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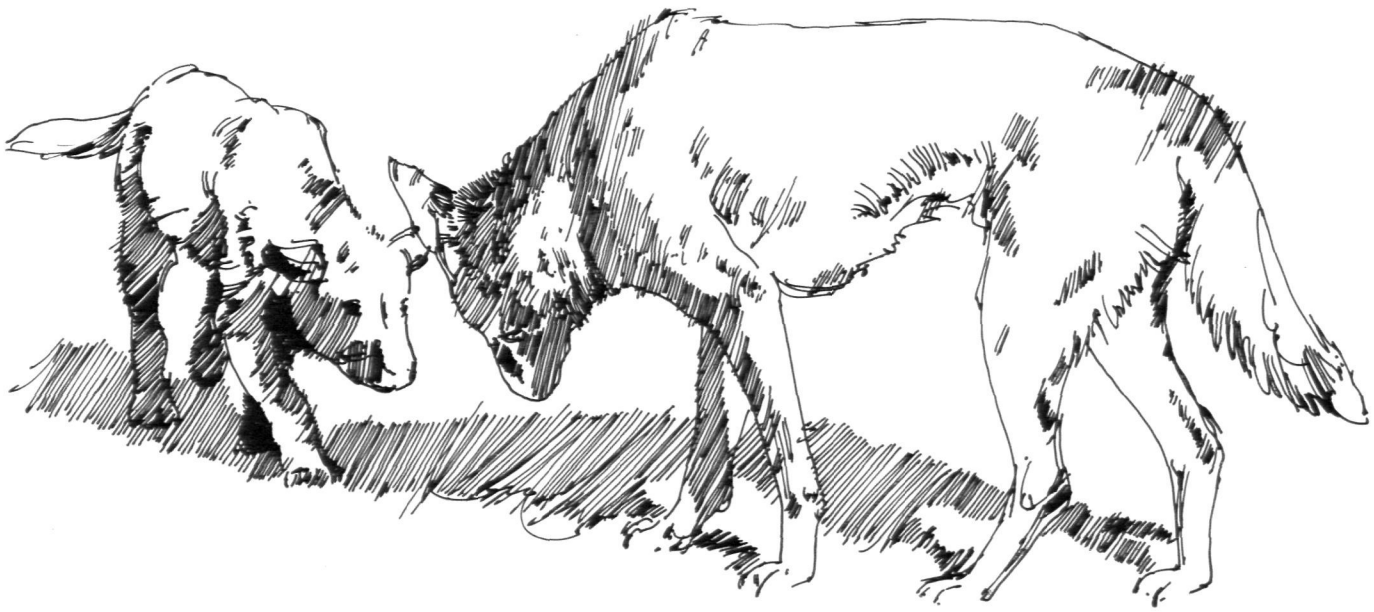

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For more than 3 000 years man has tried to reduce the numbers of pest animals by payment of bounties. In general, the system has failed.

This article, by a research scientist who specializes in the study of declared (pest) animals in Western Australia reviews some of the literature about bounties and comments on the situation in Australia.

It concludes that the arguments in favour of bounty systems for animal population management are extremely hard to justify, and little evidence of the operation of any successful bounty system can be found.

Bounty systems appear to be counter-productive in terms of alleviating the problems caused by pest animals. As a means of rural subsidy they are illogical.

"Bonus" or "bounty" systems may be defined as the payment of rewards to hunters for the killing of animals regarded as pests. The systems are intended to control animals that either compete with, or are injurious to, man's interests. The most frequent targets are predators.

Such programmes have been in operation around the world for about 3 000 years. The ancient Greeks paid bounties on wolves (1) and, since then, bounties have been paid on a wide variety of animals. These have ranged from predators of stock—wolves, bears, dingoes, etc.—through to such animals as emus, seals, crows, mountain lions, squirrels and porcupines, and the reasons why the bounties have been offered are varied.

It is difficult to find in the literature any documented cases which report the successful use of the bounty system. The little support that can be found appears to consist of letters and articles in non-technical journals, based largely on opinions rather than facts.

In the United States, bounties date back to 1683 (2) when the State of Pennsylvania introduced bounties to control predators of game. Since then all American States have, at various times, inaugurated similar programmes. Most States still use bounty systems.

In colonial America, tobacco was a medium of exchange and was used as the bonus payment. Today money is the usual payment, although other valuable tender, such as livestock, has been used.

Jacobsen (3) carried out a comprehensive survey of the various systems that have operated in the United States. In reviewing the basic requirements of any scheme, he quotes from an 1896 report of the United States Department of Agriculture. Dr. T. S. Palmer, at that time First Assistant in the U.S. Biological Surveys, stated:

> Any scheme intended to bring about the extermination of a species must fulfil certain conditions before it can prove successful in practice:
>
> - It must be applied over a wide area, practically covering the range of the species, otherwise the animal will increase in the unprotected region.
> - It should be uniform (that is, the rates should be the same) in all localities.
> - It should provide some inducement for carrying out its provisions.
> - It should be economical, for, if expensive, the cost will exceed the losses which it seeks to avert.

- It should provide, so far as is possible, against fraud or the misappropriation of public funds.

Hamilton (4) enumerated another requirement, that "theoretically, a bounty must be high enough to ensure the destruction of at least a majority of the individuals during the first bounty season".

From a model simulating coyote population dynamics Connolly and Longhurst (5) determined that if the annual kill was 75 per cent., the population could be exterminated in slightly more than 50 years. However when they studied the data from a county in California, they concluded the coyote numbers were not being reduced at all; instead, the reproduction rate was being locally stimulated.

The problems facing the use of bonus payments to control animal numbers are large. Fairley (6) described the central problem as being two-fold:

- The payment must be large enough to induce a kill in one season which is appreciably larger than that caused by the natural mortality factors.
- If the initial reduction is achieved the hunting of the smaller numbers requires more effort and, unless greater and greater bounties are paid, equilibrium is reached or the species is allowed to move to its original level. Alternatively, the hunters, whose interests are concerned, will ensure that the animal is not exterminated.

Jacobsen discussed many systems that have been evolved, and the theme is generally one of almost total lack of success, usually accompanied by frauds. As soon as the monetary incentive becomes high enough to satisfy the first criterion above, frauds of two basic kinds occur.

The first is caused by the non-uniform payment of bonuses in different areas. This results in the movement of scalps or other proofs of destruction from areas of low or no bonus, to areas of high bonus payments.

The second type of fraud consists of the substitution of the scalp of an animal of no bonus value for that of an animal on which the bonus is being paid.

The Michigan Department of Conservation reported as follows in 1922:

> The history of the Michigan bounty law on predacious things is dotted with the work of those who padded bounty orders, manufactured woodchuck scalps by sewing ears on pieces of pelts, collected bounty on house-cats claiming them to be "wild-cats", of substituting blackbird heads for baby crow heads; of claimants stealing from township clerks the once bountied and discarded scalps and heads; of others who purchased Wisconsin weasel, where no bounty is paid, and collected a bounty in Michigan on them, falsely swearing they had been captured in this State.

One of the most amazing frauds must be that cited by Hamilton where a payment of a bonus of $50 on a wolf scalp in the New York State was made in 1947. There had been no authentic record of a wolf in that State since around the turn of the century.

> "Bonuses, in themselves, have not been responsible for the satisfactory control of any predator population"

But the possibility of fraud occurring is by no means the main drawback of the bounty systems. *Bonuses, in themselves, have not been responsible for the satisfactory control of any predator population.*

The Pennsylvania Game Commission paid a bounty on weasels for over half a century and, at the end of that time, the largest number of weasels during the history of the bounty were being presented annually for payment.

In Minnesota, a 12-year bounty period for foxes yielded evidence of a steady rise in the fox population. At first 25 000 were killed per year, but this rose steadily to 40 000.

The payment of bounties on squirrels in Great Britain appears to have had no effect on the population.

Wolves and coyote populations in Ontario appear to be totally unaffected by the payment of bonuses(7. 8).

The bounty does not appear to have had any effect on the mountain lion population in California(9).

Virginia encouraged the killing of wolves almost from the date of its first settlement and has, at times, paid $25 each for their scalps. However wolves in that State were not exterminated until the Civil War period, after the rewards had been in force for more than two centuries. Even then, their extermination was not because of the bounty, but rather through the settlement of the State(10).

Probably the most detailed examination of any bounty system was carried out by Fairley, when he examined the Northern Ireland system of fox control. He concluded that the only fox "predator" was man and that, by a variety of methods, a large number of foxes were killed each year. He believed that this hunting, whether bounty-inspired or otherwise, did not make any substantial long-term difference to the population. The reasons were:

- If the bounty is affecting foxes in N. Ireland, it is curious that it is maintaining them at a more or less constant level without reducing them further. When bounties were suspended in certain countries, there was no sign of an increase in the animals.
- There are many areas where foxes are not hunted, often because they are remote or inaccessible or no-one bothers to hunt them.
- Statistical analysis of the bounty figures tends to suggest that the numbers of foxes caught in winter and early summer bear no relation to the numbers caught next winter.
- It can be concluded that less, possibly much less than 33 per cent of adults are killed by man and very much less than 44 per cent of the cubs.

Fairley concluded that the bounty "is of no value in keeping down foxes". The major mortality factor was disease, and even though a large number of deaths may be attributed to the bounty, many of the foxes killed by man would have died anyway due to natural causes. No additional mortality was being added to the pre-existing natural mortality.

This point is often missed by advocates of the bounty system, who maintain that by killing many individuals, they must be reducing the population. Mech(11) reports on studies where the natural mortality in the wolf populations in their first year of life is 50 to 70 per cent. and this may run even higher.

From the evidence cited above, there seems little doubt that the bonus system as a means of reducing predator populations has not been effective. Jacobsen states:

> At no time in our 30 years of direct and indirect association with predatory animal control have we encountered any bounty payment plan which, of itself, has successfully brought about the reduction of predators when and where needed. Apparently, the ideal bounty system has yet to be devised which, through proper and periodic upward adjustments of payments, commensurate with the scarcity of the animals to be controlled, will continue to induce hunters or trappers to seek out a reduced predator population or wary specimen, before dishonest and fraudulent practices creep in to nullify any advantage gained.

However, there is one case where a form of the bounty system appears to have been successful. In a large area of the U.S.S.R. centred around Moscow, the wolf has been virtually eliminated. The bounty paid per wolf is equivalent to about four months' wages for an agricultural worker.

This success appears to be due to (a) the amount of enthusiasm that the local population shows towards killing wolves and (b) the bonus system —both factors being assisted strongly by the social structure of the Soviet Union (Bibikov pers. comm.).

Mech states that "when payments are high, capture techniques efficient, and the density of the species to be bountied low, bounties may be effective. In certain areas, particularly on the edges of the wolf's range or where the range is limited the bounty could be a significant factor in reducing a wolf population." The Soviet Union experience would seem to support this.

However the same large amount of money is also paid in the Baltic States, but the local Governments have a different attitude towards the wolf and, even though the law and the bonus are the same as in the Moscow region, a healthy wolf population still survives. Possibly the most important factor is the social pressure exerted on the individual to believe that killing a wolf is a good or bad thing.

It could therefore be concluded that the bounty as such, despite representing one third of a year's salary, is not the reason for the wolf population decline in the Moscow region.

The Australasian experience

The course of bonus payments and bounty systems in Australia has been similar in all respects to the rest of the world. It has not been possible to find one documented case where a bounty system has been successful.

> "Many of the foxes killed by man would have died anyway due to natural causes"

The problem of fraud has been and still is a major problem in Australia. Victoria has a fox bonus and acknowledges that malpractices occur in trafficking of scalps into the State from nearby shires in New South Wales and South Australia where no fox bonus is paid.

In New Zealand there was a bonus for possums, but this was stopped in 1961 when it was apparent that all the bonus had achieved was to spread the animals throughout New Zealand(12).

There have also been reports of dingo scalp movements between areas in Western Australia where big differences exist in bonus payments. They can vary from $2 to $20 in adjoining shire areas and this is more than enough to induce people to get the higher rate by falsifying position reports. There have been rumours of people paying $15 each for scalps in one shire and subsequently obtaining $20 each in a neighbouring shire.

. . . would have died anyway, due to natural causes.

In 1969, South Australia raised the bonus it paid on dingo scalps from $2 to $4 and then to $6. At the same time, Victoria, New South Wales, Western Australia and Northern Territory were paying $2. In that year, the number of scalps handed in for payment was 19 490—a considerable increase from the 3 000-odd scalps of the year before. In 1970, the bonus was lowered and reports indicate that the scalp returns are now back to the pre-1969 level.

This case illustrates very clearly the basic problems of the bonus system. Where did all those 19 490 scalps come from? It is a moot point whether they resulted from vastly increased hunting pressure on the dingoes within South Australia or as a result of a movement of scalps across the borders.

It is also arguable that the bonus was lowered because the campaign was successful. The payments for bonuses would have risen from around $6 000 to $120 000. From the arguments of Jacobsen and Hamilton, this level would need to be maintained for at least some years, and probably should have been increased considerably.

The places in Australia where dingoes have been reduced in numbers are probably very similar to those outlined above in the U.S.A. where wolves and coyotes have been reduced. When European man first settled the continent, dingoes were distributed throughout the mainland. However, as land has been cleared for agriculture and become more densely settled, their range has been reduced and their distribution has

become patchy. The south-western corner of Australia is now virtually without dingoes.

However in the Murchison district we find a case which meets the criteria cited above by Mech where bonuses will work: low dingo population level, easy access, enthusiastic hunters and high bonus.

In the area around the town of Cue, there are a number of large sheep stations and dingoes are extremely rare. However, if a dingo is known to be in the area, a large bounty is offered immediately and the individual is removed fairly quickly. The bounty is from a permanent fund that is maintained for this reason. The low dingo density is probably due originally to the accessibility of the country leaving few dingo refuges available, and to the almost total land use by the station owners. It is kept low by the very high bonus on the few dingoes that occur. But even this sort of scheme may be subject to fraud.

Similar studies to those of Fairley, although in less depth, have also been carried out in Australia. Figure 1 shows the number of dingo scalps submitted for payment in the Pilbara district of Western Australia from 1962–75. This shows that the number has remained virtually constant despite fluctuations in bonus payments. At the same time, evidence strongly suggests that the size of the remaining population has not decreased at all—in some areas it may have increased. Figure 2 shows similar results in South Australia.

Tomlinson(13) plots figures for dingoes, foxes, eagles and emus in Western Australia (see Fig. 3) showing that for a period of nearly 30 years the number of bonuses paid on these animals varied independently of the size of the bonus. The annual number of bounties paid for dingoes, eagles and emus remained virtually constant, while the number of bounties paid for foxes increased from about 2 000 in 1928 to 45 000 in 1956. The figures indicate that the bonus has had no effect on reducing the populations of these animals.

Also, as with wolves and foxes cited above, the animals killed are probably mainly those that would have died anyway. In Western Australia, half of the dingoes caught are less than one year old and 78 per cent. are less than two years old—the young and inexperienced animals that are most subject to natural mortality.

Conclusions

So far, the discussion has centred mainly around the concept that the aim of a bonus system is to reduce a target population and therefore alleviate whatever problem it may have been causing, and this generally seems to have been the aim with most bounty systems.

However, if the aim is purely to "alleviate the problem" then the bounty system must be counter-productive. As soon as a bounty offered on a target animal is sufficiently large to warrant the effort involved in claiming it, the incentive is to get a "scalp" regardless of whether the individual animal was causing a problem or not. This situation develops into a paradox, as, more often than not, the high population concentrations of the target animal (and therefore the most easy to catch) are not where the animal is presenting a problem to man.

The bonus system therefore tends to force hunters to remove non-

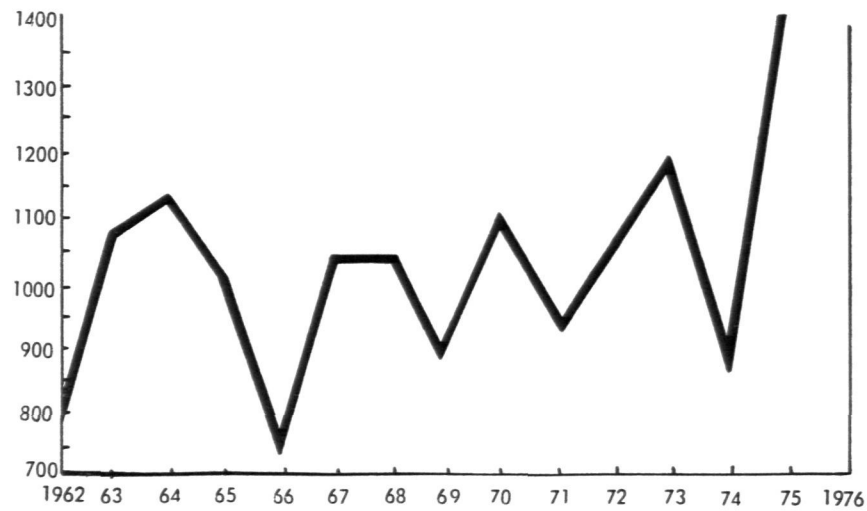

Fig. 1—Dingo scalps submitted for bonus payments in the Pilbara region of W.A. 1962-1975.

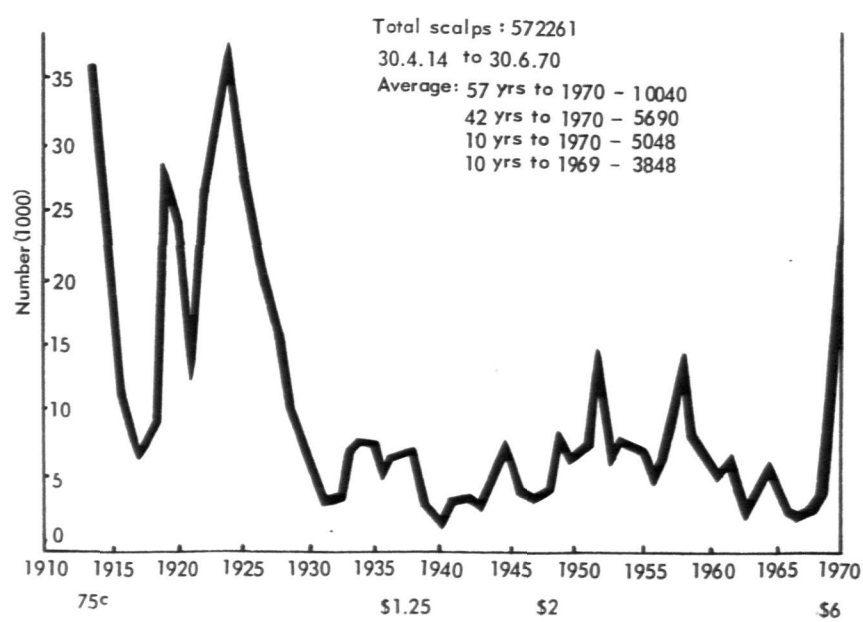

Fig. 2—Dingo scalps submitted for bonus payments in South Australia, 1910-1970.

problem animals from areas of high populations while the low population concentrations are neglected and the original problem caused by the animal persists.

The final consideration of a bounty system must be one of social benefit. Gertsell(14) talked of the "widespread distribution of large sums of money in the form of bounties", and concluded that this was an important economic factor in rural North America. He states that "payments have often meant much to rural families".

In Western Australia this is a doubtful consideration as, in most cases, the bounty payment per unit animal is small. In places where it is large, it is even more doubtful, as the finance for these large payments is raised in taxes from the "rural families" themselves. If, therefore, the aim of offering a large bounty payment is to provide a form of rural subsidy, the method of financing the bonus payments, in Western Australia at least, would seem logically to negate this aim.

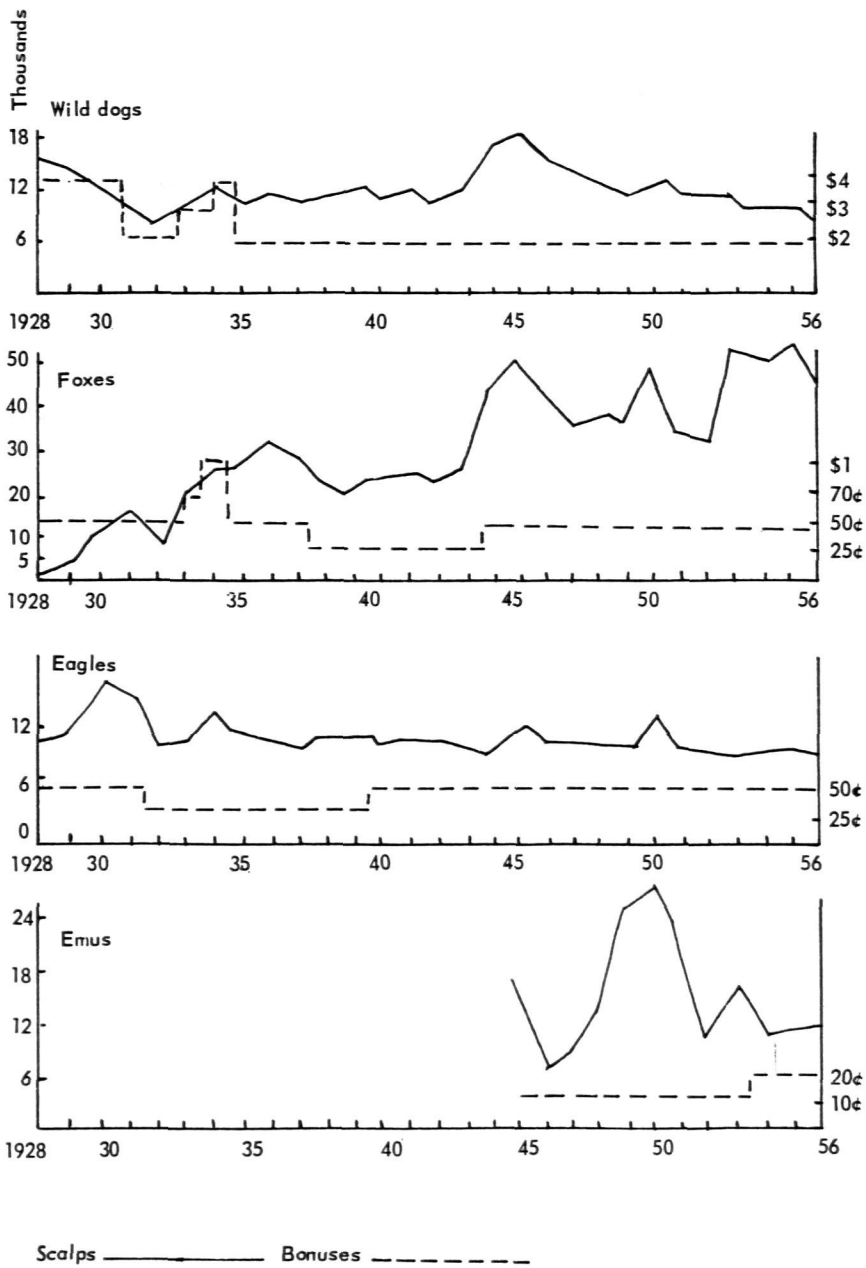

Fig. 3—Relationships between rates paid and number of scalps received annually (from Tomlinson (13)).

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