

Dog attacks on livestock

Garth Jennens

INTRODUCTION

The attacking and harassment of livestock by domestic dogs is frequently described as predatory aggression (Voith 1983, Borchelt 1983). Predatory aggression is one of several categories of aggressive behaviour described in the domestic dog. Other categories include -competitive, inter-male or female, maternal, protective, possessive, idiopathic, pain, fear and play (Voith 1983). The predatory behaviour may also be directed at people, companion animals, small mammals, livestock, birds and wildlife, or at cars and cyclists. Few attacks on people are identified as predatory aggression. Studies based on veterinary clinic behavioural records show that predatory aggression towards other animals is far less common than other types of aggression. Blackshaw (1991) in a study of clients seeking treatment for a behavioural problem, found that predatory aggression directed towards other animals, such as cats and poultry, represented less than 1% of dogs being treated for aggression.

By contrast examination of any semi rural local authority records, and results from several Australian studies show that domestic dog attacks on livestock are widespread and cause significant losses on rural properties and on smallholdings in the urban/rural fringe areas of towns and cities (Melbourne Metropolitan Board of Works Report 1980, Vertebrate Pests Control Authority Report 1983, Coman 1985, Coman and Robinson 1989, Jennens 1992). Jennens (1992) reported that in seven Perth local authorities between 1989 and 1991 more than 5,400 sheep, goats, cattle and horses were killed or destroyed on 1,300 individual properties. In this study over 1,900 dogs were involved in the attacks, of which only 62% were reported to the local authorities. Cattle and horses were often harassed but, rather than being injured by the attacking dogs, they usually panicked and were injured by running into fences.

WHEN AND WHERE ATTACKS OCCUR

Dog attacks on livestock have often been described as unpredictable because an attack may occur at any time during the day or night, or at any time during the year. It has been suggested that seasonal changes in farm management practices, such as lambing or when livestock are being moved into an area, can affect the frequency and pattern of attacks (Wade 1985, Coman and Robinson 1989, Jennens 1992). In the Perth study (Jennens 1992) livestock losses were greater between May and July. Properties in close proximity to populated areas and other smallholdings and those near creeks were particularly susceptible to attacks in this study.

However it is difficult to predict which individual property with livestock will be attacked, or why one property will be attacked rather than another. Often properties in close proximity to each other are attacked repeatedly by the same dogs and on other occasions livestock on properties kilometres apart are attacked in a series of attacks which may continue until the dog is caught, or there are no livestock left.

SURPLUS KILLING

Rowley (1970) described predation as the killing of members of one species by members of another species for food. In this context the domestic dog may not be a true predator as it does not live by killing and eating animals. Fox (1971) however showed that there were many similarities between the predatory behaviour of domestic dogs and that of wild canids. The dog is capable of carrying out all or parts of the hunting sequence of the wolf - orienting, tracking, trailing, stalking, chasing, driving, herding, attacking, killing, consumption and retrieving. In addition behaviours associated with hunting and chasing, such as wandering and scavenging, have also not been lost.

Despite these similarities, it has been suggested that domestic dogs chase and attack sheep for sport or fun particularly when many sheep are killed or injured, rather than just a few being eaten for food (Boggess, Henderson and Spaeth 1980, MMBW 1980).

However the term 'fun kills' is probably inappropriate, for many dogs do partially consume one or more carcasses after an attack. Even when many animals are attacked pieces of several carcasses are often eaten and together this makes a sizeable meal for the one or two dogs involved. Surplus killing of livestock also occurs in wild canid species, especially when prey is abundant and easily accessible (Mech 1970), or when mothers are teaching full grown pups to hunt (Schaefer, Andrews and Dinsmore 1981). Excess food is either stored for later use or simply left behind uneaten. It appears therefore that killing by some predatory species is more complex than a direct kill to eat relationship. Fox (1991) suggested that the ability of dogs to chase, corner, harass and kill the prey is probably acquired by both observational learning and trial and error. As a result the first few attacks many dogs engage in may be haphazard, messy and non-fatal, with animals in subsequent attacks being quickly and cleanly killed.

NUMBER OF DOGS INVOLVED IN AN ATTACK

It is commonly reported in the popular press, that a pack of dogs are responsible for most attacks on livestock. However several studies have reported that a single dog, or a pair of dogs were most commonly involved in the attacks (MMBW 1980, VPCA 1983, Coman and Robinson 1989). In the Perth study (Jennens 1992) 40% of 1,400 attacks where a dog or dogs were seen or located, a single dog was responsible. A pair of dogs, usually a male and a female dog were responsible in 51% of attacks and three or more dogs in only 9% of attacks.

Where two or more dogs were involved they were usually from the same household, or lived in close proximity to each other. Dogs belonging to the livestock owner or a neighbour were responsible for many of the attacks, and 80% of the dogs involved lived less than 500 metres from the attack scene. It has also been suggested that packs of dogs form around bitches on heat and afterwards attack livestock (American Humane Society 1974). Whilst this may occur in some instances, it is not as often as commonly reported. In urban or semi rural areas it is unusual for packs of dogs to form and, when they do, the group is usually mixed in breed, shape, size and temperament, small in number, and its duration short lived (Fox 1978, Berman and Dunbar 1983).

PATTERN OF INJURY TO LIVESTOCK

The extensive damage to individual animals can also lead many people to believe that a pack of dogs are involved in an attack. The injuries to sheep from an attack by dogs are usually characterised by wounds inflicted on many different bodily parts of an animal (Wade 1982). Injuries range from superficial wounds to severe lacerations and to the complete mutilation of the carcass. Dogs tend to mutilate livestock by severe bites about the head, neck and ears, as well as the flank and legs. Sheep may be skinned alive, disabled or hamstrung by deep bites, or have legs or other bodily parts torn away. These injury patterns are in sharp contrast to the distinct killing patterns of many wild canids. Livestock are rarely killed outright by dogs (Schaefer et al 1981), instead they die from their injuries, later infection, or have to be destroyed. Many fall into ditches whilst running to escape, are chased into dams and drown, or run through fences.

Dog attacks on sheep can be distinguished from other predator attacks by the type and pattern of the injuries to animals, however many livestock owners believe that certain types of dogs inflict characteristic injuries (VPCA 1983). In the Perth study (Jennens 1992) it was found that the location of primary injuries to sheep were sometimes consistent with certain breeds of dogs. Bull Terriers, for example, attacked the lower facial region and muzzle, Australian Cattle dogs attacked the hindlegs and rear end and Rottweilers the nape of the neck and the upper part of the muzzle. It is possible that anatomical and behavioural differences between breeds may account for these variations. A knowledge of breed injury patterns can assist in identifying dogs after an attack, or link a particular dog to a series of local attacks. However similarities in primary injury sites do occur when less common breeds, crossbred dogs or several dogs are responsible for an attack.

STIMULUS FOR ATTACK

Fox (1971) suggested that, whilst the scent of livestock was sufficient for a dog to investigate, the movement of the animal away from the dog was the primary stimulus for a chase to occur. When attacking sheep dogs have been observed to chase individuals that break away from the flock, or separate an animal out from the flock to increase its vulnerability and then prevent it from rejoining. Frequently a solitary animal separated from the flock is chased in preference to the main group. Once a sheep is caught, or caught and brought down, some dogs will continue to attack. Other dogs may stop, lie down, or stand close to the sheep when it stops, is caught against a fence, or is brought down. The dog may then leave it alone and chase another sheep that breaks away from the flock, or chase it again once the animal runs off.

Schaefer, et al (1981) have described defensive behaviours of domestic sheep when disturbed or attacked by dogs and wild canids. Sheep normally look up often when grazing, but when a predator is sighted they will cease grazing, collectively stand still and silently alert and watch its movements. When a predator enters the flight distance of sheep, they will usually move slowly away from it, bunch together and run as a group when chased. Some animals may then be separated from the group. Flocking makes it more difficult for a predator to concentrate on a single individual in a group. When caught by a predator individual sheep will struggle to escape, freeze or fight back. Once brought down some sheep may remain immobile, others will get up again and run. In some instances ewes and rams will stamp their feet, or head butt predators in close proximity, or ewes will circle their lambs to protect them.

BREED OF DOG INVOLVED IN THE ATTACKS

Selective breeding for specific tasks, which require specialised senses, may accentuate or inhibit individual components of the canid hunting sequence in some breeds of dogs (Fox 1971). For example Bloodhounds are bred for tracking and trailing, Setters and Pointers for stalking and pointing and Retrievers for retrieving. However there is little evidence to suggest that selective breeding has eliminated or suppressed the ability of any breed of dog to attack and kill livestock, especially if the opportunity permits. As a result all breeds and sizes of dogs, including crosses of these breeds, are involved in attacks on livestock, with hunting and working breeds more commonly involved (VPCA 1983, Coman and Robinson 1989, Jennens 1992). Coman and Robinson (1989) found that there was no predominance of one breed or type of dog involved in the attacks, although larger dogs were more commonly involved than small dogs. It is not possible to predict if a particular dog will or will not attack livestock until after the attack has occurred. Dogs from three months of age to twelve years old, entire and sterilised dogs of either sex and with the best pedigree; all have been caught attacking livestock. The only common denominator between all these dogs is that they were wandering at large, or unrestrained on their own property.

REPORTING ATTACKS

The losses of livestock are under represented because many attacks are not reported. Jones (1977) estimated that up to 60% of attacks may not be reported to the local authority. Livestock owners do not report an attack for a number of reasons. These include being unsure who to report an attack to, dissatisfaction with the local authority, or because their own dog or that of a neighbour's is involved (MMBW 1980, VPCA 1983, Jennens 1992). Others preferred to control dog problems by dispatching or capturing the dogs themselves (Jones 1977), or tracing the dog home and taking the matter up with its owner (VPCA 1983). Some livestock owners may not advise the dog owner of a dog's involvement in an attack, instead quietly disposing of the dog because they fear retribution, or do not want ill feeling in the neighbourhood.

LOCATING THE DOGS

Unless dogs are caught or destroyed at the time of the attack, or followed home immediately afterwards, they are often not located. As a result statements such as "there is little the landholder can do after an attack" or that "dogs often leave without a trace" are commonly made in the popular literature.

Once dogs have left the scene there are few methods of identifying and locating them. Many techniques used in predator control for wild canids are not suitable to identify and locate domestic dogs.

Animal tracks can be used to identify the type of predator involved in an attack, as different canid species have characteristic tracks. This may assist to determine whether foxes or dogs were involved in an attack, but it is not possible to differentiate between individual breeds. One of the difficulties in following dogs outside urban areas is that they will cross private property, use bush tracks and river lines, or cross areas where no prints are left. Radio telemetry has been used to track the movements of domestic dogs (Coman and Robinson 1989), however this does not provide details of the exact route taken by the dogs.

Dogs do however have an ability to follow scent trails, and as a result specially trained dogs are used throughout the world in predator control (Wade 1985). They can trail bobcats from fresh depredation sites, locate coyotes and their dens and are used to search for carcasses after an attack. In the Perth study (Jennens 1992) a Weimaraner was trained to track a dog involved in an attack by following its trail from the attack scene back to its home. The tracker dog was taught to discriminate between the scent of individual dogs in order to identify and track a particular dog only and trained not to switch trails when distracted by unrestrained dogs and bitches in season. The dog was also conditioned to work in all weather conditions, over different terrain and amongst pedestrians and traffic, up to thirty six hours after an attack. The tracker dog located the dog's scent from the paddock where the attack occurred and followed its trail until the offender was found, the trail was lost, or the track discontinued.

The tracker dog was used on 115 occasions, resulting in twenty five dogs being tracked directly to their homes where they were positively identified by livestock owners or independent witnesses. On 20 other occasions a dog was tracked to its home but the dog owner denied its involvement. However circumstantial evidence, independent sightings or a subsequent cessation of the attacks indicated that this was the dog responsible. A further 19 offenders were trapped or located as a result of information gained from using the tracker dog. This included information on an offending dog's exit from the attack site, its direction of departure and the route taken.

METHODS OF CONTROL

In urban/rural fringe areas no one control method (lethal or non lethal) has been shown to be fully effective (Coman 1985). Few of the traditional control methods used for wild predators on large holdings are appropriate for domestic dogs on smallholdings. In these areas the capture, removal and disposal of pets is complicated by personal human relationships, social factors and legal ramifications (Wade 1985). Cage and steel jawed traps are two of the most effective capture methods of wild dogs (dingo) and feral dogs in Australia (Coman 1985). Although time consuming and expensive, trapping is less demanding on manpower and resources than shooting. It is also more cost effective and non target species caught in cage traps can be released.

However there is considerable opposition to the use of steel jawed traps in predator control by animal welfare organisations because of the perceived cruelty to the captured animal (Hayes 1993). There is concern at the pain caused to the trapped animal and the length of time it is left unattended in the trap before being destroyed or released. As a result the use of steel jawed traps is restricted or banned in many areas.

Baiting is seen by many as too dangerous in the urban/rural fringe areas because of the risk to non-target dogs such as neighbouring pets wandering at large and children (Coman 1985). In some instances the legal requirements for its use negates the method's effectiveness. Signs that baits are laid need to be erected around the livestock owner's boundaries and owners of neighbouring properties warned. Frequently these people are responsible and tie their dog up for a short period.

PREVENTING ATTACKS

Several management practices have been identified as either predisposing livestock to an attack, or alternatively assisting in preventing one from occurring (Boggess et al 1980, Coman 1985, Wade 1985). Preventive measures include those that exclude or deter dogs from the property, warn livestock owners of an attack, destroy offending dogs and warn the dog owner of the risk to their dogs. Exclusion methods prevent the dogs from entering the livestock owners property or gaining access to paddocks where livestock are kept. They include internal or external exclusion fencing, penning or shedding livestock and moving livestock to a safe area or near an occupied dwelling. The penning or shedding of livestock is used mainly on large commercial holdings or in rural areas, but it has been suggested that it would be equally effective on smallholdings where few livestock are kept on each property (VPCA 1983).

Exclusion fencing, both electrical and conventional, if well designed, constructed and maintained is commonly used to keep dogs from entering properties where livestock are kept. However predator proof fencing is often costly to erect and maintain and for this reason it is not often used on smallholdings. Attacks on livestock can also be prevented by the destruction of dogs attacking livestock, or the capture of dogs trespassing on the livestock owner's property. Some livestock owners whose animals are frequently attacked will destroy any dog found wandering at large on their property whether attacking the livestock or not. Livestock owners may also prevent attacks by warning dogs owners of their intention to protect livestock by not tolerating trespassing dogs and by placing warning signs to this effect on their road frontage.

Dog attacks are less of a problem where livestock owners have an active program of controlling dogs that enter their property (Jones 1977). However to catch the dog after the attack, or to protect their remaining animals, livestock owners have to neglect other tasks and spend weeks guarding their animals. This can be time consuming and stressful especially if the attacks on livestock occur at night. The ineffectiveness of preventive measures may also be due to many farmers not having sufficient experience to deal with livestock attacks, a lack of knowledge of control techniques or the time to implement them (Coman 1985, Wade 1985). Many livestock owners are part-time farmers who do not have a large economic investment in their livestock. As a consequence the usual incentives to prevent losses, such as reduced profits, are not applicable to hobby farmers.

BEHAVIOURAL PROFILES OF THE DOGS INVOLVED

Domestic dogs that attack livestock are frequently described in the popular literature as being 'wild', 'savage' or 'vicious'. It has been reported that a dog's behaviour changes in the company of other dogs (American Humane Association 1974). This perception is misleading because the description relates to the dog's behaviour in relation to livestock, whereas most dogs involved in attacks are well fed family pets allowed to wander at large. Dogs are more likely to be wary or friendly to people than aggressive. In the Perth study (Jennens 1992) most of the 1,400 dogs involved in an attack were friendly and approachable family pets, very few were aggressive to people. Dogs that bite people do so because they are dominant, protective or frightened, not predatory and a dog caught attacking livestock will usually only attack people if it is threatened or cornered. The confusion between why dogs attack people and why dogs attack livestock is one reason why many owners find it difficult to accept that their dogs have killed livestock.

It has been suggested that packs of entire males commonly form around bitches in heat and may attack livestock afterwards (American Humane Association 1974). However predatory behaviour is minimally influenced by sex as it serves a function of equal importance to males and females (Borchelt 1983). It may be that male dogs have more opportunity to attack because they are more likely to be wandering at large than female dogs (Daniels 1983), or entire dogs and bitches are more likely to wander than sterilised dogs and bitches because sterilisation reduces the tendency of dogs to wander. Although not all dogs wandering at large will attack livestock, it is whilst they are wandering that many dogs have the opportunity.

SOURCE OF THE DOGS

Rowley (1970) and Bowns (1976) reported that dog attacks on livestock were more common near towns, as a result of the higher population of dogs in these areas. However other researchers have found that the main threat to small holders in urban/rural fringe areas is from dogs belonging to other small holders (VPCA 1983, Jennens 1992). Dogs from these properties in close proximity to the livestock owner's property freely wander between properties. Coman and Robinson (1989) also found that dogs from outer suburban areas, rather than the inner city areas were involved in most attacks. These authors found that dog owners usually deny that their dogs were involved in attacks, however information relating to dog owners is sometimes difficult to obtain except where the farmer's own dog or that of a neighbour is involved (Rowley 1970, MMWB 1980, Coman 1985). In the Perth study (Jennens 1992) it was found that most dog owners did not believe that their dog was capable of killing livestock, or that it would do so if given the opportunity. When many dog owners were advised they often reacted with denial and disbelief, especially if the dog had already returned home, or was seen by them shortly before the alleged time of the attack.

A number of reasons are usually given as to why the dog could or would not attack livestock. These included the dog being too friendly, too small or young, or not being interested in livestock on their own property. Some do not believe the dog could have attacked because the dog was not covered in blood when it returned home. However the absence of blood on a dog after an attack is not uncommon. Whether blood is found on a dog depends on how it attacked, whether the carcass was fed on and what the dog did after the attack. Many dogs will go to a creek or dam after an attack to drink, wash or cool down. Any blood on its coat is usually washed off. Sometimes traces of blood or wool may be found between the toes or teeth of dogs, or wool or bone may be passed in the faeces. Some dog owners who did not believe that their pets could attack livestock thought only wild dogs running in packs will attack and kill livestock. Popular articles in newspapers and magazines certainly convey this view and must share some responsibility for the entrenched belief in the community that friendly family pets are not responsible for the killing of livestock.

DOG OWNER ATTITUDES

Although most dog owners are aware of their legal responsibilities to control their dogs, many of these owners have properties too poorly fenced to prevent their dogs from wandering at large (VPCA 1983, Jennens 1992). Most of these dogs are freely able to leave their properties, often without their owner being aware that they have left. A few dog owners believe that they have a right to let their dog wander free for exercise, or allow it to wander because they feel it does no harm as they know where the dog wanders to. These people often oppose measures to control dogs in their locality. Even when dog owners are aware of their legal responsibilities and they know that their dog wanders, few choose to improve the control of the dog by fencing or restraint. Whilst adequate restraint of the dog is sufficient to prevent attacks on livestock, many dog owners choose instead to destroy the dog or relocate it, once it has attacked livestock. In the Perth study (Jennens 1992) many dogs involved in attacks on livestock were shot or baited by the livestock owner, destroyed later or relocated to another home in the city rather than being kept restrained or supervised on their property.

An owner's decision to destroy their dog was usually made to avoid prosecution or the payment of compensation or because they thought the dog could not be trusted again. Few owners made any attempt to build fences or a compound, or were prepared to provide adequate supervision of the dog in the future. Blame is usually attributed to the dog and any animal/human bond quickly breaks down after a dog is caught killing livestock. Dog owners often become angry at their pet's apparent savagery and once it became a problem were relieved to have the dog destroyed. Many such dogs were excellent pets in all other aspects and had been a member of the family for several years.

A survey of 337 livestock and dog owners in Perth found that many property owners permitted their dogs to wander unsupervised in close proximity to livestock. Most (87%) thought that their present dog(s) would not attack livestock because it was either too timid or friendly, or it did not get the opportunity to do so. However 53% of those surveyed said that they would have the dog destroyed if it did attack, whilst 47% indicated they would restrain the dog at home or relocate it into the city. An increased awareness by small holders of the likelihood that any dog will attack livestock, is one area that education programs need to address.

PREVENTION AND CONTROL THROUGH LEGISLATION

Whilst dogs play a significant role in the lives of people, they are often a problem to the community and as a result necessitate some controls (Beck 1975). Legislation aimed at containing dogs or destroying the dogs involved are the usual means of dealing with domestic dog attacks on livestock. Existing laws to control dogs have varying degrees of effectiveness in reducing dog attacks on livestock as many dogs are not located, or if located do not carry identification. Several studies have found that only a few dogs that have attacked livestock can be traced from details on registration discs on the dog (VPCA 1983, Coman and Robinson 1989, Jennens 1992). In Western Australia the Dog Act 1976, the Dog Regulations 1976 and Local Government Bylaws made under the Dog Act currently contain the rules for the registration, ownership and control of dogs. Dog attacks on livestock are included under Section 33D (1) of the Dog Act 1976, which states that "it is an offence for any dog to attack or chase any person, or any animal or bird owned by, or in the charge of another person, whether or not any injury is caused". A penalty is prescribed for the dog owner or the person in charge of the dog. Livestock owners are permitted to destroy or capture dogs attacking livestock, if the dog is observed in the act of harassing or killing livestock. However it is generally recognised that the control of domestic dogs attacking livestock cannot be achieved through legislation alone. Often the laws pertaining to the ownership, licensing, leashing and restraint of dogs are adequate but need to be enforced. Legislation is often not enforced because of insufficient manpower, funding or training, because the attacks occur outside the normal working hours of control officers or the officers having duties other than those associated with animal control.

Few dog owners are prosecuted when their dog attacks livestock. Often this is a result of a lack of evidence, but more often because livestock owners and witnesses refuse to go to court, the high cost of prosecution, or the dog is surrendered in lieu of prosecution. When court action is taken, penalties received by offenders are usually inadequate.

THE COST OF LIVESTOCK ATTACKS

To the livestock owner the cost of a dog attack is greater than just the cost of the animals killed. Additional costs include the non realised potential of the animals, a loss in production in the remaining animals, ewes aborting and mismothering their lambs and veterinary costs to treat injured animals. Costs are also incurred as labour and capital is diverted into measures to prevent further attacks. Fences need to be erected and maintained, and time is spent waiting for the dogs to return. Long term costs include the livestock owner being forced into activities less financially rewarding, no longer being able to carry livestock on their property, or not being able to use paddocks where livestock are frequently attacked (MMBW 1980, VPCA 1983). Others have to change to species, such as cattle or horses, that are less vulnerable to attacks (VPCA 1983), or go into activities not affected by predation such as cropping. Costs to the community include labour and financial expenditure by enforcement and control agencies and a potential risk of zoonotic diseases being transmitted from dogs to man by the wandering dogs. It is surprising then that when the dog is caught livestock owners do not usually receive compensation. This is sometimes because they don't seek it, but on other occasions because the dog owner refuses to pay any.

SOLUTIONS

Whilst there is probably no total solution to the problem of dog attacks on livestock other than physically separating livestock and dogs from each other, there is much that can be done to reduce the seriousness and frequency of attacks.

Local authorities must enforce fencing bylaws, provide sufficient resources to investigate the attacks and prosecute when appropriate; livestock owners on smallholdings must take better care of their livestock and actively seek penal and civil action against the dog owner; welfare groups must take more interest in issues that are of concern to them; and dog owners must restrain their dogs. If not dog attacks on livestock will continue to cost the community millions of dollars each year. At present there is minimal political, legal, economic or social pressure for dog owners to behave in any way other than irresponsibly. They are not fined, they rarely have to pay compensation and their problem dog is disposed of free of charge by the council. In addition the implementation of intensive education programs is required and these should be especially orientated towards identifying local and specific problems such as predation on livestock. At present many education programs do not provide information that may assist in reducing dog attacks on livestock.

Solutions must lie in changing the actions and attitudes of livestock and dog owners and others who are associated with the problem. Dogs and sheep are only behaving as dogs and sheep normally do and have always done. Trying to find answers in the mind of the dog, or simply catching and killing the dogs involved, will not bring about a long term reduction in the number of attacks.

REFERENCES

- American Humane Association 1974. *Predation and other problems caused by uncontrolled and feral companion animals*, The American Humane Association, pp1-35.
- Berman, M., Dunbar, L. 1983. *The social behaviour of free-ranging suburban dogs*, Applied Animal Ethology 10: 5-17.
- Blackshaw, J.K. 1991. *An overview of types of aggressive behaviour and methods of treatment*, Applied Animal Behaviour Science Vol 30: 351-361.
- Bogges, E.K., Henderson, F.R., Spaeth, C.W. 1980. *Managing predator problems: Practices for preventing and reducing livestock losses*, Co-operative Extension Service, Kansas State University. Manhattan, 19pp.
- Borchelt, P.L. 1983. *Aggressive behaviour of dogs kept as companion animals: classification and influence of sex, reproductive status and breed*, Applied Animal Ethology 10: 45-61.

Bowns, J.E. 1976. *Field criteria for predator damage*, Utah Science (March).

Coman, B.J. 1985. *Australian predators of livestock*, In S.M. Gaafar, W.E. Howard, R.E. Marsh, Eds., Parasites, Pests and Predators, Subseries B, World Animal Science Series, Elsevier Science Publishers, Amsterdam, Vol 2, pp 411-425.

Cloman, B., Robinson, J. 1989. *Some aspects of stray dog behaviour in an urban fringe area*, Australian Veterinary Journal Vol 66 (1): 30-32.

Daniels, T.J. 1983. *The social organisation of free-ranging urban dogs. II Estrus group and the mating system*, Applied Animal Ethology 10 (4): 365-373.

Fox, M.W. 1971. *Behaviour of wolves, dogs and related canids*, Harper and Row, New York.

Fox, M.W. 1971. *The dog: Its domestication and behaviour*, New York: Garland Press.

Hayes, S. 1993. *Barbaric: the steeljaw leghold trap*, Animals Today, Oct-Dec: 10.

Jennens G.W. 1992. Murdoch University Thesis (in print).

Melbourne and Metropolitan Board of Works 1980. *Study of dog problems in fringe farming areas of Melbourne*, Melbourne and Metropolitan Board of Works, Melbourne.

Mech, D. 1970. *The Wolf: Ecology and behaviour of an endangered species*, Natural History Press, New York.

Nesse, G.E., Longhurst, W.M., Howard, W.E. 1976. *Predation and the industry in California: 1972-1974*, Division of Agriculture Sciences, University of California, Bulletin 1978. 63p.

Robel, R.J., Dayton, A.D., Henderson, F.R., Meduna, R.L., Spaeth, C.L. 1981. *Relationship between husbandry methods and sheep losses to canine predators*, Journal of Wildlife Management 45 (4): 894-911.

Rowley, L. 1970. *Lamb predation in Australia: incidence, predisposing conditions and identification of wound*, CSIRO Wildlife Research Bulletin, 15: 79-123.

Roy, L.D., Dorrance, M.J. 1976. *Methods of investigating predation of domestic livestock: A manual for investigating officer*, Plant Industry Division, Alberta Agriculture, Edmonton. 54pp.

Schaefer, J.M., Andrews, R.D., Dinsmore, J.J. 1981. *An assessment of coyote and dog predation of sheep in Southern Iowa*, Journal For Wildlife Management 45 (4), 883-893.

Vertebrate Pest Control Authority 1983. *Damage to livestock caused by domestic dogs in Adelaide's urban fringe*, Department of Agriculture, South Australia, Technical Report No. 24, May 1983.

Wade, D.A. 1982. *Impacts, incidence and control of predation on livestock in the United States, with particular reference to predation to coyotes*, Council for Agriculture Science and Technology, Special publication 10, 22pp.

Wade, D.A. 1985. *Large mammal and bird predators of livestock in North America*, In S.M. Gaafar, W.E. Howard, R.E. Marsh, Eds. Parasites, Pests and Predators, Subseries B, World Animal Science Series; Elsevier Science Publishers, Amsterdam, Vol 2, pp 427-445.

ABOUT THE AUTHOR

Garth Jennens

AMREX

13 Kingsland Loop

CANNINGVALE WA 6255

Ph: 08 9455 6006

During the 1970s Garth fostered a growing interest in animal behaviour by studying Psychology and Zoology at Waikato University in Hamilton, New Zealand. With the Behaviour Unit at Ruakura Research Centre nearby he gained valuable research experience in the behaviour and welfare of domestic and companion animals. Doctoral studies into dog attacks on livestock at Murdoch University in Perth enabled him to research, develop and trial a number of strategies to reduce urban animal management problems. This has led to the development of the AMREX (Animal Management Resource Extension) Program. Currently Garth works privately as an Animal Behaviour and Management Consultant in Perth, and is a director of AMREX.

[UAM 98 Index Page](#)