THE ORGANISATION OF RABBIT CONTROL (*Oryctolagus cuniculus*) IN WESTERN AUSTRALIA

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ABSTRACT: Under Western Australian legislation, landholders have an obligation to control rabbits on their properties; local authorities the responsibility to supervise their work whilst the Agriculture Protection Board has a Statewide supervisory and co-ordination role. Prior to 1950 (when the Agriculture Protection Board was formed) the central role was in the hands of a Government department which, through lack of staff and money was unable to provide adequate supervision, and rabbits were in plague proportions. Since 1950, the Board has actively engaged in a vigorous policy aimed at tighter control and supervision. To enable this, the Board has entered into a voluntary scheme with local authorities whereby the role of local supervision of landholders is passed to staff employed by the Board, but jointly financed by the local authority and the Board. A contract poisoning service is also provided by the Agriculture Protection Board to any landholder who is unable or unwilling, to meet his obligations in this area. Both services are subsidised. Two of the major reasons for the poor level of control existing before 1950, have thereby been minimised.

Soon after its formation, the Board set up a research section which has devoted nearly all of its activities to applied research on control of the State's many vertebrate pest problems. In the rabbit control area, poisoning has received most attention. The "One-Shot" method of poisoning was developed after years of research. Fumigation is at present being closely studied as is the economics of complete eradication from some areas of the State. Greatest needs in the applied rabbit research field at present are:

- (1) a selective poison, or poisoning regime, which will not harm stock, and
- (2) a more complete understanding of the economics of control and eradication.

The serious rabbit problem which existed in 1950 has been reduced to very small proportions, by organisational development using local research findings. These organisational developments have been implemented by circumvention rather than confrontation.

The control of rabbits in Western Australia has taken on a completely new look over the past 15 years. The legal framework within which the work is carried out has changed little during this time, but organisational and supervisory changes have resulted in greatly increased efficiency and effectiveness. By a pooling of resources and their co-operative use based on a well planned use of technical knowledge and developments, the rabbit problem has been markedly reduced.

THE HISTORICAL BACKGROUND

Rabbits reached Western Australia about 1895 after crossing at a rate of about 70 miles a year from Eastern Australia where they were released near Melbourne in 1859. The Government built "rabbit proof" fences in an effort to keep the rabbits from penetrating to farming areas which were generally to the west and south west of the invading hordes. These fences, extending over 2,000 miles were by-passed by the rabbits before completion, but there is some evidence that their rate of progress was slowed. Rabbits did not complete their colonisation of the south west corner of W.A. until late in the 1920's or early 1930's. In the arable farming areas of the State (as distinct from the uncleared range (or pastoral) areas), the rabbit problem has always been associated with development of the land for farming. There is, generally speaking, no problem in the uncleared forest country, and provided that some control is carried out, there is only a minor problem in the fully developed country. The difficulty exists in newly developing areas or other areas where pasture is established amidst adequate rabbit cover. As this type of country becomes fully developed and the cover reduced, so the severity of the rabbit problem is diminished. If it were not for man's clearing of the land and the consequent creation of suitable artificial environment, there would be little or no economic problem with rabbits in this State.

THE LEGAL FRAMEWORK

All previous Acts of Parliament to control rabbits were superseded in 1918 by the Vermin Act, which laid down specific responsibilities. Firstly, landholders whether owners, lessees or occupiers, are responsible for controlling rabbits on properties and all roads adjoining.

Local authorities called vermin boards, comprising either elected members, or the local government authorities (the shire councils) acting as vermin boards, were given the task of supervising the work of landholders. Superimposed upon the local authorities was the Vermin Branch of the Department of Agriculture, charged with general regulation and co-ordination on a State-wide basis.

THE ROYAL COMMISSION

The 1944 Royal Commission of Enquiry into the Vermin Act was precipitated by several factors, not the least of which was an extremely high population of rabbits and the shortage of manpower to deal with the problem, which was clearly out of control. The greatest economic problem existed in areas where the land was in the process of development. The chief recommendations contained in the report presented to Parliament in 1945 was for the Statewide co-ordination role to be taken over by a new statutory body to be known as the Agriculture Protection Board. The Board came into existence in 1950 and in 1954 the representation was changed so that 8 of the 11 members are now from local government and farmer organisations. This means the people most concerned with rabbit control operations (farmers) and responsible for supervision of this work (local authorities) also decide the overall State-wide policy. A second recommendation of the Commission was that the Agriculture Protection Board be given authority to acquire operative staff and plant with which to control rabbits on reserves and other Crown lands, as well as being permitted to assist farmers directly with control work on their properties. The great improvement which has occurred in the level of control attained since 1950 can be attributed directly to these two recommendations and the way in which they have subsequently been carried into effect.

THE STATUS QUO IN 1950

Prior to the formation of the Board in 1950, and its becoming active in approximately 1952, the control of rabbits was achieved by farmers carrying out poisoning operations using relatively ineffective methods such as poison baiting with phosphorus in pollard, strychnine on apples or oats and fumigation with carbon bisulphide, sodium cyanide or carbon monoxide. Their work was supervised by inspectors employed by local authorities, possibly for as short a time as four or six weeks per year. (A few councils did employ full time inspectors.) Usually the inspectors were given multiple tasks including sanitary collector, pound keeper, dog catcher, or any other task "sufficiently menial to suit the talents of the vermin inspector." This system of "local" control was supervised by the Department of Agriculture, with four inspectors to cover an area approximately 600 miles long by 200 miles wide. The task was obviously beyond them and consequently rabbit control was not treated seriously by the majority of farmers. Some landholders who placed great importance on good management of their properties, did achieve eradication under this system, but this was usually due to their own personal efforts.

The Australian urban economy started its period of rapid expansion at about this time and this naturally intensified the rural manpower shortage which had existed during the war years. Soon after the war the drift to the cities became a headlong rush. These were some of the problems faced by the Agriculture Protection Board when it commenced activities in the early 1950's. Another, probably even greater problem, was the lack of technical information available about rabbits or existing methods of control, which, by this time, were generally considered to be ineffective or old fashioned and no longer held any appeal.

THE RESEARCH SECTION

One of the first steps taken by the Board was the appointment in 1952 of a research section led by a graduate in agricultural science, whose first task was to set about updating the methods of control. All of the technical innovations detailed later in this paper have come from this section, which has trebled in size in the 17 years of its existence. The main purpose of the research section is still to investigate methods and techniques of vermin control, but some time is now also devoted to purely biological work, to obtain basic information on which to base control. ("Vermin" species are those animals and birds which have been so declared by the Agriculture Protection Board.)

INSPECTION - THE BASIS OF CONTROL

Shortly after the Agriculture Protection Board was formed, many local authorities took advantage of the opportunity to pass over some of their responsibility for rabbit control. They challenged the Agriculture Protection Board over two major issues. The first of these was that they could not obtain satisfactory staff to work as inspectors, and the second was that the methods recommended were not effective.

The Board accepted both these challenges but at this stage only the question of inspection will be dealt with. The question of control methods will be discussed later. The reason good permanent staff could not be obtained was simple - not enough incentive, status, security or remuneration was being offered to attract the right people. The Agriculture Protection Board decided to use some of its own resources (obtained from a rate on all land used in the State for agricultural purposes matched by a Government grant) to meet part of the cost of employing satisfactory inspectors. The Board, in fact, subsidised the salary and allowances of the inspectors by one-third and, at the same time, offered to provide the direction, control and supervision of their work at the local level. (The Board was responsible for the central administration and co-ordination of work under the Act, but now it also took over the task of directing the inspectorial staff. This naturally meant that the work was carried out to the level of efficiency required by the Board.) The subsidy paid was increased to 50% from 1966. Although costs have continued to increase, these have not been passed on and at present the Agriculture Protection Board is subsidising the inspectorial service to the extent of 62%.

That this scheme has been a success is illustrated by the fact that of the 87 shire councils in the rabbit infested areas all but two now employ Agriculture Protection Board inspectors under this scheme. (One of these councils employs its own full time inspector, without the benefit of the subsidy, while the other does not appear to have a significant rabbit problem.) The cost to a local authority of employing an inspector (district vermin control officer) is \$ Aust. 2,237, while the Agriculture Protection Board's share is \$ Aust. 3,647 per annum.

District vermin control officers are employed, supervised and controlled by the Agriculture Protection Board to carry out a duty which is assigned by legislation to local authorities. The system works exceedingly well because (a) it enables a uniform approach and policy to be maintained throughout the State; (b) it removes the responsibility for initiating unpopular enforcement action from the local authority; (c) it gives vermin control in each local district the backing of a much bigger and more powerful organisation; (d) it enables the costs of vermin control inspection to be borne more equitably over the entire rural community, through the application of a subsidy; (e) it enables the appointment of permanent, full time inspectors with benefits such as superannuation, and immediately resulted in an upgrading of their standard.

The scheme is not without disadvantages, the major one being the loss of interest by local authorities (and, to some extent, by the rural community) and a feeling that the responsibility has been "taken over" by the Agriculture Protection Board. In many areas regular meetings are held between representatives of local authorities and senior staff of the Agriculture Protection Board in an effort to maintain close liaison, to iron out any local difficulties and to consider and formulate local policy. In areas where such meetings are held, the understanding and relationships between the two bodies are much better than in those places where the local people have obviously "handed over," and then promptly proceeded to lose interest.

CONTROL METHODS

Some discussion upon the methods of control used in Western Australia is necessary before a full appreciation of the complete system can be obtained.

When the research section of the Agriculture Protection Board was formed in 1952 it inherited a number of methods of control which had remained unchanged since the turn of the century. The initial problem was to obtain a quick knock down of the population, so most attention was focused upon myxomatosis and poisoning.

(1) MYXOMATOSIS

This disease which originated in Brazil was first introduced successfully into the wild rabbits of Australia at the beginning of 1951 in Victoria and New South Wales. By the end of 1951, W.A. had established many infection centres at which infected rabbits were exposed. However, only four outbreaks occurred in the first 3-1/2 years and these were restricted in area, the largest being approximately 100 miles long by 30 miles wide. It was later shown that these poor results were due to a scarcity of suitable vectors. However, in the summer of 1955 heavy unseasonal cyclonic rains caused general flooding in the main rabbit infested areas followed by extensive mosquito infestations and the disease spread extensively. In approximately twelve months, myxomatosis was present in all the agricultural areas of the State. This did a great deal to reduce the rabbit population, but a rapid rise in immunity,

a build up in genetic resistance and attenuation of the virus itself tended to limit the useful life of the disease.

(2) CONVENTIONAL POISONING

The poor start to myxomatosis in this State focused attention upon other methods of control and by the time myxomatosis was established the poisoning research programme was already well under way. Phosphorised bran and pollard was the popular method at this time, but exhaustive tests showed that kills of 80% were the exception, the general reduction being more like 50% to 60% of the population or less. It was soon obvious that kills of this magnitude did little to improve the overall control situation, especially when related to the rabbit's breeding capacity.

Many screening tests were carried out to find the most acceptable bait material. Cereal offal (bran and pollard), oats and apples were the traditional base media. Palatability tests appeared to verify the appeal of both apples and oats, and showed that while wheaten bran and pollard were not attractive, both oaten pollard and barley pollard were readily accepted. Poisons also came in for close attention. Phosphorus, strychnine and the newly released 1080 (sodium fluoroacetate) were tested for lethality, poison repellency and methods of application.

The many advantages of 1080 soon became apparent and with oats proving to be a cheap, readily available, easily stored and attractive bait to rabbits, the improvement to be gained by their being combined in a baiting formulation was obvious. Oats had traditionally been boiled with mollasses before the poison was added, but this was shown to be unnecessary and the simplest of all methods, i.e., a solution of 1080 sprinkled onto dry oats, was adopted. At least three "free feeds" (prepoisoning feeds with unpoisoned oats) were necessary to obtain kills of the order of 95% or better.

This method has become known as the "conventional" 1080 poisoning procedure for rabbits in W.A. Not all the Australian States share W.A.'s enthusiasm for oats as a bait medium. Some States use carrots extensively but in the same conventional manner of free feeding followed by a poison feed.

Once the novelty of the new method had worn off it was noticeable that many landholders lost interest in "free feeding" and the general standard of baiting fell, with a resultant reduction in effectiveness.

(3) "ONE-SHOT" POISONING

In any business, time is valuable, and it would seem from a casual look at conventional baiting, that much time and effort is "wasted" in the preliminary feeding of the rabbit population with unpoisoned bait. However, this is not so, for without adequate "free feeding", the percentage kills obtained are very much reduced. The need then was for a method which would reduce the labour and time required, but not eliminate the principle of free feeding. In conventional baiting there appear to be two reasons for free feeding. The first of these is to allow the bolder rabbits a period of time to encourage shy rabbits to eat the bait, and the second, to build up each rabbit's appetite for the bait to a stage where a lethal dosage of poison may be eaten before any effects are felt. With oats and 1080 at 0.04% the lethal dosage is approximately 40 oat grains and the time factor 12-15 minutes. With "One-Shot" baiting, the second reason for free feeding is eliminated by making every poisoned oat a lethal bait. Each poisoned oat grain, in fact, contains an average of three times a lethal dose. The level is made as high as this to ensure that even the smallest grains will be lethal. This is an important factor in "One-Shot" baiting - each poisoned bait must be lethal to eliminate the possibility of sub-lethal doses - yet small enough to ensure its total consumption in a short period of time.

"One-Shot" baiting is simply the mixing of a limited number of lethal oats (treated with 1080) with an appropriate number of unpoisoned oats, and the mixture laid out in a furrow, in the normal manner. The important factors are:

- (a) Each poisoned oat should be lethal - no sub-lethal dosages;
- (b) there should be no contamination of the unpoisoned oats with poison (poisoned oats are coated with P.V.A.);

- (c) the ratio of poisoned oats should be such as to permit sufficient free feeding to lure the shy rabbits onto the furrow; by lowering the bait ratio a longer period of free feeding occurs, whilst a higher bait ratio tends to shorten the free feeding period. For most conditions prevailing in W.A., a 1% ratio is adequate;
- (d) sufficient of the mixture should be laid out to enable all rabbits in the area to be poisoned;
- (e) the furrow should be placed in the existing rabbit feeding areas as much as possible, and should not be placed only to intercept their passage from cover to feeding areas. (This is necessary because of the relatively shorter time available in which to change the feeding pattern prior to poisoning.)

The advantage of "One-Shot" baiting lies mostly in a saving of time (and hence money). All the principles so important to conventional baiting are still important when using the "One-Shot" method, except that some of these factors are taken care of by the method itself. The effectiveness of "One-Shot" baiting is comparable with that of the conventional method, if the operator has a good knowledge of the local rabbit population. An added advantage is that "One-Shot" baiting is done entirely by trained experts.

THE INSPECTOR/OPERATOR SCHEME

This scheme in which the Agriculture Protection Board provides inspectors who are jointly financed by local authorities, arose from the inability of the authorities to find and hold suitable staff. Likewise, the "One-Shot" baiting method grew out of control measures which were comparatively inefficient. Any inspection scheme depends for its success upon a "back up" work force capable of carrying out control work if the landholder is unable or unwilling to do it himself. (To overcome the declining effectiveness of poisoning, inspectors were authorised to arrange or undertake the full operation, including free feeding and poisoning, if landholders would meet the costs which were considered too high by most.) On the other hand, the "One-Shot" baiting method requires a work force with a good sound knowledge of each property if it is to be successful. It soon became apparent that a merging of these two schemes should take place. This new scheme became known as the inspector/ operator scheme, under which officers are firstly inspectors, but they are also equipped with units with which to carry out any poisoning required as contractors. Although farmers may do any poisoning themselves, the Board's work is so successful and economical (this cost is also subsidised by the Agriculture Protection Board) that nearly all of the rabbit poisoning carried out in W.A. is done under the inspector/operator scheme. (See Table 1.) Because of Public Health Department restrictions placed on the use of 1080, farmers are not permitted to handle "One-Shot" bait. They are allowed to purchase and use prepared "conventional" bait which has a much lower 1080 content (0.04%).

Here we have permanent, trained personnel, backed by a strong supervisory and research organisation to carry out the control programme, which has been acknowledged by landholders to be much more efficient and effective than that carried out by themselves.

ENFORCEMENT - (THE LAST RESORT)

Under the Western Australian Vermin Act, inspectors have authority to enter and search any properties for vermin. If vermin are located the officers should then issue landholders with notices requiring them to carry out specified works to suppress or destroy vermin. Legally inspectors are obliged to issue landholders with notices when vermin are discovered, but, in fact, notices are only issued under certain circumstances. Obviously if landholders agree to have the area poisoned by the officers or to employ private warren ripping contractors to destroy warrens, there is no need for notices and, in these cases, they are not issued. If, however, landholders procrastinate or are not certain when they can do the work, notices are issued for the specified work to be done within seven days. In such cases second inspections are made about ten days later and if the work is not done, the landholders become liable for prosecution, but, more important, inspectors then have the power to enter the properties with any plant or people required to carry out the work at the farmers' expense. The cost of such work is not subsidised and is roughly 50% higher than contract work. (These charges are recoverable at law if necessary.) The important point is that the vermin have been destroyed, and, in most cases, prosecutions are not proceeded with. Enforcement work is often required when new officers take over an area or where particularly stubborn farmers are concerned. However, prosecutions are rare, but when undertaken are well justified and every effort is made to obtain local publicity.

TABLE I. CONVENTIONAL 1080 POISONING SCHEME (1955-1969)

Year	Vials of 1080 (4 gms each)	Furrow Miles	Number Contracts
1955/56	19,488		
		14,616	4,204
1956/57	16,404	16,599	2,734
1957/58	14,108	17,635	4,855
1958/59	29,436	44,154	8,597
1959/60	17,729	31,026	5,951
1960/61	17,081	25,621	5,063
1961/62	13,390	20,058	5,213
1962/63	5,646	8,469	2,280
1963/64	2,146	3,477	781
1964/65	829	1,244	323
1965/66	704	1,056	267
1966/67	945	1,632	300
1967/68	569	926	143
1968/69	nil	nil	nil

"ONE-SHOT" - INSPECTOR/OPERATOR ANALYSIS

Year	Farm Contracts	Farm Hours	"One-Shot" ¹ Mixes
1961/62	358	627	3,219
1962/63	3,921	6,115	21,558
1963/64	5,200	7,514	35,126
1964/65	6,303	10,085	46,734
1965/66	6,666	11,124	54,877
1966/67	6,627	11,242	56,099
1967/68	6,629	12,649	72,934
1968/69	7,606	12,925	73,995

THE FUTURE

The recent past history of rabbit control in W.A. (from 1952 to 1969) has been a story of success in reducing rabbit numbers from plague proportions to an average of approximately three per mile of spotlighting in the wheat growing and grazing areas, and approximately ten per mile of spotlighting in the more difficult higher rainfall, small farm and forest country in the partially developed areas of the State. The question exercising our minds at present is how far should we aim to go towards complete eradication of rabbits. Over much of W.A. this would be an impossible task, but there are several million acres in the wheat-belt with lighter rainfall and well cleared areas where eradication would be relatively simple. The question devolves finally onto economics. A trial is under way to assess the practicability and costs of eradication and it is hoped also to relate this to increased rural production. In the wetter areas we are hopeful that before long an extensive, biological and economic assessment can be carried out to see what return the State is obtaining for the \$ Aust. 1 million spent on vermin control each year. The training of staff has for some years played a major role in increasing efficiency. A very extensive training programme, especially at the district vermin control officer (inspector/operator) level, is already well established. We are now at the stage where much more attention must be directed towards the farming community and local authorities. This will take the form of an extension programme aimed at overcoming the apathy and loss of interest in vermin control which has become familiar in recent years. Rabbits have been reduced to the point where many landholders think they are doing so little economic damage that they are things of the past. It is anticipated that an extension programme, based on economic data obtained from the eradication trials and the biological and economic survey, will help to stimulate interest in rabbit control. We are at present looking very closely at myxomatosis, especially in relation to

the introduction of the European rabbit flea, which promises to place a very different aspect upon the vector situation in W.A. This, combined with a better knowledge of the cross breeding of viruses and the resulting appearance of many new highly virulent strains, gives promise of a continuing use of the disease for many years to come.

One big problem with poisoning is the non-selective nature of the poison 1080 at present used. In many cases sheep need to be shifted from one part of a property to another to enable poisoning to be carried out and this often results in many areas not being treated at the most effective time. The discovery of a selective poison which would kill rabbits, but not harm sheep, would be a big help in increasing the level of control still further. Selective bait media are also being investigated.

The role of fumigation of rabbit burrows is being actively reconsidered at the present time. The rate of diffusion of different lethal gases through soil at different temperatures and at different soil moisture levels and their efficacy in killing rabbits is also being tested. Fumigation has been used for many years, but little is known of the basic facts of this method. The knowledge gained should result in more efficient fumigation.

Whilst many of the technical aspects of rabbit control have been solved, we are often faced with the problem of by-passing people before we can destroy rabbits. The ways in which the Agriculture Protection Board of Western Australia has circumvented many of these problems have been discussed. The old unworkable and cumbersome system of responsibility and supervision has been turned into a very efficient control system based on scientific and technically proven methods. These methods would be of little value if there was no organisation to carry them into effect.