

Regulation of domestic cat ownership to protect urban wildlife: a justification based on the precautionary principle

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ABSTRACT

While it is undeniable that both feral cats and owned domestic cats prey on native wildlife, evidence that this is a threat to the viability of wildlife populations is contentious, particularly in the suburbs. Where uncertainty is great or the risks are high, the precautionary principle is a guide as to whether or not action should be taken to regulate domestic cats. This involves an evaluation of the available evidence and the extent of uncertainty, as well as consideration of the viewpoints of major stakeholders. Applying this approach leads to the conclusion that wildlife can be protected while improving cat welfare. Containing cats at night not only separates cats and nocturnal wildlife, but minimises trauma from both cat fights and road accidents while reducing nuisance to neighbours from caterwauling and fighting. Desexed cats no longer contribute toward unwanted stray and feral cat populations that depredate native wildlife populations and are often less of a nuisance to neighbours and themselves as spraying and fighting are reduced. Cats with identification can be returned to their owners should they be found lost or injured, while problem cats can be identified. Therefore, the cat welfare issue is the key to a successful precautionary approach because it achieves wildlife protection while respecting the interests of cat owners.

Key words: Suburban wildlife, domestic cats, responsible cat ownership, cat regulation, precautionary principle

Introduction

The potential impact of owned domestic cats *Felis catus* on wildlife in suburbia and urban bushland remnants is a controversial and potentially divisive issue. Viewpoints abound in popular magazines and on the Internet (e.g., Hartwell 1994; Winter 1999; Archer 2000; American Bird Conservancy Group 2001; Feral Cat Coalition 2001; Mooney 2001-2002). Detailed Australian studies have described the range of prey taken by owned domestic cats, but quantifying predation rates and establishing compelling evidence that this predation suppresses prey populations is far more difficult (e.g., Trueman 1991; Paton 1991, 1993; Barratt 1994, 1995, 1997, 1998). Despite this uncertainty, increasing numbers of local councils throughout Australia are enacting cat control regulations (Kelly 1999) and some, but not all, state legislatures have implemented state-wide regulations (e.g., South Australia's Dog and Cat Management Act 1995 (<http://www.dogsncats.asn.au/act1995/act1995ab.htm>), Victoria's Domestic (Feral and Nuisance) Animals Act 1994 (http://www.dms.dpc.vic.gov.au/l2d/D/ACT00874/0_1.html), the New South Wales Companion Animals Act 1998 (http://www.austlii.edu.au/au/legis/nsw/consol_act/caa1998174/) and the Australian Capital Territory Domestic Animals Act 2000 (<http://www.legislation.act.gov.au/a/2000-86/default.asp>). We believe that wildlife biologists could and should contribute to the debate and to the type of regulations enacted. However, if such contributions are to be effective, they should operate within a framework that acknowledges both the need to protect the environment and the level of uncertainty in existing information, while also considering the views of all participants in the debate.

The precautionary principle provides an appropriate framework which is familiar to wildlife biologists from debates over the use of natural resources (e.g., Calver *et al.* 1999). It argues that:

'Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and, (ii) an assessment of the risk-weighted consequences of various options.' (The Intergovernmental Agreement on the Environment, May 1992, quoted in Deville and Harding 1997, p. 13).

The explicit recognition of the need for action despite uncertainty is appropriate to the cat-control debate. However, application of the precautionary principle is generally accepted as a consultative process (e.g., Kruger *et al.* 1997) in which specialist scientific opinion is only one voice (Santillo *et al.* 1998). Therefore wildlife biologists working within this framework would benefit from complementing their thorough understanding of what is known and unknown about the impacts of owned domestic cats on wildlife with an appreciation of the attitudes and practices of cat-owners, the concerns of citizens who do not own cats, the perspectives of veterinary professionals and the views of local government councillors and officers who have the power to enact and enforce cat control regulations.

In this paper we summarise both the current understanding of the potential impacts of owned domestic cats on suburban wildlife in Australia and the attitudes toward cat regulation expressed by major interest groups. We then integrate these elements into a precautionary framework arguing for regulation of cat ownership. Our perspective is predominantly Western Australian, as our state is among those yet to introduce uniform, state-wide legislation on this issue. However, the explicit acknowledgement of uncertainty and the incorporation of viewpoints from divergent groups into a precautionary approach will be applicable across Australia.

Predation by owned domestic cats in Australia

While we may have sympathy for individual animals that die, it is possible to take a substantial ongoing harvest of animals from a population and not cause any decline in numbers. It is perfectly possible that cats might simply take a sustained harvest of many native species without threatening their populations at all.

Bomford *et al.* (1995, p. 203)

Dietary studies confirm that feral cats eat Australian native fauna and abundant circumstantial and anecdotal

evidence suggests that they may suppress prey populations (see Dickman 1996; Calver and Dell 1998 and Risbey 2000 for full reviews). However, numerous authors have argued that demonstrating that feral cats prey on native species is not proof of an impact on prey populations and that experimental evidence from manipulation of predator densities is required (Bomford *et al.* 1995; Dickman 1996; Risbey *et al.* 1999). Recent field experiments demonstrating increases in native fauna following cat removal, failed fauna reintroductions in the presence of feral cats, and studies of mammalian extinctions on off-shore islands in either the presence or absence of feral cats, all strengthen the case for feral cats causing population declines in native fauna (e.g., Christensen and Burrows 1994; Risbey *et al.* 2000; Burbidge and Manly 2002). However, the evidence may not be strong enough to convince all critics.

Unfortunately, experimental manipulations of predator densities are harder to achieve in a suburban setting when the predator is a domestic pet. Cat curfews or the establishment of cat exclusion zones where cats cannot be owned do alter cat density in time or space, but we are unaware of any situation in which they have been implemented and monitored in conjunction with control areas where cats roam freely. This restricts interpretation to an uncontrolled before/after design. Therefore, studies

Table 1. Summary of the study methods and target populations of major Australian surveys of predation by owned cats or studies of the attitudes and practices of owners and non-owners towards owned cats in suburbia.

Study	Survey methods	Target population
Paton (1991 and 1993)	Questionnaire distributed through schools and natural history clubs. A sub-sample of respondents agreed to supply data on prey caught by their cats over a year.	Adelaide suburbs, South Australian country towns, rural South Australia
REARK (1994a)	Telephone survey of residents regarding the hunting behaviour of cats relative to owners' husbandry practices. Owners recalled predation histories over the past 12 months	Each capital city except Darwin
REARK (1994b)	As above, but target population restricted. More detailed data are presented than in the previous study	Sydney and Melbourne only
McHarg (1995), Headey (1999)	Telephone survey determining type and number of pets owned, as well as some questions of husbandry	Nationwide telephone survey
Barratt (1995), (1997), (1998)	Owners collecting remains of prey caught by their cats over a 12 month period	Canberra suburbs
Reid and Spiers (1995)	Door to door delivery and collection (or postal return) of a written questionnaire	All residents aged 16 and over on Magnetic Island, off Townsville, Queensland
Murray <i>et al.</i> (1999)	Postal or door to door delivery and collection of a written questionnaire	All residents aged 16 and over on Magnetic Island, off Townsville, Queensland
Perry (1999)	First study addressed cat hunting behaviour, owners' husbandry practices and likely compliance with cat regulations. Data collected door to door by council employees. Second study investigated methods for tagging cats and the effect of bells on hunting behaviour. Forms were completed at veterinary surgeries and a major pet retailer	Mt Isa (first study) and Brisbane (second study), Queensland
Grayson <i>et al.</i> (2002)	Postal survey assessing (i) cat-owners' husbandry practices, attitudes to proposed regulations, nuisances caused by roaming cats and perceptions of cat/ wildlife issues, (ii) non-owners' attitudes to proposed regulations, nuisances caused by roaming cats and perceptions of cat/ wildlife issues	Electoral district of Melville, Perth, Western Australia

of the putative impacts of owned cats on suburban wildlife are restricted mainly to surveys and uncontrolled manipulations. While these confirm that some owned cats do eat native wildlife, they do not resolve the issue of whether or not this impacts upon prey populations.

Surveys of predation by owned cats on wildlife in Australia are mostly less than a decade old, reflecting the recent surge of interest in this question (e.g., Trueman 1991; Paton 1991, 1993; REARK 1994a,b; McHarg *et al.* 1995; Barratt 1995, 1997, 1998; Perry 1999; Grayson *et al.* 2002). Barratt (1994); Ruxton *et al.* (2002) and Gillies and Clout (2003) reviewed the relevant international literature. Methods varied, including telephone polls of owners, owner self-assessment via forms completed in veterinary surgeries, mailed questionnaires and collection of all prey caught by the cat. Some studies were highly localised, focusing on a specific township or city, while others attempted nation-wide assessment (Table 1). Very few of the studies were peer-reviewed. Cat ownership was estimated nationally at between 25.2% of households (REARK 1994a) and 27% (McHarg *et al.* 1995), with 8% of owners having more than one cat (Perry 1999). Although differences in residential zoning mean that the actual density of cats implied by these figures will vary according to housing density, Paton (1991) estimated the density of owned cats in suburbia at c. 2/ha. This is markedly greater than the densities of 0.003-0.01/ha known for feral populations (Paton 1991; Risbey 2000). The overall trend of cat ownership over time was in decline (REARK 1994a,b; McHarg *et al.* 1995; Perry 1999; Kelly 1999; Baldock *et al.* 2003).

The telephone or paper surveys found that approximately half of all pet cats hunted, ranging from 49% in Mt Isa, Queensland (Perry 1999), to 56% nationally (REARK 1994a). In the warm Queensland climate at Mt Isa and Brisbane, lizards were the most common prey, followed by birds and then mammals (Perry 1999). Elsewhere in Australia, mammals and birds predominated as prey, followed by lizards. The mammals and birds taken were mainly introduced species such as house mice *Mus domesticus*, starlings *Sturnus vulgaris* and sparrows *Passer domesticus* (REARK 1994a; Perry 1999). While owners did not identify the lizard species taken, they presumably were native species.

Where owners collected the prey killed by their cats, similar or higher proportions of hunting cats were noted, prey species were identified more accurately, mean predation rates were estimated and demographics of hunting cats were noted. In Paton's (1991) study, 50 to 60% of cats caught birds or mammals and c. 30% caught lizards. On average, cats caught eight birds, 16 mammals and eight reptiles each/year. However, the range was broad and cats in country towns and rural areas caught up to twice the number of prey/year than cats in large cities. Native species comprised a large proportion of the prey (e.g., only 9 of the 76 bird species caught were introduced), although this was probably influenced by the inclusion of rural cats in the sample. Barratt's (1995, 1997, 1998) study concentrated on suburban Canberra. In a given year, 70% of the cats caught less than 10 prey animals and 6% of the

cats caught greater than 50 prey animals. The estimated mean predation rate was 10.2 prey items per cat per year, considerably less than the rate of 23.3 prey items per cat per year estimated by owners before the study started. Prey species comprised 64% introduced mammals, 27% birds (approximately half of which were native species) and 7% lizards. Native mammals comprised only 1% of prey. Hunting declined with age, but there was no evidence that the age a cat was neutered, its sex or its breed influenced hunting behaviour. Night time curfews on cats were recommended to reduce predation on mammals, but they were unlikely to protect diurnal birds or lizards. However, these figures do not indicate any impact of cat predation on prey population numbers because there was no quantitative assessment of the prey populations.

A before/after study, albeit uncontrolled, was provided when the municipality of Sherbrooke in Victoria responded to pressure for over four years from groups concerned about dwindling lyrebird *Menura novaehollandiae* numbers in Sherbrooke Forest. The council implemented cat registration by marking animals with microchips inserted under the skin, offered a reduction in registration fees for desexed animals and instigated controls on pet movement and a night-time curfew (Anderson 1994). Opposition groups argued that the regulations violated the rights of cat-owners and their pets, and were also inhumane (Hartwell 1994), so council officers used education campaigns to change the perception of the community to cat legislation. The actions appeared successful as the lyrebird population recovered and there was a decrease in the number of lyrebirds brought in with cat related injuries. However, attacks on diurnal native birds increased markedly, presumably because cats hunted by day rather than by night (Pergl 1994).

Overall, it is evident that owned cats do kill a range of suburban wildlife, including some native mammals, birds and lizards. The proportions of native species taken increases on suburban fringes adjacent to bushland and in rural areas (Paton 1991; Barratt 1997, 1998). The dense cat populations sustained in suburbs by human support may also lead to high predation rates. However, there is no conclusive evidence of suppression of populations of any native species in suburbia as a result of cat predation and accurate estimates of predation rates are difficult (Barratt 1998).

Based on this information, several authors take the view that the impact of owned domestic cats on urban wildlife is overstated: few cats hunt often and their impact is likely to be small relative to losses caused by other factors such as land clearing and road mortality. Furthermore, there is no compelling evidence that wildlife populations are endangered by predation by owned domestic cats. Although wildlife losses can and should be minimised, pets should not be demonised (e.g., Natrass 1992; REARK 1994a; Perry 1999; Chaseling 2001). The position was summarised succinctly by Chaseling (2001):

In Australia it seems cats have been painted as environmental vandals and their popularity as pets has suffered as a consequence. Whilst it is true that some household cats do kill wildlife, by far the biggest threat to native animals is habitat destruction by humans.

On the whole, well-managed, responsibly owned cats present little threat to native animals. Most domestically owned cats live in highly modified environments and it would be hard to differentiate their impact from the impact of introduced species and habitat change. In environmentally sensitive areas, both cats and wildlife can and should be managed to reduce predation.

We respect that view, but prefer to emphasise that uncertainty as to whether or not cat predation poses a serious risk to remnant wildlife populations in suburbia is no reason for inaction until the question is resolved. Therefore, it is appropriate to invoke the precautionary principle, which argues that where either risk or uncertainty are high, action should be taken to anticipate possible environmental damage (Deville and Harding 1997). Such action could include incentives to neuter pets to reduce the possibility of strays, restricting the number of cats that can be kept by one household to limit cat densities, requiring identification and licensing of cats so nuisance animals can be traced, confining cats to owners' premises at all times or at least at night to lessen the exposure of potential prey and prohibiting cat ownership in environmentally sensitive areas. The need for such measures is greatest on suburban fringes and adjacent to bushland remnants, where opportunities for attacks on native species are greatest (Barratt 1998).

However, gaining community acceptance of cat regulation on the basis of wildlife welfare alone is challenging, given the lack of convincing data. This suggests that arguments beyond the suspicion of impacts on wildlife are necessary if regulation is to attract widespread support. Such arguments come from the attitudes and practices of other stakeholders in the debate.

Attitudes and practices of cat owners

When there was room on the ledge outside of the pots and boxes for a cat, the cat was there – in sunny weather – stretched at full length, asleep and blissful,

with her furry belly to the sun and a paw curved over her nose. Then that house was complete, and its contentment and peace were made manifest to the world by this symbol, whose testimony is infallible. A home without a cat – and a well-fed, well-petted and properly revered cat – may be a perfect home, perhaps, but how can it prove title?

Twain (1964, pp. 21-22)

Cat ownership confers significant health benefits including lower blood pressure and reduced incidence of heart attack and stroke (Anderson *et al.* 1992; Jackson 1999). Pet ownership is used to teach children responsibility, respect and compassion (Murray and Penridge 1997), while children who grow up with pets appear to develop fewer allergies to cats and dogs than those who do not grow up with pets in their household (Roost *et al.* 1999). Several authors estimate significant economic benefits to society as well. In 1995 it was estimated that \$2.2 billion was spent on pet care in Australia and over 30,000 people were employed in the pet food industry, veterinary services and manufacture of associated pet products (Murray and Penridge 1997). Mangosi (1999) estimated that Australians spent \$365 million on cat care alone in 1998, with approximately 41% of this being veterinary bills. Headey (1999) estimated that cat and dog ownership saved the Australian health budget \$988 million in the 1994-95 financial year. Therefore, many people have significant practical, emotional and financial reasons for defending cats.

What constitutes responsible cat ownership and are Australian cat-owners responsible? For some authors, the incidence of sterilisation is a simple yardstick which shows that Australian cat-owners are, on the whole, responsible (see Perry 1999; Chaseling 2001 and Grayson *et al.* 2002 for use of this approach). However, results of an internet search for 'responsible cat ownership' using the Google search engine on April 28th 2003 indicate a much broader range of criteria for responsibility (Table 2). In total, 651 sites were identified, of which we considered the first 60 listed. Twelve criteria of responsible ownership were recognised from these sites, with sterilisation,

Table 2. Results of an internet survey for sites describing 'responsible cat ownership'. The numbers indicate the total number of sites which mentioned each criterion of cat ownership.

Criteria for responsible ownership	Australian sites	Other sites
Total confinement on owner's land	6	7
Containment at night only	12	5
Sterilisation	15	12
Vaccination	6	6
Worming	2	4
Feeding	3	3
Not feeding strays	1	1
Not declawing the cat	0	1
Identifying/registering the cat	12	7
Housing the cat correctly	2	5
Placing a bell on the cat's collar	3	2
Arranging care when on holiday	3	3
Total sites visited	33	27

identification/registration and confining cats between dusk and dawn being the three most mentioned for the Australian sites. Internationally, sterilisation, identification/registration and total confinement (the cat always being inside the home or within an outdoor enclosure) were the three criteria mentioned most often.

With regard to sterilisation, Australian cat-owners appear highly responsible. Perry (1999) found that 83% of pet cats were sterilised before they were a year old, 93% were sterilised by the age of five years and few owners permitted a cat more than one litter. These figures agree closely with estimates of desexing in other surveys (88% of all cats and 94% of cats older than one year in REARK 1994a, 90% of all cats in McHarg 1995 *et al.* and 93% of all cats in Murray *et al.* 1999). Grayson *et al.* (2002) reported 85% agreement by cat-owners with the statement: 'Excluding cats owned by licensed breeders, all pet cats should be desexed.' These desexing rates are considerably higher than that of 78% reported for the United States by the American Bird Conservancy Group (1997).

Australian cat-owners also show strong agreement with provisions to identify or register cats, although actual compliance may be lower. Grayson *et al.* (2002) reported that 93% of female cat-owners and 82% of male cat-owners surveyed in Perth, Western Australia agreed that they would licence their cat with the local council if it became compulsory. Similarly, Murray *et al.* (1999) found that 96.3% of residents on Magnetic Island off the Queensland coast were in favour of identifying and registering cats, although this figure includes non-owner responses as well. Despite these reports, data on actual registration of animals when legally required suggests a lower acceptance. Pert (2001) noted that approximately 500,000 dogs and cats were microchipped for identification under the New South Wales Companion Animals Act 1998, but only 200,000 dogs and cats were registered with local councils. Similarly, Scheele (2001) noted that mandatory cat registration in Manningham City Council (Victoria) was taken up by only 15% of households, well beneath the estimated 26% of households owning a cat. These figures may suggest a reluctance to register a pet cat, or alternatively a misconception by owners that an identified cat is automatically a registered cat.

Australian cat-owners also appear less responsible when it comes to containing their cats. McHarg *et al.*'s (1995) nation-wide telephone survey found that only 6% of owners kept their cats solely indoors, although 50% of owners claimed their cats lived primarily indoors and 61% kept their cats inside at night. The similar REARK (1994a) survey found that 39% of cats were contained at night and that 79% of all cats were believed not to roam away from their home during the day. However, there were marked variations in these figures from city to city. REARK (1994b) concentrated specifically on Sydney and Melbourne, where between 17% and 45% of cats were contained securely at night, depending on the suburb. Perry (1999) found that only total confinement prevented hunting although REARK (1994a,b) confirmed that those cats that stayed close to home hunted less. The Australian Veterinary Association (Media release October 18, 1996, [http://](http://www.ava.com.au/content/press/cat.htm)

www.ava.com.au/content/press/cat.htm) estimated that 50% of owners confined their cats at night and argued that this figure indicated high responsibility. Despite this opinion, the overall incidence of confinement is markedly lower than the proportion of cats sterilised.

Moreover, it is important to note that many cat owners question the value of wildlife protection measures, seeing confinement primarily as a cat welfare measure reducing the risk of fighting, theft and road accidents. In Western Australia, Grayson *et al.* (2002) found that 86% of cat owners agreed that cats in nature reserves were detrimental to wildlife, but only 50% of cat owners agreed that cat predation was a significant factor for suburban wildlife. Grayson *et al.* (2002) also sought opinions on the proposition that local councils should have the power to prohibit cat ownership in new subdivisions. Cat-owners registered only 17% agreement. If such attitudes are reflected nationally, then cat owners are unconvinced that their pets are a menace to suburban wildlife although they do concede the value of confinement in protecting cats from injury. They are also strongly opposed to the imposition of cat exclusion zones.

Attitudes of the non-cat owning public

Dear Tarpey Neighbour,

Is your cat missing?

Was he the fuzzy black and white one that used to come over my fence and fight with that big orange striped one under my bedroom window at two in the morning? Or was he the young sleek one that liked to whiz in the flower bed near my front door and then move on to the backyard to make his pile in my kid's sandbox?

I'm familiar with all these creatures and know where they went. After several seasons of enduring these invasions and mid-nocturnal awakenings by uncontrolled pets, I phoned the SPCA and was advised that I could rent a live trap from them, catch the offending beasts, and bring them in to their facility.

The trap was baited with a generous portion of healthy food, possibly better stuff than they got at home, so that they would be well nourished and content for the ride to their new home at the SPCA impoundment. The nice folks at the SPCA said that I was well within the law to trap them live and humanely, and that they'd take good care of them for a few days until their owners came for them. If the owners didn't come within a few days, since the SPCA has limited space, that the cats would have to go to - well - go to that big litter box in the sky.

So, that may be where your missing cat is, or was. (I wonder if there's a big enough trap for that brown tail-less dog that drops his messages in my front yard?)

Name withheld by request

Letter to the Editor, reproduced on http://www.purrrfectangels.org/responsible_cat_ownership.html

Some of the surveys of community attitudes towards cat ownership and husbandry considered the views of non-owners as well as owners and found varying degrees of concern about the nuisance caused by roaming cats or their possible impact on suburban wildlife. In Queensland, 71% of cat-owners and 66% of non-owners reported roaming cats as a problem (Perry 1999), while in McHarg *et al.*'s (1995) stratified national survey, 22% of respondents (cat ownership status not indicated) complained that unwanted cats were constantly or frequently on their property. Local council officers also reported numerous complaints regarding roaming cats after the passing of the *Domestic (Feral and Nuisance) Animals Act 1994* in Victoria (e.g., Baker 2001). In Perth, Western Australia, 74% of non-owners agreed that cats were a menace to wildlife in the suburbs (Grayson *et al.* 2002).

In Grayson *et al.*'s (2002) study, non-owners were also emphatic about what they wanted done to resolve the issues of nuisance and wildlife protection. They advocated compulsory sterilisation of all cats not owned by licensed breeders (86% support) and confining cats to their owners' properties (87% support). The exact opinions of non-owners are more difficult to identify in other studies which targeted whole communities rather than non-owners specifically. However, high support for compulsory identification of pet cats and also for sterilisation of cats excepting those owned by licensed breeders is noted (e.g., 96% and 93% respectively in Murray *et al.* 1999). Importantly, Grayson *et al.* (2002) found that only 48% of non-owners agreed that local councils should have the power to prohibit cat ownership in environmentally sensitive areas, perhaps feeling that such a move contravenes basic civil liberties. However, some councils in Victoria have implemented such measures successfully (e.g., Moore 2001, Buttris 2001). In the latter case, a key element in success was imposing a cat exclusion regulation before a new sub-division was developed.

Overall, non-owners support such measures as identification, sterilisation, confining cats at night and restricting cats to their owners' properties, which could reduce predation on wildlife. However, they show only lukewarm support for cat exclusion zones unless these are implemented before an area is developed.

The veterinarians' perspective

All companion animals cause community problems – dogs bark, parrots screech – but both provide companionship whose value outweighs the problems they cause. Cats are particularly misunderstood and often cat owners feel guilt for the sins of their much loved couch potato's feral counterpart. It is important that the benefits of responsible cat ownership be acknowledged and that strategies are put in place to educate owners on the value of early desexing, confinement and correct identification.

Perry (1999)

Veterinarians deal with cats and their owners daily and, in some cases, also treat wildlife victims of cat attacks. They therefore have first hand experience of the significance

of cat ownership for people, the welfare problems such as fighting and road accident trauma associated with roaming cats and the extent of attacks on wildlife. Treating cats is also a substantial component of many veterinarians' practices. However, we are unaware of any specific survey of the attitudes of veterinarians to cat regulations or of the advice they give owners on husbandry in relation to wildlife issues. A limited but possibly unrepresentative assessment can be made by considering available publications on the topic by veterinarians, media releases by the Australian Veterinary Association and debates in the letters pages of the *Australian Veterinary Journal*.

Recent publications by veterinarians on the issue of cats and wildlife argued that most cat-owners are responsible, highlighting statistics such as the high rates of identifying and desexing pet cats in Australia, the small number of households owning more than one cat and the preponderance of introduced vermin in the prey of owned cats (e.g., Perry 1999; Fougere 2000). Veterinarians also encouraged clients to sterilise animals early, with 78% of the Sydney practices surveyed by McGreevy *et al.* (2002) answering negatively to the question: 'Would you delay desexing of selected clients' cats until after a litter has been produced and assist with rehoming?' However, in the same survey only 26% of respondents answered negatively to the question: 'Would you maintain a register of local entire toms (in Clinic or with selected clients) for breeding if a client wanted to breed their female cat?'

The Australian Veterinary Association (AVA) was also quick to defend cat ownership against extreme suggestions that cats should be eradicated from Australia. Their media release on the topic emphasised the companionship and health benefits of cat ownership, the low likelihood of owned domestic cats threatening endangered populations of native species, the high responsibility of Australian cat owners as indicated by sterilisation and confinement statistics and the roles of educating owners and controlling feral cats in preventing problems (Media release October 18, 1996, <http://www.ava.com.au/content/press/cat.htm>). Other media releases by the AVA sought to improve the measures for compulsory identification of pet cats under the Companion Animals Act 1998 (NSW) (Media Release July 23, 1998, <http://www.ava.com.au/content/press/980723b.htm>, Media Release June 8, 1999, <http://www.ava.com.au/content/press/990608.htm>). The AVA also praised the general intent of the *Companion Animals Act 1998* (NSW), although arguing that the implementation of compulsory identification needed reform (Anonymous 1999).

Veterinarians' views were also expressed in the letters pages of the *Australian Veterinary Journal* in 1999, in response to the *Companion Animals Act 1998* (NSW). Five correspondents supported the identification provisions of the Act, but found major problems with the implementation (e.g., McPartland 1999). Another expressed concern that problems with identification and costs of retrieving animals from shelters was actually increasing the number of impounded animals destroyed (Rogers 1999). Lastly, Shirley (1999) advocated declawing cats to protect wildlife and prevent furniture damage, but the point was contested strongly on cat welfare grounds by Stokes (1999).

Could regulation of cat ownership reduce the popularity of cats as pets, or otherwise change the proportion of cat-related business in veterinary surgeries? Following the introduction of a cat curfew in the Sherbrooke municipality, the local veterinarian's subjective impression was that fewer cats were presented with fighting injuries or road accident injuries (Pergl 1994). Perry (1999) also expressed concern about the decline in cat ownership in Australia, a view shared by some non-veterinary authors (REARK 1994a; Chaseling 2001). Baldock *et al.* (2003) confirmed the decline recently, citing survey evidence that this may be caused by a dislike of cats or because of the concern about the impacts of cats on wildlife. They found that cats were not being replaced regardless of the demographic of the household. Whatever the reasons, the decline contrasts with the increased popularity of pet cats in the United States and the United Kingdom (American Bird Conservancy Group 1997; Chaseling 2001; Baldock *et al.* 2003).

The decline in cat numbers may be reflected in a fall in cat-related clinical work in some Australian veterinary practices (McGreevy *et al.* 2002). Their data for Sydney practices in the years 1996 – 2000 indicated that cat related activities declined for approximately 20% of practices, increased for 20% of practices and remained the same in others compared to the previous five years. Nevertheless, the authors concluded that the majority of practices surveyed promoted cat ownership.

Overall, the sources consulted show that veterinarians recognise that owned domestic cats do attack wildlife in the suburbs, but at least some argue that available data indicate that impacts of this predation are probably exaggerated. Cat welfare issues may therefore be paramount for veterinarians when advising their clients, although specific surveys of veterinarians are needed to confirm this opinion. Nevertheless, veterinarians offer strong support for measures such as confinement, identification and sterilisation as issues of cat welfare and these also provide some wildlife protection. They also have legitimate concerns over the possible impact of regulations on their businesses.

Views of local government officers

In a subject such as cat legislation lobby groups can be so loud it becomes difficult to hear what the average Joe Blow really wants. The cat provisions of the Dog and Cat Management Act 1995 were an honest attempt to define and regulate the views of ordinary people in a manner that provides the flexibility for local government to manage cats in accordance with the wishes of their local communities. Now, four years down the track, it is still 'enabling' legislation and is still criticised as being draconian and wishy-washy. On this basis, we probably got it about right for the South Australian community today. If public attitudes change then it is imperative that the legislation be amended accordingly.

Kelly (1999)

Initial steps to regulate cat ownership in Australia were taken by local councils (e.g., Anderson 1994, Pergl 1994). Several state legislatures have followed their lead by enacting bills to regulate cat ownership (Penson 1995,

Kelly 1999). These include South Australia's Dog and Cat Management Act 1995, Victoria's *Domestic (Feral and Nuisance) Animals Act 1994*, the New South Wales *Companion Animals Act 1998* and the Australian Capital Territory *Domestic Animals Act 2000*. With no implied order of priority, all share concerns for predation on wildlife, transmission of disease to wildlife and humans, cat welfare, nuisance caused by roaming cats and the social and economic importance of cats as pets. All Acts include provision for identification of cats, action against nuisance animals and, with the exception of the South Australian legislation and ACT legislation, compulsory registration of cats with discounts for neutered animals. The ACT legislation also requires the desexing of all cats born after 21 June 2001 unless the owner has a permit to keep the animal sexually entire. Local municipalities are required to implement the Acts and have the option to enforce more stringent regulations within their jurisdictions. Kelly (1999) overviews the arguments for and against regulation in regard to these and other contentious issues.

Given the recent implementation of regulation, there has been little opportunity to assess the community attitudes and compliance to the new laws, highlighting areas that need more attention via community education to make the new legislation successful. However, Kelly (1999) reported that South Australia's *Dog and Cat Management Act* was well received and the Magnetic Island council resurveyed the opinions of the community as to the effectiveness of new cat and dog legislation (Murray *et al.* 1999). Their follow-up survey, 14 months after the introduction of the legislation, found that the implementation of a 'pet management plan' did not discourage members of the community from owning pets. Furthermore, the attitudes of Magnetic Island residents to the cat management plan did not alter significantly. Residents supported all points of the plan including limiting the number of cats to two/household; desexing pet cats; identifying owned cats and confining cats at night (Murray *et al.* 1999).

Pergl (1994) described the experiences of Sherbrooke Council in detail. He believed that the council's Animal Welfare Local Law focused residents' attention on the needs of both wildlife and pets, with both being valued. It was workable and the provisions for cat identification and registration, exclusion from some public areas and a night-time curfew led to a reduced incidence of cat injuries as well as declines in a range of wildlife (but not diurnal birds) being presented with injuries from cat attacks. Other councils in Victoria report success with specific measures including complete confinement of cats to owners' premises (Baker 2001), prohibiting cat ownership in new sub-divisions before owners move in (Buttriss 2001) and declaring nature conservation areas where free-roaming cats will be impounded (Moore 2001).

However, because the issue of enforcement of regulations lies with local government it must carry the cost and resolve any issues confronting officials in their duties (see Pert 2001 for a discussion of these issues in relation to the *Companion Animals Act 1998*, NSW). These are important topics, because half-hearted enforcement by local councils may undermine the value of any regulations.

Integrating perspectives in a precautionary approach

Justification for a precautionary approach

The precautionary principle applies in situations where risk is suspected but is to a greater or lesser extent unknown. This is distinct from 'prevention' which is appropriate where the risk is accepted and well-known and the objective is to minimise or eliminate it (Deville and Harding 1997). Thus application of the precautionary principle requires a reasonable supposition of risk but uncertainty about its magnitude.

The conservation value of remnant urban bushland includes possible conservation of rare species, maintenance of representative biotic communities and preservation of an on-going resource for migratory species (How and Dell 2000 and included references). All these values might be disrupted by cat predation. With regard to uncertainty, Barratt (1998) highlighted the few published studies of predation by owned domestic cats, the wide variability in both the incidence of hunting by different cats and in estimations of total predation rates, and the lack of definitive population studies to demonstrate any declines in abundance in response to cat predation. Overall, the combination of significant risk and high uncertainty justify precautionary action. However, the possibility of significant impacts will vary with suburb, with the risk greatest in suburbs close to bushland remnants or on the fringes of suburbia (e.g., Barratt 1998). Therefore these areas should require the highest levels of precaution and it may be appropriate to have differing precautionary standards in different suburbs (e.g., Moore 2001).

Applying precautionary measures

Cat welfare issues appear to be the key to the successful implementation of cat control regulations that implement a precautionary approach to protection of urban wildlife from cat predation. A welfare emphasis appeals to a very broad section of the interested public as well as to veterinarians, while almost all measures proposed to protect wildlife also have a cat welfare benefit (e.g., Kelly 1999; Perry 1999; Fougere 2000; Chaseling 2001). Regulations to enforce registration/identification, desexing, and a maximum number of cats per property have general acceptance and are already widely practised by cat owners (REARK 1994a,b, McHarg *et al.* 1995, Kelly 1999, Murray *et al.* 1999, Grayson *et al.* 2002). However, confinement of cats at night and restriction of cats to their owners' properties are less popular measures for cat owners, who currently are far less likely to do this than to sterilise or tag their pets (REARK 1994a,b, McHarg *et al.* 1995, Grayson *et al.* 2002). Wider acceptance might be gained by appealing to the benefits of these measures for cat welfare and reducing the incidence of nuisance, following the example of Sherbrooke Council (Pergl 1994). However, cat exclusion zones were extremely contentious in Perth, Western Australia (Grayson *et al.* 2002) and these attitudes may be reflected elsewhere. Exclusion zones confer no benefits to cat welfare beyond restricting roaming and have only moderate support from

non-owners (Grayson *et al.* 2002). Including provision for cat exclusion zones in cat control regulations will require a sensitive education campaign.

Further research to reduce uncertainty

As more municipalities move to enact cat regulations, there may be opportunities for treating these as experimental manipulations to determine any benefits arising for wildlife (Tidemann 1994). This is analogous to the 'adaptive management' approaches already practised or called for in wildlife management (e.g., Norton and May 1994). Studies could involve before/after designs, in which wildlife numbers were monitored in multiple municipalities before implementation of cat control regulations in some of them, with others remaining as controls. Further monitoring would continue in all areas post-implementation to determine any impact of the regulations on wildlife populations. Data from such experiments would provide stronger evidence for or against the impact of owned cats on suburban wildlife. Some surprising results might also arise if rat or raven populations increased in the presence of cat curfews, increasing predation on bird eggs and nestlings (see Courchamp *et al.* 1999 for a case study involving feral cats on islands and Barratt 1998 for consideration of this hypothesis in relation to cats in suburbia). Van Dyck's (2001-2002) hypothesis that *Antechinus* spp. would co-exist happily in Australian suburbia in the absence of cats could also be tested. It will also be valuable to focus explicitly on the potential impact of cat predation on lizards in suburbia, rather than the prevailing emphasis on mammals and birds. Many lizards are small enough in size and have sufficiently limited ranges for impact studies to be designed and implemented at small spatial scales.

Given the current reluctance of cat owners to adopt total confinement, it may also be valuable to examine ways of reducing cats' inclination to hunt and the success of hunts. Barratt (1998) highlighted the considerable variability in hunting behaviour of individual cats, which is largely unexplained. Controlled behavioural and breeding studies of the influence of rearing on hunting behaviour may suggest husbandry approaches that can reduce hunting tendencies. The controversy over the efficacy of attaching bells to a cat's collar in reducing predation might also be resolved by careful experimental studies (see Paton 1991, 1993; REARK 1994a; American Bird Conservancy Group 1997 and Ruxton *et al.* 2002 for relevant observations and studies).

Lastly, the studies to date on the attitudes of people towards cat control and wildlife protection have not targeted the key groups of veterinarians and local government officials. Veterinarians are important because they are in frequent contact with cat-owners and may have considerable influence over their attitudes and behaviour. They also have legitimate concerns for the possible impact of regulations on their business. Local government officials are also critical as they often have considerable freedom to design, implement and enforce regulations, while possibly being responsible for community education campaigns. They also have basic responsibilities under some state legislation. Together, these two groups can have a significant influence on compliance with regulations so their attitudes and practices are worthy of specific study.

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References

- American Bird Conservancy Group, 1997.** Human attitudes and behavior regarding cats. <http://www.abcbirds.org/index.htm>
- American Bird Conservancy Group, 2001.** Cats indoors! The campaign for safer birds and cats. <http://www.abcbirds.org/cats/catsindoors.htm>
- Anderson, A.P., Reid, C.M. and Jennings, G.L., 1992.** Is pet ownership good for your heart? The results of a survey of risk factors for cardiovascular disease in Melbourne, Australia. Proceedings of the 1st Urban Animal Management Conference, Brisbane. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Anderson, I., 1994.** Should the cat take the rap? *New Scientist* (21 May): 13-14.
- Anonymous, 1999.** NSW Companion Animals Act. *Australian Veterinary Journal* 77: 424.
- Archer, M., 2000.** Monstrous moggies or charming chuditches? *Nature Australia* 26(8): 70-71.
- Baker, D., 2001.** Cat curfew - Casey City Council. Proceedings of the 10th Urban Animal Management Conference, Brisbane. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Baldock, F.C., Alexander, L. and More, S.J., 2003.** Estimated and predicted changes to the cat population of Australian households from 1979 to 2005. *Australian Veterinary Journal* 81: 289-292.
- Barratt, D.G., 1994.** Using theory and scientific experience to assess the impact of house-based domestic cats *Felis catus* (L) on prey populations and prey community structure. 3rd Urban Animal Management Conference. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Barratt, D.G., 1995.** Ecological impact of domestic cats. Pp. 181-187 in *People and nature conservation: perspectives on private land use and endangered species recovery*, edited by A. Bennett, G. Backhouse and T. Clark. Royal Zoological Society of New South Wales, Mosman, NSW.
- Barratt, D. G., 1997.** Predation by house cats *Felis catus* (L) in Canberra, Australia. I. Prey composition and preference. *Wildlife Research* 24: 263-277.
- Barratt, D. G., 1998.** Predation by house cats *Felis catus* (L) in Canberra, Australia. II. Factors affecting the amount of prey caught and estimates of the impact on wildlife. *Wildlife Research* 25: 475-487.
- Bomford, M., Newsome, A., and O'Brien, P., 1995.** Solutions to feral animal problems: ecological and economic principles. Pp. 202-09 in *Conserving Biodiversity: Threats and Solutions*, edited by R.A. Bradstock, T.D. Auld, D.A. Keith, R.T. Kingsford, D. Lunney, and D.P. Sivertsen. Surrey Beatty & Sons: Chipping Norton, NSW.
- Burbidge, A. A. and Manly, B. F. J., 2002.** Mammal extinctions on Australian islands: causes and conservation implications. *Journal of Biogeography* 29: 465-473.
- Buttriss, R., 2001.** No cat zone – City of Kingston. Proceedings of the 10th Urban Animal Management Conference, Brisbane. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Calver, M. C. and Dell, J., 1998.** Conservation status of mammals and birds in south-western Australian forests. I. Is there evidence of direct links between forestry practices and species decline and extinction? *Pacific Conservation Biology* 4: 296-314.
- Calver, M. C., Bradley, J. S. and Wright, I. W., 1999.** Towards scientific contributions in applying the precautionary principle: an example from Western Australia. *Pacific Conservation Biology* 5: 63-72.
- Chaseling, S., 2001.** Pet populations in Australia. Dogs increasing and cats decreasing - why is it so? 10th Urban Animal Management Conference, Melbourne. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Christensen, P. and Burrows, N., 1994.** Project Desert Dreaming: experimental reintroduction of mammals to the Gibson Desert, Western Australia. Pp. 199-207 in *Reintroduction biology of Australian and New Zealand fauna*, edited by M. Serena. Surrey Beatty and Sons, Chipping Norton, New South Wales.
- Courchamp, F., Langlais, M. and Sugihara, G., 1999.** Cats protecting birds: modelling the mesopredator release effect. *Journal of Animal Ecology* 68: 282-292.
- Deville, A. and Harding, R. (eds), 1997.** *Applying the Precautionary Principle*. The Federation Press, Sydney, New South Wales.
- Dickman, C. R., 1996.** *Overview of the Impact of Feral Cats on the Australian Native Fauna*. Australian Nature Conservation Agency, Canberra.
- Feral Cat Coalition, 2001.** <http://www.feralcat.com/>
- Fougere, B., 2000.** Cats and wildlife in the urban environment - a review. 9th Urban Animal Management Conference, Hobart. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Gillies, C. and Clout, M., 2003.** The prey of domestic cats (*Felis catus*) in two suburbs of Auckland City, New Zealand. *Journal of Zoology (London)* 259: 309-315.
- Grayson, J., Calver, M.C. and Styles, I., 2002.** Suburban West Australians support most aspects of cat control legislation. *Australian Veterinary Journal* 80: 536-543.
- Hartwell, S., 1994.** The great Australian cat dilemma. <http://www.feralcat.com/sarah1.html> Accessed 18/12/01.
- Headey, B., 1999.** Health benefits and health cost savings due to pets: Preliminary estimates from an Australian national survey. *Social Indicators Research* 47: 233-243.
- How, R. A. and Dell, J., 2000.** Ground vertebrate fauna of Perth's vegetation remnants: impact of 170 years of urbanization. *Pacific Conservation Biology* 6: 198-217.
- Jackson, V., 1999.** Making sure there is room for pets in our society in the next millennium - providing for, not preventing, pet access. 8th Urban Animal Management Conference, Gold Coast. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Kelly, D., 1999.** The power of the retrospective - cat legislation: what precisely did we learn in South Australia? 8th Urban Animal Management Conference, Gold Coast. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>

- Kruger, F. J., van Wilgen, B. W., Weaver, A. v. B. and Greyling, T., 1997.** Sustainable development and the environment: lessons from the St Lucia environmental impact assessment. *South African Journal of Science* **93**: 23-33.
- Mangosi, S., 1999.** *Contributions of the Pet Care Industry to the Australian Economy*. BIS Shrapnel Global Marketing Intelligence and Forecasting: Melbourne.
- McGreevy, P.D., Fougere, B., Collins, H., Bartimote, K.M. and Thomson, P.C., 2002.** Effect of declining owned-cat population on veterinary practices in Sydney. *Australian Veterinary Journal* **80**: 739-745.
- McHarg, M., Baldock, C., Headey, B. and Robinson, A., 1995.** National people and pets survey. Urban Animal Management Coalition. http://www.petnet.com.au/People_and_Pets/52UAMR.HTML
- McPartland, B., 1999.** Microchipping – why worry? *Australian Veterinary Journal* **77**: 762.
- Mooney, N., 2001-2002.** Native pets: an unnatural disaster. *Nature Australia* **26**(8): 84.
- Moore, S., 2001.** Cat confinement – does it work? Proceedings of the 10th Urban Animal Management Conference, Brisbane. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Murray, R. W. and Penridge, H. E. (eds), 1997.** *Dogs and Cats in the Urban Environment. A Handbook of Municipal Pet Management*. Chiron Media, Mooloolah, Australia. <http://www.petnet.com.au/dcue/index.htm>
- Murray, R., Scriggins, S., Bowman, D. and Speare, R., 1999.** Cat management for Magnetic Island. 8th Urban Animal Management Conference, Gold Coast. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Nattrass, R., 1992.** Wildlife conservation in the urban environment: are pets a threat? 1st Urban Animal Management Conference. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Norton, T. W. and May, S. A., 1994.** Towards sustainable forestry in Australian temperate eucalypt forests: Ecological impacts and priorities for conservation, research and management. Pp. 10-30 in *Ecology and sustainability of southern temperate ecosystems*, edited by T. W. Norton and S. R. Dovers, CSIRO Publications,
- Paton, D. C., 1991.** Loss of wildlife to domestic cats. Pp. 64-69 in *The impact of cats on native wildlife*, edited by C. Potter. Workshop Proceedings facilitated by the Endangered Species Unit, Australian National Parks and Wildlife Unit, Canberra.
- Paton, D.C., 1993.** Impacts of domestic and feral cats on wildlife. Pp. 9-15 in: *Cat Management Workshop Proceedings*, edited by G. Siepen and C. Owens. Queensland Department of Environment and Heritage.
- Penson, P., 1995.** Victorian cat legislation. 4th Urban Animal Management Conference. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Pergl, G., 1994.** The Sherbrooke cat law – does it work? 3rd Urban Animal Management Conference. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Perry, G., 1999.** Cats - perceptions and misconceptions: two recent studies about cats and how people see them. 8th Urban Animal Management Conference. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Pert, T.A., 2001.** NSW Companion Animals Act 1998. Funding – is it adequate for animal management? Proceedings of the 10th Urban Animal Management Conference, Brisbane. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- REARK 1994a.** *The Metropolitan Domestic Cat. A Survey of the Population Characteristics and Hunting Behaviour of the Domestic Cat in Australia*. Petcare Information and Advisory Services, Melbourne. Ref: CM-5946-TH/JM <http://www.petnet.com.au/reark/reark.html>
- REARK 1994b.** *The Cat in the Suburbs Survey in Sydney and Melbourne*. Petcare Information and Advisory Services, Melbourne. Ref: CM-5897-TH/JM
- Risbey, D. A., 2000.** *The Impact of Cats and Foxes on Small Terrestrial Vertebrates and the Control of Feral Cats at Heirisson Prong*. Ph D thesis. Murdoch University: Perth, Western Australia.
- Risbey, D. A., Calver, M. C. and Short, J., 1999.** The impact of cats and foxes on the small vertebrate fauna of Heirisson Prong, Western Australia: I. Exploring potential impacts using diet analysis. *Wildlife Research* **25**: 621-630.
- Risbey, D. A., Calver, M. C., Short, J., Bradley, J. S. and Wright, I. W., 2000.** The impact of cats and foxes on the small vertebrate fauna of Heirisson Prong, Western Australia: II. A field experiment. *Wildlife Research* **27**: 223-235.
- Rogers, K., 1999.** Pet owners duped? *Australian Veterinary Journal* **77**: 762.
- Roost, H.P., Kunzli, N., Schindler, C., Jarvis, D., Chinn, S., Perruchoud, A.P., Ackermann-Liebrich, U., Burney, P. and Wuthrich, B., 1999.** Role of current and childhood exposure to cat and atopic sensitization. *Journal of Allergy and Clinical Immunology* **104**: 941-947.
- Ruxton, G. D., Thomas, S. and Wright, J. W., 2002.** Bells reduce predation of wildlife by domestic cats (*Felis catus*). *Journal of Zoology (London)* **256**: 81-83.
- Santillo, D., Stringer, R. L., Johnson, P. A. and Tickner, J., 1998.** The precautionary principle: protecting against failures of scientific method and risk assessment. *Mar. Poll. Bull.* **36**: 939-950.
- Scheele, M., 2001.** Cat pounds – Manningham City Council perspective. Proceedings of the 10th Urban Animal Management Conference, Brisbane. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Shirley, C., 1999.** Why not declaw cats? *Australian Veterinary Journal* **77**: 132.
- Stokes, R., 1999.** Declawing cats – ludicrous. *Australian Veterinary Journal* **77**: 269.
- Tidemann, C., 1994.** Do cats impact on wildlife? 3rd Urban Animal Management Conference. <http://www.ava.com.au/content/confer/uam/proceed%20intro.htm>
- Trueman, P., 1991.** *The Impact of Domestic and Semi-domestic Cats on the Wildlife of South Tasmania, Hobart, Australia*. Unpublished Honours thesis, University of Tasmania.
- Twain, M., 1964.** *Pudd'nhead Wilson*. American Library of World Literature, Incorporated, New York. (First published 1894).
- Van Dyke, S., 2001-2002.** Sex to die for. *Nature Australia* **27**(3): 20-21.
- Winter, L., 1999.** Cats indoors! *Earth Island Journal* **41**(2): 25