THE EVOLVING TECHNOLOGY OF VERMIN CONTROL IN COLONIAL AUSTRALIA

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Settlers in colonial Australia resorted initially to traditional methods of vermin control inherited from Europe, namely, trapping and hunting. The magnitude of the problem required eventually the development of novel, more sophisticated and considerably more costly technologies.

Keywords: trapping and hunting, colonial Australia, vermin control, dingoes, kangaroos, rabbits, fencing

INTRODUCTION

To a considerable extent the colonization of the land of Australia in the 19th century and beyond was a struggle between settlers (squatters and agriculturalists) and the fauna, native and introduced, that preyed on livestock and competed for the often sparse grazing. Initially, settlers sought to rid their holdings, or at least control the numbers of such vermin, by means of traditional methods inherited from Europe: namely, trapping and hunting.[1] As the century progressed, however, the problem assumed such proportions that settlers were gradually compelled to adopt quite novel, more sophisticated and also considerably more costly means in their struggle against the depredations of vermin.

According to the common perception, vermin control in the Australian past is virtually synonymous with the struggle against the rapid spread of the rabbit, once it had gained a foothold following its introduction from Europe. In fact, however, while the rabbit emerged as the major pest, a whole range of fauna posed an economic threat to the fortunes of settlement and, in consequence, a technology was developed that had a far broader application. This technology was based on the principle that land could be kept relatively free of vermin by the traditional means of hunting and trapping, as well as other methods, once the land was enclosed by a fence capable of preventing the ingress of the vermin from adjoining infested areas. On the basis of that principle specific types of fencing were developed for the particular genera of vermin they were named after: *viz,* 'dingo-fence', 'rabbit-fence', 'wallaby fence', etc.

Before the arrival and rapid spread of the rabbit, the major animal pests faced by settlers were the dingo, or native dog, and the herbivorous marsupials, kangaroos and wallabies. The dingo was particularly feared by settlers as a ruthless and indiscriminate killer of sheep and calves. It was a characteristic of the dingo that it 'worried' its way through a flock, killing and maiming numbers of sheep over and above those actually taken and eaten. In attacking a flock of sheep, according to one 19th-century writer, the dingo passed "swiftly from one to the other, giving to each a nip and a wrench across the loins that dislocates the back, and leaves the poor brute to die in agony".[2] In dingo infested areas, therefore, flocks had to be guarded round the clock: by a shepherd during the day and night by the watchman who was responsible for protecting the flock enclosed in a small brush — or timber — fenced yard.

It is difficult to quantify sheep losses caused by dingoes. Sinclair has shown that the Clyde Company of the Port Phillip District, in 1838 lost about 1.5 per cent of the total flock 'either killed by dogs or missing'. In the preceding year, 1837, the figure had been less than 1 per cent. According to Sinclair, the manager of the Clyde Company had a reputation for taking particular care with his flocks. He also makes the point that over 60 per cent of the losses in 1838 occurred in one particular flock.[3] These latter losses suggest exceptional circumstances and the possibility that a lower rate of loss may have been the norm among the company's flocks. Whilst the Clyde Company figures appear to indicate an acceptable loss rate, it is interesting that, at about the same time, a general meeting of the inhabitants of the Port Phillip District expressed their concern with the problem to the extent of offering a head bounty of five shillings for each wild dog killed.

Benjamin Boyd, one of the largest landowners in the colony, with holdings in the Monaro and Victoria, told the Immigration Committee of 1843 that, although his sheep were 'camped out' at night in flocks of 3000 without being enclosed in hurdles, he was not 'aware of having lost a single sheep by native dogs'.[4] Boyd's good fortune was not shared by Wolseley of Arrownie in the New England district who, much later in the century, sought to counter the ravages of marauding dingoes through the expensive expedient of enclosing about 4,000 hectares of grazing land with a 28 kilometre-long, twelve-wire fence. Lacking barbed wire, Wolseley improvised by having his fencers twist short lengths of wire onto the strained fence-wires, by means of a hand tool, so that the ends protruded and acted as barbs. These make-shift barbs were secured at 15 centimetre intervals along the 336 kilometres of wire which comprised the fence. The result did little to deter the dingoes and was, therefore, a costly failure.[5]

The above examples illustrate the difficulty of quantifying losses by

dingoes. It is apparent that a number of variables operated to influence the degree of risk of dingo attack. These variables included such diverse factors as the quality of flock management. In 1849, John Francis Macarthur, a settler from Argyle, one of the older populated areas, estimated that dogs killed only about one sheep out of every 150.[6] A higher frequency of dingo attacks on sheep could also be expected where there was a lack of native prey occasioned by drought or some other interference with the dingo's natural food supply.

Whatever the extent of the damage wrought by the dingo, it is beyond doubt that this animal was perceived by settlers in general, and flockowners in particular, to be a dangerous and costly predator. This perception of the dingo was so widespread that, in 1852, the Select Committee on the Destruction of the Native Dog did not consider it necessary to take evidence concerning dingo depredations "as the losses occasioned by the inroads of these pests. . .are too notorious to require proof",[7] The Committee noted that "Certain Districts are more exposed to this nuisance than others" and recommended that a bounty of ten shillings be paid for "each unmutilated Scalp of a wild dog".[8] It is noteworthy, as an indication of the contemporary view of the destruction caused by the dingo, that in the early 1850s at least one British firm was offering iron and wire fences specifically designed to exclude dingoes.[9]

Settlers attempted to control, if not eradicate the dingo by hunting and trapping; and by the erection of special types of fencing. Such efforts, however, had limited success. It was not until the practice of lacing meat-baits with strychnine was widely adopted that a substantial reduction in dingo numbers and some semblance of control over numbers in the more settled districts was achieved. Elsewhere, in the more remote regions of relatively sparse settlement, or in rough country offering refuge to the predator, the dingo remained a continuing threat.

HERBIVOROUS MARSUPIALS

Over time settlers became increasingly aware of the herbivorous marsupials as an economic threat to pastoralism, through the competition for pasture they offered to livestock, and to agriculture through the crop damage they were capable of causing. To the extent that settlers were successful in eradicating the dingo as a predator in respect of kangaroos and wallabies (as well as cattle and sheep) and for that matter the Aborigines who had lived from the hunting of herbivorous marsupials, the numbers of the latter increased and, at times and in places, assumed plague proportions. The threat they posed to farming became particularly acute in the frequent periods of

drought when their greater hardiness and mobility than domestic livestock threatened the survival of the latter.

A Victorian squatter, E.M. Curr, has recorded that on one Victorian station 10,000 kangaroos were killed annually over a period of six years and, at the end of that time, the number remained "at an excessively high level".[10] Each kangaroo was believed to consume at least as much grass as a sheep.[11]

In the competition for grazing between marsupials and livestock, squatter sentiment was explicably little concerned with the humaneness of the methods adopted to control the numbers of the former. This perception is clearly expressed by Boldrewood when, in discussing the need to kill a great number of kangaroos trapped in a hunt, he wrote: "sheep and cattle, and the welfare of Christian men, women and children thereon depending, must be preferred to that of brutes, however directly offensive".[12]

In the struggle against the kangaroo, the largest and most mobile of the marsupials, temporary successes were achieved through a form of hunting known as 'driving'. Here large numbers of mounted men, accompanied by dogs, fanned out across the countryside and drove kangaroos before them into a specially prepared enclosure. There the trapped animals were killed: usually by clubbing them to death rather than the more costly method of shooting. On one occasion using this method some 2,000 kangaroos are recorded as having been destroyed.[13] 'Driving' accounted for many thousands of kangaroos. Nevertheless, even in combination with shooting, 'dogging' and other hunting practices, it failed to provide more than a localised and extremely short-term solution to the problem.

It is therefore not surprising, given the failure of traditional and innovatory hunting practices to provide more than a temporary solution to the vermin problem, that attention should be directed to the idea of quarantining land actually cleared against re-infestation from other areas. Here developments in the technology of fencing, originally designed for the purpose of confining domestic animals to particular areas of land, were utilized by Australian settlers essentially for the purposes of keeping vermin out of those particular areas of land.

VERMIN FENCES

The use of specialised fencing to prevent the ingress of vermin other than rabbits probably commenced quite early in the 19th century. At least by the early 1850s different forms of fencing, and types of fencing wire claimed to be effective against various species of predator were available to Australian settlers. The British company Charles D.

Young & Co., for example, was offering at that time iron and wire fences "adapted especially for Australia". These included several "intended to exclude wild dogs".[14]

A typical anti-dingo fence offered by Charles D. Young & Co. was constructed of strong, twisted and galvanised wire netting, of a three-and-a-half inch mesh with a reinforced twisted selvedge at the top, bottom and ends. When erected, with a three inch gap between the ground and the bottom selvedge and a single strand of wire running six inches above the top selvedge, the fence was fifty-one inches high. Complete with optional wrought-iron standards or posts, and straining pillars, the fence was sold for £176 per mile (or 2s. per foot).[15]

As the century progressed woven wire of various mesh sizes and gauges become available on the Australian market. This development offered the opportunity of constructing all-purpose fences, designed to exclude the entire range of vermin, by lacing together two or more woven wires of different meshes. One example of such an all-purpose fence was that erected by the Victorian state government in the 1880s from Tyntynder homestead to Yarriambac Creek: a distance of 130 kilometres. The lower half of this fence comprised three foot high rabbit-proof woven wire set six inches into the ground to prevent burrowing. The upper half of the fence consisted of four-inch mesh dog-netting to an additional height of three foot. And the whole construction was topped by a single strand of barbed wire that was presumably designed to deter even the largest of kangaroos, or the most persistent of dingoes.[16]

Vermin fences, particularly of an all-purpose type, were an expensive propositon. During the last quarter of the century colonial governments become active in their construction.[17] Previously, most settlers were forced to rely upon their own resources, and continued to depend on vermin eradication, rather than vermin exclusion, to provide at least temporary relief from the problem. All this was to change as the rabbit reached plague proportions.

THE RABBIT PLAGUE

In 1859 a landholder imported 24 rabbits and released them on his holding near Geelong, in Victoria. Six years later some 20,000 rabbits were exterminated on the same holding.[18] By 1880 the rabbit was across the Murray River and infesting New South Wales. By the turn of the century, in spite of the efforts of colonial governments, the pest had firmly implanted itself on two-third of the continent: in effect, in all but the tropical and desert areas.

An indication of the impact of the rabbit and its fecundity may be gathered from description of the Victorian Mallee, an area of some 12

million acres and one of the earliest pastoral districts to be settled in that colony. In 1883 C.L. Tucker, the Minister for Lands, speaking on a bill for the Reclamation of the Mallee, said:

> The rabbit began to invade the district in 1876, but the effect of that invasion was not felt until 1877. In the following year the abandonment of the runs commenced and since then no less than 62 once prosperous runs, each carrying from 20,000 to 40,000 sheep have been absolutely abandoned.[19]

Other factors, apart from rabbit infestation, played a part in decisions to abandon Mallee runs in the late 1870s. Until 1875 pastoralists had enjoyed high wool prices, which then tended to fall slowly before accelerating downward in 1878 "to bring prices down to a relatively low level by 1879".[20] Also, climatic conditions deteriorated in 1877-78, with a serious drought. At the same time interest rates on pastoral advances rose to an exceptionally high level, as "banks attempted to curb the drain on local and overseas funds".[21] By 1880, however, wool prices had risen considerably, interest rates were down, the drought had broken and, as Butlin has put it, the stage was set for a new phase of pastoral investment.[22] Yet there was a reluctance to re-occupy Mallee runs.

The answer appears to lie in the fact that the Mallee pastoralists held their land on pastoral leases and, therefore, did not enjoy the security of tenure conferred by long-term leases. Consequently, there was little, if any incentive to invest in methods designed to combat the rabbit plague. Tucker, in his address to the Parliament, cited the case of a settler who held leases in both the Victorian and South Australian Mallee. On his South Australian run — held on long-term tenure — the settler ran some 30,000 sheep, but across the border in Victoria he had been "absolutely obliged to abandon his run".[23]

Limited as their effect had been against herbivorous marsupials, conventional methods of 'driving', shooting, poisoning, dogging and digging out were totally ineffective as a means of controlling, let alone eradicating, the rabbit. In 1890, for example, a total of 920,000 rabbits were destroyed at Tupra Station near Hay in New South Wales and it was expected that number would be exceeded during the course of the following year.[24] The only answer appeared to be some means of quarantining land against infestation from outside.

Some settlers attempted to exclude rabbits by fences constructed of readily available materials. On Tyntynder homestead in Victoria, for example, in the early 1880s a virtual stockade was built of wooden posts, six-foot in length and a minimum of four inches in diameter, which were sunk 18 inches into the ground and close enough together to prevent the passage of a rabbit. This fence, of five miles in length,

was a complete failure. Within two years the drifting of sand against its exterior surface had provided a bridge for rabbits to enter the land of the homestead.[25]

More success was achieved, but at similarly enormous cost, with a fence constructed of split timber slabs that completely surrounded the celebrated Jancourt holding near Camperdown, Victoria, by 1885.[26] The Manifolds went so far as to build stone walls to protect their holding near Lake Purrumbete in Victoria against rabbits. Erected from the end of the 1850s, onwards, these walls cost £120 a mile by the 1880s and were so designed that a rabbit was unable to burrow under or climb over them.[27] Eventually, however, it was woven wire, or wire netting as it came to be called, which proved to be the most cost-effective means of rabbit control and, from the early 1880s, it was increasingly employed for that purpose. By 1885 the demand for wire netting in Australia was of the order of 1,000 tons per annum. Five years later demand had increased six-fold and, despite the collapse of pastoral investment in the early 1890s, by 1900 "net imports plus local output amounted to about 8,000 miles per annum".[28]

The efficiency of wire netting for rabbit control was dependent upon a number of factors; a situation that generated a great deal of debate in the later 19th century. Such factors included the size of mesh required to prevent the passage of young rabbits, the depth and manner of sinking the mesh into the ground to prevent entry by burrowing and the height required to keep out adult rabbits. Eventually, specifications were established and recommended by colonial governments, although even these measures did not bring the debate to an end.

In 1891 the Victorian government recommended that netting for rabbit exclusion must be constructed of 17 gauge wire, of a mesh no greater than $1^5/_8$ inches, and to a width (between the top and bottom selvedges) of three feet. A number of graziers, however, insisted that a closer mesh, of 1½ or even 1¼ inches was required to keep young rabbits out and that the height of the fence should be at least 42 inches. In response to the Victorian measure, the *Australasian Pastoralists' Review* of 15 January 1892 called: "for some practical experiments to be made with a view to testing the ability of young rabbits to get through a true $1^5/_8$ inch or 1½ inch [mesh], and also the jumping power of the full grown animal".

A pastorialist, in response to the above article, expressed the view that a 1¼ inch mesh was necessary to stop the ingress of young rabbits. Therefore, where the government recommended specifications had been adopted, he suggested that a 9 inch strip of 1¼ inch mesh should be fixed along the bottom of the existing fence. As "a young rabbit must have its hind feet on the ground in order to push

its way through" the fence, the $1^5/_8$ inch mesh above the 9 inch strip would still be effective against more mature rabbits. In addition, to prevent the latter jumping or clambering over the three-foot fence, the writer recommended placing "a thickset, 4 point barb wire, well strained and stapled on posts, say 2 inches or less above the netting".[29]

Particular controversy existed over the depth to which it was necessary to sink the netting into the ground to prevent rabbit burrowing underneath it. Recommended depths ranged from three to seven inches, with some graziers recommending that a narrow strip of netting be placed horizontally below the ground alongside the exterior of the fence. In 1886 a Victorian Order in Council proclaimed a rabbit-proof fence, within the meaning of the Mallee Amending Act of 1885, to include it being sunk three inches into the ground with a seven-inch trench below, to be filled with the timber of Mallee scrub cleared from the land. Eventually the footing controversy was solved by experience proving that rabbits could be effectively prevented from burrowing under a fence, by leaving six inches of netting below the ground so that three inches curved outwards.[30]

EVOLVING TECHNOLOGY

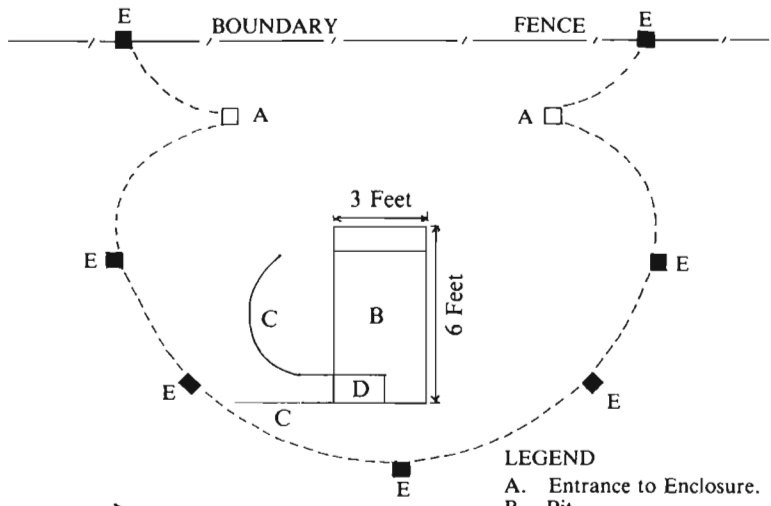
Towards the end of the century settlers began to exploit the technology of fencing to go over to the counter-offensive against the rabbit, by incorporating various types of traps into their fences. The basic trap consisted of a 'catching yard' constructed immediately adjacent to a section of fence. This yard was either a 'double netter' (i.e., enclosed by a double height of netting) or surrounded by a single height but capped with a 12 inch band of netting sloping upwards and inwards at an angle of 45 degrees. The ground within the enclosure was then covered with netting to prevent escape by burrowing.

Access by rabbits to the 'catching yard' was provided by openings in the boundary fence. Commonly these were made by cutting a single mesh at a height of about six inches from the ground and turning the cut wires inwards to deter rabbits from attempting to escape from the yard. Specially manufactured openings for traps also appeared on the market, such as the 'Terrawynia' patent rabbit arch or various cylinders constructed of wire netting. These were equipped with inward-pointing needles to bar egress to rabbits entering the trap. In all cases it was the usual practice to build small ramps, or mounds of earth, under the openings to facilitate the rabbit's entry into the trap.[31]

Much larger 'catches' were made in traps built around sources of water: 2,100 rabbits were captured around one tank on Yandama Station, near Wilannia, during one night in 1892.[32] That netting traps were perceived as having a high degree of efficiency is attested to by

Figure 1

IMPROVED PIT TRAP



LEGEND

A. Entrance to Enclosure.
B. Pit.
C. Netting wings.
D. Tilt.
E. Posts.

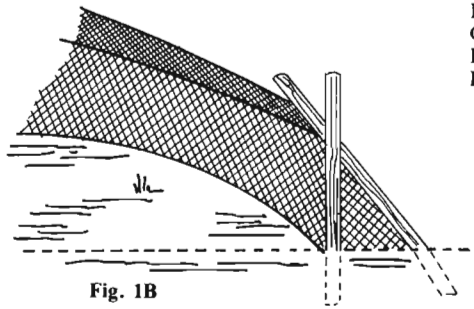


Fig. 1B

Fig. 1B Shows method of constructing fence around trap. Note that fence is capped with a 12 inch strip of netting slanting upwards at an angle of 45 degrees.

Fig. 1C

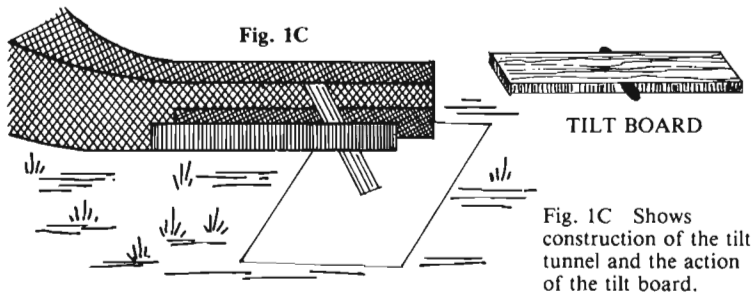


Fig. 1C Shows construction of the tilt tunnel and the action of the tilt board.

Source: *The Australasian Pastoralists' Review*, 15 April, 1892.

the fact that as late as 1903 the New South Wales Department of Agriculture was advising settlers that 'pit traps' should be incorporated at intervals into boundary fences for the purpose of trapping rabbits and preventing this undermining of fences by the same animals.[33]

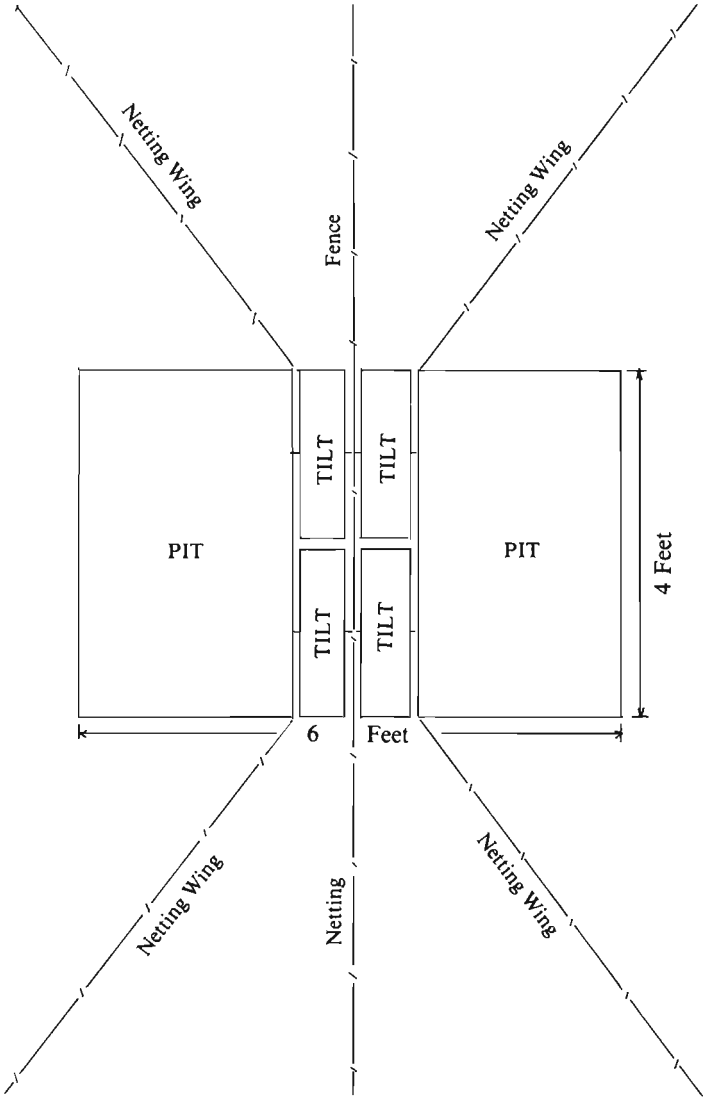
The 'pit trap' typically consisted of a netted enclosure around a pit four feet wide, eight feet long and two feet deep. The floor and walls of the pit were netted or lined with wooden slabs and it was customary to use hollow logs for entrances. Before being placed into position the end of the log pointing into the pit was adzed to create a sharp edge and the inside of the log was 'scented' by confining a rabbit within it for a day or two. 'Scenting' was believed to induce rabbits to enter the log.[34]

The entrance log was positioned so that the sharpened end projected into the pit at a distance of some eight inches from the side and about two feet above the bottom. A rabbit entering the log was unable to retreat by turning and was apparently enticed to jump into the pit by the presence of other rabbits inside it. Thereafter, the rabbit was unable to escape by jumping back into the log on account of being unable to gain a foothold on the adzed edge.[35]

A more elaborate and costly version of the 'pit trap' was developed in response to the notion that rabbits were actually deterred from entering the pit by the sight of other rabbits or by the smell left of dead ones. Here a technology incorporating the 'catching yard' and the more basic 'pit trap' was combined with other innovations. (See Fig. 1). The pit was dug in a section of the 'catching-yard' and covered by netting over which grass or rushes were placed. Netting 'wings' built in the yards were so placed as to channel rabbits towards the pit and into narrow lanes or netting cylinders leading to concealed tilts which dropped under the weight of the rabbit and projected into the pit. Tilting boards were made of timber and were usually two feet long by six inches wide. They turned on pivots usually made of strong fencing wire or nails attached to the boards by staples and placed into half-rounded spars laid across the pit. Tilting boards were so designed as to immediately return to the horizontal position when relieved of the weight of the rabbit.[36]

Another variation of the 'pit trap' involved the construction of a pit under the fence rather than beside it. (See Fig. 2). The siting of the pit in this manner — with the fence line passing over the middle of the pit — enabled the trapping of rabbits already within the paddock as well as those outside. This type of trap was lined with netting or slabs similarly to other 'pit traps' and was roofed at ground level with wire netting attached to logs set into the surface of the ground. However, under-fence 'pit traps' differed from all other similar traps in that they were not enclosed by surface fencing. Instead a four-foot long fence

Figure 2
UNDER FENCE PIT TRAP



Source: *The Australasian Pastoralists' Review,* 16 March, 1986.

was erected parallel with and on each side of the boundary fence, to form two narrow lanes just sufficiently wide to permit a rabbit to pass through. Netting wings projected at an angle of about 45 degrees from the ends of the short fences. Rabbits passing along the boundary fence were channeled by the wings into the narrow lanes and over one of the two tilt boards concealed in each lane.[37]

Settlers employing 'pit traps' or 'catching yards' were advised to regularly clear them of dead rabbits and to scatter these in heaps about their paddocks to make the entire area uninhabitable for any rabbits existing on the property. Alternatively, it was suggested that rabbit carcases be buried at the entrances of burrows outside the fence, for "by this means rabbits are induced to forsake the burrows and, consequently, the traps are better fed".[38]

Overall traps built in boundary fences appear to have accounted for considerable numbers of rabbits and to have provided graziers with some measure of protection. It was common for a hundred or more to be taken by a single trap in a single night.[39] A refinement of this type of trap occurred where water holes, dams or tanks were enclosed in the same manner as the basic trap. Rabbits, attempting to reach the water, entered the trap through a netting tunnel which projected into the enclosure so that the exit hole was some three feet inside the fence. The location of the exit hole was important. According to a contemporary source, once inside the trap, the rabbits often "hang on to the wire fence and never leave it so that they don't get out through the tunnel mouth".[40] Trapped rabbits were removed each morning. The watering place was thrown open to stock each day, but closed each evening to once again become a trap.[41] However, along with various types of vermin fencing, they were unable to bring the overall rabbit problem of Australia under control. That had to await the biological weapon of myxamatosis which was applied in the middle of the 20th century.

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