

Australian Pet Welfare Foundation Submission

to the Australian House of Representatives

Standing Committee on the Environment and Energy

Inquiry into the Problem of Feral and Domestic cats in Australia



Jacquie Rand, BVSc (Melb), DVSc (Guelph), MANZCVS

Diplomate, American College of Veterinary Internal Medicine

Emeritus Professor, the University of Queensland

Executive Director and Chief Scientist, Australian Pet Welfare Foundation

Emily Lancaster, BAppSc (Hons)

Research Officer, Australian Pet Welfare Foundation

July 2020



Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

About the Australian Pet Welfare Foundation (APWF)

The Australian Pet Welfare Foundation (APWF) is the peak research body and advocate for pet welfare in Australia. As a not-for-profit organisation, APWF specialises in evidence-based solutions for reducing euthanasia in animal welfare shelters and local government facilities. APWF is led by Dr. Jacquie Rand, Emeritus Professor of Companion Animal Health at The University of Queensland (UQ). She has worked extensively in shelter research over the last 14 years, including collaborative studies with the RSPCA, Animal Welfare League and local governments. Professor Rand has a distinguished track record in the delivery of industry-relevant research outcomes. She is the author of over 115 journal articles, 118 abstracts, and 42 book chapters, and is the editor of three books. While at UQ she taught Urban Animal Management and since 2013 has co-authored 21 peer-reviewed articles on the management of urban domestic animals, including seven related to semi-owned and unowned cats. She is also the author of government reports and discussion papers on the management of urban dogs and cats, and consults with local governments on urban cat management.

Introduction

This submission responds to the Cat Inquiry of the Standing Committee on the Environment and Energy of the Australian House of Representatives. The submission relates for the most part to the management of domestic (owned, semi-owned and unowned) cats in urban, peri-urban and rural areas (on farms). The management strategies that will effectively reduce the number of free-roaming domestic cats, protect wildlife, and reduce impacts on humans in these places are different from those needed to protect wildlife from truly feral cats in remoter parts of the country. In all cases, however, it is essential that effective management strategies be based on sound evidence and clear analysis of impact.

Definitions of cats for the purpose of management: Domestic Cats (Owned, Semi-owned and Unowned) in urban, peri-urban and rural areas, and Feral Cats

The Threat Abatement Plan for Predation by Feral Cats, adopted by the Commonwealth of Australia (2015), acknowledges that for management purposes cats be grouped into categories based on how and where they live, and that individual cats may move from one category to another. The Plan emphasizes that “In any given situation, the category causing the most damage to wildlife needs to be identified because management actions will depend on the type of cat causing the damage.”

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

The RSPCA's manual for Best Practice in Domestic Cat Management (RSPCA Australia 2018) defines **domestic cats** as those with some dependence (direct or indirect) on humans, and subcategorised into **owned**, **semi-owned** cats and **unowned** cats. **Owned cats** are identified with and cared for by a specific person and are directly depending on humans. They are usually sociable although sociability varies. **Semi-owned** cats are fed or are provided with some other care by people who do not consider they own them. These cats are of varying sociability, with many socialised to humans, and they may be associated with one or more households. **Unowned** cats are indirectly dependent on humans, may have casual and temporary interactions with humans, and are of varying sociability, including some who are unsocialised to humans. Unowned cats often live in groups or colonies in urban environments, where common aggregation places include industrial sites, universities, rubbish tips, food outlets, and fishing harbours. **Feral cats** can be distinguished from domestic cats because they are unowned, unsocialised, have no relationship with or dependence on humans, survive by hunting or scavenging, and live and reproduce in the wild. For practical policy and management purposes, there is a high probability that a cat in Australia found more than 2-3 km from the nearest human habitation is a feral cat (Roetman et al. 2017).

Despite frequent media attention to the negative effects of domestic cats, it is important to acknowledge that domestic cats have a positive role in Australian society. Cats provide companionship and improve the mental, physical, and social health of people who care for them. Studies have shown that relationships with animals are important for many people, contributing to their health and well-being (McConnell et al. 2011, Benjamin & Thompson 2017). Even people caring for semi-owned cats talk to the cats multiple times a day and say they are attached to the cats. They also say the cats give them a reason for getting up in the morning and help them get through tough times (unpublished data, Rand 2020), which is why these carers are traumatised when the cats they are caring for are trapped and killed.

It is important and relevant to note that cat management by local governments in Australian cities and towns typically occurs in response to cat-related complaints. After the cats are caught and removed, they are either adopted or killed, with an average of 50% currently being killed across all Australian shelters and pounds.

For the remainder of this submission, which tracks topic by topic the issues the Standing Committee identified as being important and relevant for the purposes of its Cat Inquiry, we refer to Australian cats as feral or domestic with the further understanding that domestic cats can be either owned, semi-owned or unowned in urban, peri-urban or rural (farm) areas.

TOPIC 1: The prevalence of cats in Australia

Feral cats

The most reliable estimates (Legge et al. 2017) are that the feral cat population in natural environments in Australia is between 1.4 million (after periods of extensive drought) and 5.6 million (after periods of extensive rainfall). Their average density is 0.27 cats/km². However, population density in specific areas varies depending on environmental and geographical influences, as well as on the availability of prey species. Despite culling of cats over many years, there is no evidence that culling has reduced overall numbers of feral cats in Australia, which is difficult in vast, remote landscapes (Stobo-Wilson et al. 2020).

Domestic cats

Owned cats: According to Animal Medicines Australia (2016), there are about 3.77 million owned cats (150/1,000 residents) in Australia, with 27% of households having at least one cat (average 1.4).

Semi-owned and unowned cats: Legge et al. (2017) estimated that there were 0.7 million semi-owned and unowned cats, or 8.2 cats/km², representing approximately 29 cats/1,000 residents in highly disturbed environments. Two Australian surveys of semi-owners (cat carers who do not see the cats as their property) found 3-9% of adults fed a semi-owned cat daily, and an average of 1.5 cats were fed (Rand et al. 2018; Zito et al. 2015). If 3% of adults feed 1.5 semi-owned cats on average, the total number of semi-owned cats would be 0.9 million (36 cats/1,000 residents), a figure close to Legge's estimate of semi-owned/unowned cats. If 9% of adults feed an average of 1.5 cats daily, the upper end of the estimate for these cats would be 2.7 million, which is close to Legge's upper estimate of 2.65 million cats in highly modified environments. The difficulty in accurately estimating semi-owned/unowned cat numbers using surveys is compounded by the fact that some cats are fed by more than one person, and some urban and peri-urban unowned cats are not fed by people intentionally.

The variability in total semi-owned/unowned cat numbers is also affected by the fact that the density of these cats varies between suburbs, with the highest numbers occurring in the most socioeconomically disadvantaged areas (Rand et al. 2018). This is reflected in published data from Victoria showing that on average 7 cats/1,000 residents are impounded by local governments, but the range runs from 1 cat/1,000 residents in high socio-economic suburbs to 33 cats/1,000 residents in lower socio-economic suburbs or regional areas (Rand et al. 2018). Semi-owned and unowned cats comprise 80% to 100% of council impoundments.

If we look at the total intake of owned, semi-owned and unowned cats into animal welfare shelters and municipal pounds across Australia for those states with readily accessible data, the range runs from 4.2 cats/1,000 residents for ACT to 9.6 cats/1,000 for Victoria (unpublished data, Chua & Rand, 2020). These figures do not include, however, the many cats received directly by rescue groups. Most cats admitted to council pounds (85-100%) and animal welfare shelters (60-80%) are semi-owned and unowned cats from urban areas – classed as stray cats in shelter and pound data (Kerr et al. 2018; Alberthsen et al. 2013). So, whether we try to measure or estimate the number of semi-owned and unowned cats in Australia from survey data, or from council and shelter intake data, the precision of the results leaves a lot to be desired.

Wildlife motion-detecting cameras are useful for determining free-roaming cat densities, although they cannot distinguish between owned and semi-owned/unowned cats unless the owned cat is wearing a collar (a minority). Such cameras are currently being employed by the Australian Pet Welfare Foundation in a pilot project in three suburbs of the City of Ipswich, Queensland. When the camera data are coupled with survey data they provide more useful estimates of the density of semi-owned/unowned cats in a given area than would otherwise be available.

Recommendation 1:

1. To establish the current prevalence of feral, owned and semi-owned/unowned cats in urban, peri-urban and rural areas of Australia, especially for *specific locations* where cats are perceived to represent a risk to the environment (risks to wildlife, human health or social amenity).
2. To establish the factors affecting the density of cats in different geographical locations.

TOPIC 2: The impacts of cats on native wildlife and habitats

Predation by feral cats

There is little doubt that in rural and natural areas, feral cat populations have impacted significantly on native wildlife, and have played a role in the extinction of native species in mainland Australia, most notably on some Australian islands (Dickman 1996). But the effects they have on wildlife populations in a particular geographical location can be negative, neutral or positive depending in part upon the type and prevalence of native and introduced species in the area being examined (Dickman 1996).

Much of the published literature about the impacts of cats in both wild and urban places relies on modelling data rather than actual population studies. If we want to know what actual impacts cats are having on threatened and endangered species in particular places, and then manage cats on the basis of that information, more and different kinds of information will be needed. And the same goes for the other factors that undoubtedly affect the numbers and status of endangered and threatened native species, such as habitat size and quality, bushfires, and the presence of other predators. Without that information, it is not possible to devise management strategies that will be effective in protecting threatened and endangered species, nor will they represent the best return on government and private funding.

Predation by domestic cats

The widespread perception that free-roaming urban cats, whether owned or semi-owned/unowned, contribute to declines in *urban* native wildlife through predation is reflected in data from a recent Australian study showing that 32% of respondents believed cats had a negative effect on native wildlife in their area (Rand et al. 2019). Despite multiple, hypothetical extrapolations of data about the predation impacts of urban cats (Legge et al. 2017 & 2020; Woinarski et al. 2017 & 2018; Murphy et al. 2019), we actually know remarkably little about the effects that cats in urban environments have on population sizes of native birds and animals. Several Australian studies have failed to demonstrate a correlation between the abundance of cats in urban areas and the density and diversity of native animals or birds (Grayson et al. 2007; Lilith et al. 2010; Maclagan et al. 2018).

We comment on this work.

Lilith et al. (2010): A study in Perth investigated the association between the density and diversity of mammals in bushland adjacent to three suburbs, each with different cat management legislation, including one which did not allow cats, one which required cats to

wear a bell during the day and be confined at night, and a third which had no relevant regulations at all. Numbers of the two most abundant medium-sized mammals present, brushtail possums (*Trichosurus vulpecula*) and southern brown bandicoots (*Isodon obesulus*), were not different across all sites. The smaller mardo *Antechinus flavipes*, which was regarded as highly susceptible to cat predation, was trapped mostly at a site with no relevant regulations relating to cat management. The vegetation density was greater at this site, and the authors concluded it was vegetation density, rather than cats or cat management legislation, that had the greatest impact on susceptible populations.

Maclagan et al. (2018): A Victorian study of bandicoots similarly suggested that cats do not have a negative effect on bandicoots in urban areas. The abundance of the southern brown bandicoot was *higher* in peri-urban areas compared with nature reserves. It was in fact highest at sites with the most urbanized surroundings, where cats were also most prevalent, and significantly lower in nature reserves, where cats were largely absent.

Grayson et al. (2007): Another Australian study to investigate the effect of cats on bird populations looked at 57 sites in metropolitan Perth. The researchers were interested in the factors affecting passerine bird community composition. Bird data were collected at each site, and a questionnaire distributed to surrounding neighbours to determine cat density. No link was found between cat density and passerine bird species richness (density and diversity). However, there was a negative correlation between richness of bird species and both housing density and increasing distance from bushland (and decreasing size of bushland), leading the authors to suggest that habitat destruction and degradation were the critical factors affecting the native birds, not the cats.

The disparity between the hypothetical effects and the observed effects of cats on native bird and mammal populations in urban areas is, of course, both troubling and cautionary. The most plausible explanation is that the methodology used in studies intended to generate hypothetical estimates of cat impacts on other species is flawed, because it fails to control or account for the inaccuracies that arise when the findings of research conducted in one region or environment are extrapolated to other regions or environments with significantly different attributes. Such hypothetical estimates also typically fail to include any measure of the positive impact cat predation has by reducing the numbers of other predators, like the rats that predate bird nests (Matthews et al. 1999).

An important further limitation of attempts to estimate the significance of bird predation by cats is that they do not always properly account for the condition of the birds; whether or not they are sick, for example, or might otherwise not have contributed to the next breeding

cycle. The average lifespan of banded birds of Australian species predated by cats is typically 2-4 years (Department of Environment and Energy 2017). This means that approximately 25-50% of the population of bird species susceptible to cat predation dies annually from natural causes. Studies of bird mortality from Europe find that birds killed by cats are significantly less healthy than those killed by other forms of trauma (Baker et al. 2008; Møller & Erritzøe 2000). A study in the city of Bristol, UK, for example, found that fat and pectoral muscle mass were both lower in birds killed by pet cats, compared with birds killed through collisions with windows or cars (Baker et al. 2008). Another study, using dead passerine birds recovered by members of the public, determined that spleen size was significantly smaller in birds caught by cats (n=58) than those that died from collisions with windows or cars (n=477) (Møller & Erritzøe 2000). The difference in spleen size was almost one-third and is considerable in the light of the fact that spleen size is an accepted measure of immunocompetence and is involved in both humoral and cell-mediated responses (National Research Council 1992). There was some evidence that younger birds were being caught by cats, but even within juveniles, spleen size was on average 48% smaller in birds caught by cats. The inference is that cat-killed birds were in significantly poorer condition than those killed following collisions, leading the authors to conclude that cat predation represents a compensatory rather than an additive form of mortality. In other words, cat predation does not cause a secular change in the overall mortality of bird populations.

The implications of these findings for public policy are clear. If predation by cats removes unhealthy individuals unlikely to breed again, and likely to die from other causes anyway, the magnitude and significance of any effect urban cats have on native bird populations is at the very least unclear. And if the large numbers of birds killed by cats that some studies report (Loss et al. 2013; Woinarski et al. 2017, Legge et al. 2020) are misleading, they ought not to be the basis for imposing lethal control measures on urban cats unless and until more reliable measures of the impacts of cats on wildlife numbers become available. Or, to put it differently, prospective studies are urgently needed to evaluate the impact alternative control measures would have on wildlife numbers and diversity in urban areas. These are not technically difficult to do, using motion-detecting wildlife cameras and animal traps.

There is not at the moment a sufficiently robust evidentiary basis for concluding that either low intensity efforts to trap-adopt-or-kill urban cats or other and non-lethal approaches to reducing cat populations will have a significant impact on wildlife losses.

Impact of cats on human health: Disease risk

In a survey of residents of Brisbane, Queensland, 18% agreed that stray cats spread disease to humans (Rand et al. 2019). However, most diseases with the potential to spread from cats to humans and cause serious disease are rare, and require sufficiently close contact with infected cats that disease can be transmitted directly through bites, scratches, or in faeces (Centers for Disease Control and Prevention, 2016). The risks to public health from cats are, therefore, small (Chomel 2014). Pet cats with close human contact pose a higher risk to humans than semi-owned/unowned cats, which less frequently have direct physical contact with humans. Ringworm (a fungal infection caused by *Microsporum canis*), fleas, mites (*Cheyletiella* spp.) and intestinal worms (*Toxocara* spp.) can all be transmitted from cats to humans, but these are easily treated. Cat bites and scratches represent a more serious risk, resulting in wounds that cause localised pain and infection, as well as the transmission of the bacteria (*Bartonella henselae*) that causes cat scratch fever.

Gastrointestinal infections (such as *Giardia* and *Salmonella*) occur when humans are in contact with the faeces of an infected cat. The risk of zoonoses will be reduced by maintaining high standards of animal care and husbandry and good hygiene practices.

Impact of cats on human health: Toxoplasmosis

Toxoplasmosis is a cat-borne parasite that infects about 25% of the world's human population. Although it rarely causes human disease, its prevalence means that it is the second most common cause of death from food-borne disease in North America, accounting for 24% of fatalities (Scallan et al. 2011). Toxoplasmosis can result in neurological damage in immunocompromised people and abortion or stillbirth when pregnant women are exposed. Human infection occurs via ingestion of oocysts directly from the environment (for example, on unwashed vegetables) or improperly cooked meat – especially mutton or lamb.

In Australia, 16% of lambs and 32% of sheep have evidence of prior infection with *Toxoplasma gondii* (*T gondii*) and will, therefore, have infective tissue cysts in muscle, posing a risk to humans if they eat undercooked meat (Kiermeier 2008). Sheep are infected by consuming pasture, feed or drinking water contaminated by cat faeces containing *T gondii* oocysts. *T gondii* infections have been identified with cases of “abortion storms” in sheep flocks causing severe impacts on affected farmers, with many subclinical losses going unnoticed (Munday 1975a). In addition to posing a risk to human and animal health, *T gondii* results in commercial losses to the sheep industry, at an estimated cost in Tasmania, for

example, of \$1.7 million/year (unpublished data, Department of Primary Industries, Parks, Water and Environment, Tasmanian Government).

Cats are typically infected by *T gondii* in their first year of life and shed oocysts for 2-3 weeks before becoming immune. Young cats shed 300 times more oocysts than older adults with prior exposure, and 60 times more than older, immunologically naïve cats (Davis & Dubey 1995; Dubey 1995). Low-intensity trap-adopt-or-kill programs, result, therefore in more environmental contamination with *T gondii* oocysts than those based on desexing. This is because of the higher proportion of kittens in areas managed by trap-adopt-or-kill programs than in desexing programs, where colonies comprise primarily mature cats. By reducing semi-owned/unowned cat numbers in urban, peri-urban and rural (farm) areas using a non-lethal desexing paradigm, the potential for disease spread will likely be reduced compared with current trap-adopt-or-kill strategies.

Moreover, research has shown that cats living in close proximity to humans—and largely reliant upon human provisions—are much less likely to be exposed to toxoplasmosis than cats that have to hunt to provide all their nutritional needs (VanWormer 2013). This is because prey, such as introduced rodents and native animals, will often contain infective tissue cysts in their muscle, and hence they act as intermediate hosts, infecting cats. This is why desexing semi-owned and unowned cats and feeding them processed cat food can be an effective measure to reduce the spread of toxoplasmosis in cats, humans, and wildlife.

Given the life cycle of *T gondii* and variable cat densities in different environmental contexts, contamination from *T gondii* oocysts and subsequent infection of production animals, especially sheep, probably originates largely from farm cats, rather than feral cats. Farm cats produce litters of immunologically naïve kittens, which then become infected and shed oocysts around areas where the sheep are managed for shearing, drenching, and vaccination. Cats become infected by preying on mice and rats living around these areas. It is important, therefore, to ensure that all farm/barn/shearing shed cats are desexed, and that all immigrant cats are promptly trapped and desexed, to prevent kitten births; a strategy that would likely reduce environmental contamination by toxoplasmosis cysts. This would in turn reduce economic losses from abortion in sheep and reduce the prevalence of sheep infected with *T gondii*, and therefore, reduce risks to humans.

Remaining desexed farm cats could then be tested to determine if they have protective antibodies to toxoplasma. This provides an additional benefit, because cats with protective antibodies could still hunt rodents with minimal risk of additional oocyst shedding. Cats without protective antibodies could be adopted or relocated to horse barns, confined inside or

in an outdoor enclosure, or be artificially infected and then confined in an enclosure until oocyst shedding is finished and it is confirmed that protective antibodies have developed. Barn cats should be monitored to ensure they are able to maintain good body condition from rodent predation, with supplementary food if needed, because cats in poor condition or stressed in other ways are more likely to shed oocysts, even if previously exposed.

Impact of cats on human health: Sarcocystis

Sarcocystis infect beef and sheep that eat pasture or feed contaminated by cat faeces containing *Sarcocystis* spores. Cats are infected by consuming sheep carcasses or uncooked meat containing tissue cysts. Unlike *T. gondii*, cats do not develop immunity and can be reinfected throughout life. *Sarcocystis* infection in sheep and cattle is common, with research suggesting over 90% of Tasmanian sheep and cattle are infected (Munday 1975b). Although it does not cause clinical disease in livestock, it results in significant commercial loss as a result of unappealing, white, rice-grain sized cysts in muscle. Losses result from the trimming of infected muscle or the condemnation of carcasses, with estimated trimming costs of \$1.50/sheep at a Kangaroo Island abattoir in 2003. Estimated overall costs to the Australian sheep industry are \$15 million/year (Animal Health Australia 2020). To reduce risk, farm/barn cats should not be fed raw or uncooked meat, and sheep carcasses should be promptly removed from paddocks.

Impact of cats on human health: Mental health

The inability to utilize humane and effective methods of population control to manage domestic cats in Australia results in approximately 80,000–115,000 healthy and treatable cats being killed every year in local pounds and shelters. Currently and on average across all the shelters and pounds in Australia approximately 50% of cats admitted are killed (Rand et al. 2018). Approximately half the admitted cats are kittens, and pre-weaned kittens and healthy but poorly socialised cats are over-represented amongst those killed. What this means, to put it quite straightforwardly, and bluntly, is that the management of domestic cats in Australia is a major welfare issue for cats, and a major ethical issue for Australians.

In most Australian animal shelters and pounds, cats have substantially poorer outcomes than dogs. In local government areas in Victoria, for example, the average euthanasia rate for admitted dogs was 8%, compared to 48% for cats. And in one quarter of the shelters and pounds servicing Victorian local government areas, the level of killing reached 67-98% of all impounded cats (Rand et al. 2018).

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

The fact that current management methods result in large numbers of healthy and treatable cats and kittens being killed in shelters and municipal facilities, has a substantial adverse effect on the mental health of shelter and pound staff, resulting in post-traumatic stress and increased risk of suicide (Rohlf & Bennett 2005; Scotney et al. 2015). In the USA, the work-place suicide rate for the animal shelter sector has reached number one ranking, comparable to other protective service professions, such as police and firefighting (Tiesman et al. 2015). Staff turnover rate in shelters is proportional to the euthanasia rate (Rogelberg et al. 2007). The results of a recently published US study reveal a suicide rate among veterinarians that is up to 3.5 times higher than the national suicide rate, with ‘euthanasia procedures’ identified as a likely contributing factor. In Australia, suicide rates for veterinarians are four times higher than for the general public (SBS News 2020, ABC News 2019). The way Australia currently manages domestic cats is, in other words, a significant source of mental health damage to people working in local shelters and pounds.

Quotes from shelter staff highlight the issues: “The effect on mental health is a very real problem, and veterinarians were the most affected – it was terrible to see the impact on them” AND “I have seen so many people’s lives damaged by having to kill a never-ending stream of kittens and cats”.

Quote from a mental health practitioner: “Shelter staff are certainly overrepresented in my practice”.

Quote from an Animal Management Officer (AMO): “AMOs spend their time trapping cats, then become a taxi for a cat killing program because there is no room left for them (in the shelter). As an AMO, it is extremely heartbreaking to go to work each day knowing that is what your role is about. This method of cat management makes no difference to the cat intake numbers each year, and the cost is high for me personally and for the cats.” (See City of Banyule submission)

Impact of cats on pet health: Disease risk

Cats under one year of age shed substantially more infectious agents in faeces, including helminths and toxoplasma oocytes, than older cats (Davis & Dubey 1995; Dubey 1995, Epe 2011). Decreasing cat numbers and increasing the proportion that are desexed can therefore reduce the risk of disease spread to pets, as well as to humans and wildlife (Levy et al. 2014; Natoli et al. 2006; Rand et al. 2019; Spehar & Wolf 2018a & 2018b; Zito et al. 2015 & 2018). Desexing also reduces fighting, which in turn reduces the risk of cellulitis and

abscesses from cat bites and decreases the spread of feline immunodeficiency virus (FIV or feline AIDS) to pet cats (Sykes 2013).

Recommendation 2:

Feral cats

Future funding for cat management strategies should be tied to demonstrating a measurable increase in the numbers of endangered native species at the location being managed, before there is more widespread implementation of those strategies. Modelling studies and studies estimating the numbers of native animals killed by cats have serious limitations in predicting the effectiveness of a given cat management intervention for protecting targeted native species, and such studies should not be prioritized for funding. Similarly, strategies that treat the number of cats culled as the principal measure of successful outcomes should not be funded, because of the risk that they will be ineffective in protecting targeted native species, and will at worst, result in adverse effects. The effect of other strategies to increase native wildlife populations, such as increasing habitat size and quality, reducing the frequency and intensity of bushfires, and the retention of apex predators need to be investigated as a matter of urgency.

Domestic cats (owned, semi-owned and unowned)

Funding is needed to determine the *actual* impact (not based on modelling or hypothetical predation studies) of owned and semi-owned/unowned cats on native wildlife populations, and to evaluate the effectiveness of the various strategies to reduce that impact, where there is a reasonable prospect of success. In addition, as a basis for good public policy, the effect of various cat management strategies on other relevant impacts needs to be determined, including the impacts that killing large numbers of cats and kittens have on the mental and physical health of the people tasked with doing the killing, and on the health of other pets. A high priority should be assigned to research that will support the evidence-based management of farm cats and the contribution that can make to reducing both risks to human health and economic losses from toxoplasmosis.

TOPIC 3: The effectiveness of current legislative and regulatory approaches

Feral cats

APWF does not support declaring feral cats to be pests, because it risks deflecting scant funds for protecting threatened and endangered species to controlling cats as the primary goal. In most areas, this likely has no benefit for wildlife, given the magnitude of the culling that is needed to effectively reduce cat populations. If not accompanied by evaluation of effects on wildlife (which is unlikely to occur if the end goal is culling cats), it may even be detrimental (Lazenby et al. 2014, Bergstrom et al. 2009). Its only predictable effect would be to intensify “eradication” strategies that we already know are going to be ineffective.

Declaring feral cats as pests commits governments, and potentially individual landholders, to fund programs to control cats as an end goal, when state and federal government funds are better spent on effective evidence-based strategies to protect wildlife. For example, it would be more effective to allocate funds for buying back privately-held land to prevent future land clearing, or paying farmers to remove livestock and regenerate land.

Some salient facts:

Firstly, cats are difficult to kill in sufficient numbers to reduce overall numbers. The average density of cats in natural environments is 0.27 cats/square kilometre (Legge et al. 2017), so there is approximately 1 cat per 300 hectares, or 100 cats in 30,000 hectares. Typically baiting does not remove more than 20% of cats, so for every 100 cats, removal of 20% leaves 40 females producing an average of 5 kittens a year (200 kittens), and these kittens can produce more kittens by 6 months of age (Nutter et al. 2004). Although at least 75% of kittens die before 6 months, sufficient survive to maintain the same number (Nutter et al. 2004)

Secondly, unless 30-50% of the population is removed every 6 months, no progressive decrease in cat numbers occurs (Miller et al. 2014, Boone et al. 2019). For example, removal of 30% of cats in a 12-month period, rapidly increased cat numbers by 2 to 3 times in a Tasmanian study (Lazenby et al. 2014), mainly because of immigration from surrounding areas. Numbers subsided to baseline, once culling stopped. Note, an average of one cat was caught per 100 nights of trapping – removal of cats is time consuming and costly. Therefore, low level culling is ineffective in progressively decreasing cat numbers, is costly and could actually increase cat numbers. High level culling is prohibitively expensive and difficult to achieve except in contained areas. For example, the cost to remove 315 cats on Macquarie

Island was \$10,476 per cat (total \$3.3 million), which is mid-range for reported costs for removing cats from islands (Robinson & Copson 2014)

Thirdly, unless other pest species such as rabbits, foxes and rats are also effectively controlled (additional costs), the effect of removing cats can worsen the situation. This happened on Macquarie Island, where removing cats caused “environmental devastation” that cost a further \$24 million to remedy by removing rats, mice and rabbits (Bergstrom et al. 2009).

Therefore, removal of cats needs to be targeted to areas it is shown to benefit wildlife, not just because they are classed as a pest species.

Domestic Cats – Owned

Effectiveness of legislation relating to mandatory desexing

An analysis of 191,000 cats entering RSPCA shelters over 4 years in Australia found that while the ACT had mandated desexing of all dogs and cats by 6 months of age for 10 years prior to the study, the territory had the lowest proportion of desexed kittens (by 6 months of age) of all the jurisdictions in the Commonwealth (Alberthsen et al. 2016).

Legislation only works, in other words, if it is enforced. One cannot readily tell from a distance, of course, whether a free-roaming cat is desexed as required by law, or not, or who owns it. So, mandatory desexing is difficult and resource intensive to enforce, because it requires cats to be trapped and traced to an owner. The costs to local governments of meeting these requirements mean it is just not feasible to enforce mandatory desexing. Moreover, the main barrier to desexing is not addressed by mandating it.

In Australia, multiple surveys report that most owned cats are desexed, at rates typically exceeding 90%. We also know, however, that the intake of cats and kittens into shelters and pounds is correlated with socioeconomic factors, and that intakes are significantly higher in suburbs where 20% to 30% of households are classed as low income, which in Australia is often defined as 2.4 people living on less than \$650/week. In these suburbs, there are high numbers of “free/give-away” kittens and cats, because the cost of desexing cats is unaffordable.

People who take on the care of a cat or kitten often do it on a good Samaritan basis, in response to social media messages that implore people to provide a home for the animal, because otherwise it “will be killed at the pound” - which may or may not be true, depending on which local government area people are living in. We are talking, here, about people who can afford to feed a cat and provide inexpensive items, such as bedding, but the cost of

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

desexing, microchipping and local council registration for the cat they have opted to care for is simply unaffordable. It typically runs from \$350 to \$500 for a female cat.

In the face of these realities, the effect of mandating desexing is essentially to criminalize cat ownership in the less prosperous parts of the country and to encourage semi-ownership. Public policy effectively encourages people to say that “it’s not my cat,” and disavow their best instincts for caring.

If the goal of public policy for cat management is to reduce free-roaming cat numbers, and more specifically the numbers of semi-owned, unowned and owned cats producing kittens, then the money and resources associated with mandating desexing and compliance would be more effective if it were targeted to providing support for free/affordable desexing in socioeconomically disadvantaged areas.

In the USA, to cite some comparative data, in households with annual family incomes greater than or equal to \$USD 75,000, 96% of cats were desexed. In households with annual family incomes between \$USD 35,000 and \$USD 74,999, 91% of cats were desexed (Chu 2007). When annual family income was below \$35,000, only 51% of cats were desexed. At the US federal poverty line where individual incomes range between \$16K and \$19K a year for 2 people, only 10% of pets are desexed.

Research also shows, however, that providing free or affordable desexing in socioeconomically disadvantaged areas increases the desexing rate in pets to 90% (Chadwich, Emancipet, AIAM 2019 conference). The clear implication is that low income individuals and families want to do the right thing in caring for pets, and when voluntary, free/affordable and accessible desexing programs are available, and are coupled with information on why it is important to desex, high rates of desexing can be achieved. Other assistance to overcome barriers to desexing, such as provision of a carry cage, assistance with catching the cat, and transport of the cat to and from the veterinarian may also be needed.

More specifically, in a survey of people enrolling a cat in a free desexing program in the City of Banyule (VIC), a program targeted to low SOE suburbs with high cat intake and complaints, when people were asked “What was the single most important factor why you have not already had this cat desexed?” 90% said it was because desexing was unaffordable. The targeted suburbs in this case had 20-30% of households living on \$650 a week or less.

Effectiveness of legislation relating to mandatory containment

The same factors of income and affordability surface in trying to understand why mandates for the containment of cats get limited traction in those Australian suburbs where

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

many properties are rental properties and where cat containment systems can cost on the order of \$1,000-\$2,000. For many low-income families or renters these costs are simply not feasible.

For people with “door-dasher” cats, confinement inside is usually not possible, except at night. In addition, a significant proportion of Australian cat owners believe that total indoor confinement of their animals is a welfare issue (McLeod et al. 2015). This is why a policy focus on educating owners about responsible cat ownership in suburbs with high free-roaming cat numbers has not been an effective strategy for decreasing cat impoundments or cat-related complaints. Some councils have in fact noted an increase in complaints after enacting containment by-laws, likely because of unrealistic expectations of residents that these by-laws will be complied with, and that council animal management officers will enforce them.

It costs between \$150 to \$400 for an animal management officer to trap one cat, and additional costs for it to be held in a pound or at a service provider’s shelter (animal welfare agency) until it is claimed, rehomed or euthanased. Costs for councils and animal welfare agencies to manage cats in their shelters range from \$500 to \$1,000/cat, with an average hold time of 30 days.

Note that for “door-dasher” cats, strategic feeding (feeding 30% of daily food in the morning, 30% at dusk and the last 30% after the door is closed for night) helps to ensure that cats will be contained. This can be an effective and inexpensive way to facilitate night confinement and it needs to be promoted by local governments, and coupled with information to residents about the benefit to their cat of night-time confinement in reducing cat fight injuries, risk of FIV and road accidents.

No-pet clauses in rental accommodation

In Australia, the lack of rental accommodations allowing pets is common reason people surrender pets to pounds or shelters. The lack of rental accommodation for pets accounts for 36% of adult cat surrenders to RSPCA shelters (Alberthsen 2014; Alberthsen et al. 2016). Although 33% of Australians live in rented accommodation (ABS, 2016), only 4% of advertised rentals specifically allow pets (Danaher 2016). Banning “no-pets” clauses in tenancy agreements would allow more pet owners to obtain rental accommodation, thus reducing the number of cats surrendered to shelters and pounds, and reduce the numbers euthanased. Note that most large welfare agencies charge owners to surrender their pet (approximately \$100 for a cat), which in low income areas can be a barrier to surrender, and “no-pets” clauses encourage dumping or leaving cats at rental properties when they are vacated. In addition, “no-pets”

clauses in tenancy agreements mean that fewer homes are available to adopt pets from shelters and pounds, further contributing to unnecessary pet euthanasia.

Many landlords have a preconceived notion that pet owners cause more property damage than non-owners (Carlisle-Frank et al, 2005), and conclude that pet owners will be a financial burden. However, research conducted in the USA demonstrates that pet owners stay twice as long, pay more rent and are no more likely to cause damage than non-pet owners. In contrast, renters with children cause an average of \$150 more damage per unit per year (Carlisle-Frank et al, 2005). In all the states in Australia, however, it is illegal to discriminate against tenants with children (eg. Anti-Discrimination Act Queensland, 1991). The U.S. findings are consistent with the experiences of First National Real Estate in Australia. Stewart Bunn, a First National spokesperson stated that ‘what we observe is that pet owners generally sign longer leases and pay more rent’ (Quelch 2015).

Pet ownership in the community has well-documented physical, psychological, and social benefits for individuals and for the community as a whole (RSPCA, 2015, Franklin 2006, Power 2013). Pet ownership decreases loneliness and stress amongst elderly owners (Keil 1998), improves community neighbourhood interactions and relations (Power 2013), and enhances the sense of community (Wood et al. 2007). Pet ownership also results in health benefits to the community. For example, total health care savings associated with cat and dog ownership were estimated at \$1.813 billion or 5% of Australia’s total health expenditure in 1999 (Headey 1999). Pet owners have fewer doctor visits and less use of medication for high blood pressure, high cholesterol, sleeping difficulties, and heart problems (Headey 1999). “No-pet” clauses mean many renters miss out on the health benefits of pet ownership, and this indirectly leads to mental health damage in shelter and municipal staff because of surrendered cats. It also encourages dumping and abandonment of cats, including at rental properties.

Domestic cats: Semi-owned and unowned

The effectiveness of current legislative and regulatory approaches: trap-adopt-or-kill

The approach currently supported by legislation and local government by-laws for the management of semi-owned/unowned cats in Australia is to trap cats that give rise to persistent complaints from the public, and to kill those that are not adopted. This results in approximately 5% of the semi-owned/unowned cat population being culled annually (Tan 2017). Both population modelling (Miller et al. 2014, Boone et al. 2019) and field data support the conclusion that this low-level culling of cats is ineffective in reducing cat-related complaints

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

and associated impoundments, or in reducing cat numbers. It is instructive to look at some statistics about local council pound and shelter intakes and outcomes:

- In NSW, over 7 years (2008/09 to 2014/15), 173,000 cats were impounded by local governments and 107,000 killed, but intake did not decrease and remained at 24,000 per year (NSW Office of Local Government).
- In Queensland, over 7 years (2011/12 to 2017/18), RSPCA Queensland shelters admitted 94,770 cats (70% were semi-owned and unowned cats), and 18,420 were killed. But intake increased over the 7-year period from 13,600 to 14,895 (Kerr et al. 2018; RSPCA Australia 2016, 2017, 2018).
- In Victoria, over 7 years (2011/12 to 2017/18), the RSPCA and Lost Dogs' Home admitted 157,959 cats and killed 74,368 cats, with minimal impact on yearly intake (which declined from 23,684 to 21,844).
- In Queensland, a generously funded program for controlling urban free-roaming cats is run by the Brisbane City Council (BCC). The program employed two trappers at an annual cost of around \$250,000, to catch 1,000 cats annually, approximately 90% of which were killed (per Cr Bourke). Although it was generously funded, the BCC program was ineffectual in achieving a sustained decrease in semi-owned/unowned cat numbers. Cat intake into the council pound increased by 36% from 2015 to 2017 (data from BCC).

The reason low levels of cat culling in urban areas does not yield the intended result has to do with the fecundity of the remaining cats. For example, based on population estimates for the Brisbane local government area (Legge et al. 2017; Tan et al. 2017), the annual removal of 1,000 cats leaves untouched at least 40,000 unowned cats. This includes 20,000 females, each potentially producing 5 kittens a year, and each female kitten can then reproduce at 6 months old (Nutter et al. 2004). Although 75% of free-born kittens die before 6 months of age, (Nutter et al. 2004), enough survive to maintain overall population numbers, which slowly increase over time as the human population grows.

The inescapable conclusion from the preceding analysis is that current legislative and regulatory approaches to the management of urban and peri-urban cats in Australia are ineffective. Changes to state and local government bylaws are urgently required to allow management of owned, semi-owned and unowned cats using scientifically proven, best-practice methodologies. Parliament can lead by outlining the legal and policy framework within which local and state management could proceed.

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

The scientific basis for contemporary community cat programs shows that when high intensity desexing of all cats, targeted to areas of high cat impoundments or complaints, is combined with components of trap-adopt-or-return home methods, this can be successful in managing semi-owned and unowned cats in urban areas. There are now half a dozen publications documenting the basis for successful trap-adopt-or-return home programs at the suburb or city level (Levy et al. 2014, Spehar 2017, 2018a, 2018b & 2019, Kreisler et al. 2019). And in contrast to lethal programs that have little public support, non-lethal programs attract support from welfare agencies, rescue groups and individuals who help contribute to the cost. Notably, there are no reports in the Australian or international literature of high intensity trap-adopt-or-kill programs being successful at the city or suburb level.

At present, the management of semi-owned and unowned cat populations using the non-lethal methods just described is illegal in Australia. This is an unfortunate legacy of state legislation dealing with animal management (generally requiring confinement on property), animal care and protection (to prevent abandonment), and biosecurity (prohibiting the feeding, moving, selling, giving away, or release of “restricted” matter).

In Queensland, for example, it is illegal to feed or adopt a semi-owned/unowned kitten or cat without a restricted matter permit. Veterinarians in Brisbane who take in these cats from the public have been threatened with breaches of the Queensland Biosecurity Act, and many will no longer accept these cats or kittens. Members of the public caught feeding semi-owned and unowned cats in Brisbane are being fined, and some repeat offenders have been given suspended jail sentences. The effect of the Queensland legislation is that veterinarians are being prevented from providing a valuable community service, accepting semi-owned/unowned cats and kittens from the public, and then free of charge, desexing, vaccinating, micro-chipping and finding homes for them. Veterinarians in other states and in local government areas outside of Brisbane provide significant amounts of *pro bono* service to the community, which is illegal under Queensland legislation. Note that Brisbane is the only local government area that appears to have the motivation or funding to enforce this legislation.

We need legislation that enables rather than prevents effective urban cat management. The lack of ability to implement effective urban cat management strategies increases costs to local governments, does nothing to reduce significantly the numbers of free-roaming cats in urban areas, and therefore wildlife predation, and it exposes humans to the disease and mental health risks associated with the unchecked breeding of semi-owned and unowned cats. It is a recipe for little more than the continued euthanasia of cats in shelters and municipal pounds, and ongoing damage to the mental health of staff.

Background information on characteristics of semi-owned and unowned cats, based on fieldwork from the Australian Community Cat Program



Baseline fieldwork for the Australian Community Cat Program (<https://petwelfare.org.au/community-cat-program/>) demonstrates that most semi-owned/unowned cats are semi-owned cats, and are on private property. They are fed by individuals who feed 1-2 cats, most of which are entire, and are the major source of cats and kittens entering shelters and pounds (Zito et al. 2015 & 2016). Most carers are in low socioeconomic areas. They will make use of free desexing, microchipping and registration services and typically will agree to being listed as the owner on the microchip and council registration. They may require some assistance with capture and transport of the cats, as well as information on the benefit to the cat, and to them, of desexing it.

Much less frequently found are individuals who care for cats but have become overwhelmed by the number, some of them feeding 8 or more cats on their property. This can result in squalor situations, and mental health issues may be involved, compounded by feeling overwhelmed. However, the carers want help, and respond extremely well to help, provided it does not involve trapping and killing the cats they care for. Many will take ownership of the cats, where state and local bylaws allow this, or where they are flexibly enforced so that multiple cats can be owned. Less frequent still are colonies of cats on public land, around businesses like food outlets and factories, around government housing, universities, schools, and hospitals. These can be very successfully managed by desexing (trap-neuter-adopt-or-return, TNR) (Swarbrick & Rand 2018). Almost all the cats in these situations are being fed by one or more carers. True hoarding situations exist, but are uncommon, and recidivism rates are close to 100% unless intervention strategies are implemented to manage the underlying mental health issues.

Aims of a contemporary community cat program

The aims of a contemporary community cat program based on desexing for semi-owned, unowned, and owned cats in targeted urban areas are the following:

- Humanely manage free-living cats in urban and peri-urban areas.
- Decrease the intake and euthanasia rates of cats and kittens in council pounds and animal welfare organisation shelters.
- Improve the mental health and job satisfaction of pound staff, shelter staff and volunteer animal carers.
- Increase the proportion of responsibly owned cats, strength of the owner-cat bond, and responsible cat caring attitudes and behaviours (e.g. desexing and confinement).
- Decrease cat-related complaints received by councils and encourage changes in community attitudes to semi-owned and unowned cats.
- Decrease costs and increase benefits, compared to traditional methods of cat management, for councils and shelters.
- Decrease population size and density of free-roaming semi-owned/unowned cats.
- Decrease problematic behaviour such as fighting, spraying and constant breeding, which lead to cat-related complaints.
- Decrease wildlife predation and cat roaming behaviours.
- Give each cat and kitten the opportunity to maintain good health and quality of life.

Elements of a contemporary community cat program

- Identify carers of semi-owned cats and desex their cats, and where possible, register the carer as the owner on the microchip and registration databases.
- Offer free desexing for owned cats in areas contributing to high shelter intake and euthanasia.
- Capture and desex healthy and treatable unowned cats, and if not readily adoptable, return them to their home location, and where possible, identify a carer to support them (often called trap, neuter and return or TNR; this is essential to prevent repopulation with kittens of areas targeted for free desexing of owned and semi-owned cats).
- Adopt readily adoptable unowned cats, and especially kittens, to new homes.
- Desex healthy unowned and unclaimed cats brought to a shelter by members of the public or council officers and, if they are not readily adoptable, return these cats to the location where they were found (often called shelter, neuter and return, SNR or

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

community cat diversion; this has the greatest impact in reducing euthanasia of healthy adult cats, and reducing exposure of staff to the adverse mental health effects of killing them).

- Community education regarding the importance of desexing and keeping cats safe through confinement on property and identification. Promotion of the value of microchipping and keeping contact details updated, and if possible, use of a collar with ID tag giving contact phone numbers, to facilitate rapid reuniting of lost pets with their owners.
- Best practice in resolving cat-related issues in the community, including providing education and cat deterrents for people who do not want cats on their property.
- Community cat watch to identify cats that are not desexed, or are injured or sick, and notifying the agency responsible for the community cat program in the area.

Limitations of current management with trap-adopt-or-kill

There is a widespread assumption that removing cats from the environment reduces their associated risks. This assumption is not based on scientific evidence. Not a single published study is known to have demonstrated that the long-standing municipal practice of trapping and killing semi-owned and unowned cats in urban areas has reduced the size of any community's free-roaming cat population. For some it is a matter of common sense that removing cats lowers their associated risks. But careful analysis shows that there are many reasons why "trap-adopt-or-kill" programs are failures. Chief among them is that cats are prolific breeders and it would literally cost millions of dollars to remove enough of them quickly enough in a large urban area to get ahead of their reproductive curve.

Published reports of modelling unowned urban cat populations estimate that for a sustained decrease in cat numbers to occur over 10 years, some 30-50% of the population would need to be culled every 6 months (Boone et al. 2019; Miller et al. 2014). For an effective culling strategy in a city 5 million (Melbourne or Sydney), at least 100,000 cats would need to be culled in the first 12 months, at a cost of \$25-\$50 million (at \$250 to \$500/cat), not including costs to build shelters and maintain cats for the minimum legal holding period. Although the numbers of cats to be killed each year would slowly decrease over 10 years, the secular expense is too great for local governments to sustain, and the level of killing involved is unlikely be acceptable to the community. There are, as noted, no published papers documenting the success of high-intensity trap-adopt-or-kill programs at a suburb or city level. Nor do any published

papers show that the low-intensity trap-adopt-or-kill programs typically implemented by local governments in Australia reduce cat numbers in the medium to long term.

Research in Australia, as well as in other countries, suggests on the contrary that low-intensity culling can increase cat numbers; an outcome that can be explained by the prolific reproductive capacity of cats, increased juvenile survival, and immigration of other cats into the area (Lazenby et al. 2014; Miller et al. 2014). In fact, Australian research showed that low-intensity culling with removal of 30% of cats per year rapidly increased cat numbers by two to three times, and that once trapping of cats ceased, numbers gradually subsided to original levels (Lazenby et al. 2014). This is why research into new management methods based on desexing and community education is so important and so badly needed for semi-owned and unowned cats.

One additional and recently published paper needs to be mentioned, here, because it provides evidence-based recommendations for the management of cats in remote indigenous communities (Kennedy et al. 2020). The authors make the case that in indigenous Australian communities relationships between people and cats are different from those in Western society: “the relationship is one of companionship in the true sense of the word, rather than ownership”. In fact, this relationship is similar to that experienced by the semi-owners in Australian cities and towns who feed one or more cats on a daily basis they do not perceive they own. The recommendations for cat population control in indigenous communities rely on a combination of desexing owned cats, trap-neuter-return for unsocialised cats, adoption of friendly cats, and euthanasia of sick cats (Kennedy et al. 2020). A community cat program for all of Australia that uses targeted, free/affordable desexing for owned, semi-owned and unowned cats is consistent with these recommendations. It is the only effective strategy that is affordable for local governments and will result in long term declines in free-roaming cat populations and their associated problems in the country’s urban areas. Typically, these programs attract support from welfare organisations and rescue groups, because they are humane and have flow-on benefits to their operations.

Recommendation 3:

Feral cats: Feral cats should *not* be declared pests, because of the resulting focus on culling as the primary goal, rather than protection of threatened and endangered species. Culling is costly, may not have any benefit to wildlife, and in some cases is deleterious. Instead, where threatened and endangered species exist on crown, state or private property, and these species are at risk from cat predation, funding should be prioritized for strategies which will best preserve these populations. These strategies might include cat control and/or other strategies that increase survival of native animal in the presence of cats.

Domestic cats (semi-owned and unowned cats): The current legislative and regulatory approaches for managing cats in urban areas, primarily using a trap-adopt-or-kill approach, have not been effective thus far. Both field data and statistical modelling show that this approach is not effective at current trapping levels. Based on cost analyses, it is not feasible or sustainable for governments or local councils to implement trapping at the levels required to achieve a sustained decrease in semi-owned/unowned cat numbers at a city or suburb level. Evaluation of new methods for managing cats in urban areas based on population control through desexing are urgently needed in Australia. This particularly relates to contemporary community cat programs focused on converting semi-owners to owners, but also including the owned and unowned cats in the target areas. Legislative changes at the state and local government level are needed to facilitate more effective and cost sensitive management of semi-owned and unowned cats, and parliamentary initiative can establish the overall framework within which change occurs.

Domestic cats (owned cats): Legislative approaches to ban “no-pets” clauses in rental agreements are required to reduce surrender or dumping and abandonment of owned cats, and increase adoption of cats. This will reduce unnecessary killing of healthy and treatable cats and kittens in shelters and pounds. Mandated desexing should be replaced by free desexing in areas overrepresented by cat impoundments and cat-related complaints. Mandated confinement should be replaced with information on simple strategies to promote night-time confinement. Cat owners should be provided with free or affordable cat containment systems where threatened and endangered species can be shown to be at risk from cat predation.

TOPIC 4: The effectiveness of Commonwealth action and cooperation with states and territories on this issue, including progress made under the Threat Abatement Plan, national framework and national declaration relating to feral and domestic cats in Australia.

For effective management, domestic and feral cats need to be classified uniformly under Commonwealth and state legislation and regulatory policy, specifically to recognise owned, semi-owned and unowned cats as subclasses of domestic cats, and that each of the classes and subclasses will require differing management strategies to be most effective.

Recommendation 4:

1. That legislation clearly recognise and distinguish between the different classes and subclasses of cats – feral cats and domestic cats (with recognition of owned, semi-owned and unowned as subclasses of domestic cats) and that any management strategies implemented be tailored and targeted to the specific class and subclass. A national framework is needed for the revision of existing law and policy and to ensure consistency in subsequent implementation across states.
2. That state legislation relating to animal management and animal care and protection acts be amended to mandate best-practice management of urban cats based on the best available scientific research. This would authorize programs in applicable areas that desex semi-owned and unowned cats, including those cats that cannot be adopted, but are healthy and would otherwise be killed. Treated cats would then be returned to their home location, preferably with a designated carer.
3. That funding for cat management be redirected to strategies which increase desexing rates in disadvantaged areas with high cat numbers and assist with cat containment where threatened and endangered species can be shown to be at risk from cat predation.

TOPIC 5: The efficacy (in terms of reducing the impact of cats), cost effectiveness and use of current and emerging methods and tools for controlling feral cats, including baiting, the establishment of feral cat-free areas using conservation fencing, gene drive technology

The Australian Pet Welfare Foundation supports the statement made in the Threat Abatement Plan (Commonwealth of Australia 2015) that: “In any given situation, the category causing the most damage to wildlife needs to be identified because management actions will depend on the type of cat causing the damage.”

Feral cats

Evidence-based strategies are required to ensure that the goal of protecting threatened and endangered species is being achieved. At present, the cost-effectiveness of various management strategies for truly feral cats that might improve the survival of threatened and endangered species is poorly understood. Management of the effects of cat predation should address a range of options, including an increase in the size and quality of the habitat of target species, mechanisms to increase survival in the presence of cats, the possibilities for and consequences of preserving alpha predators (such as dingos) while protecting livestock (e.g., with guardian animals), and the use of other interventions, such as conservation fencing and improved bushfire management. It is critical that the impact of the interventions on the threatened wildlife to be protected is evaluated before and after intervention strategies are undertaken, to ensure that it is achieving a measurable increase in the numbers of endangered native species, rather than being assessed solely by how many cats are culled.

The end goal of current methods for feral cat management in Australia is for all intents and purposes, to maximize the number of cats that can be killed. And when it comes to questions about how effective and efficient other management methods could be in protecting threatened and endangered species, we are flying blind. To continue funding ineffective methods which do not protect wildlife is not good use of government or private funding. For example, a Tasmanian study showed that culling 30% of cats in the trial areas, led to a rapid increase in cat numbers (Lazenby et al. 2014), and removing cats from Macquarie Island had a devastating effect on the environment and seabirds (Bergstrom et al. 2009). We need to be evidence-based on how we invest funds to protect target native species.

Recommendation 5:

To ensure the best use of government funding, the management of truly feral cats should be focused on interventions to protect wildlife and be supported by an evaluation of the impact of the interventions on the target threatened species. Evaluative research is needed to determine the most cost-effective strategies for protecting threatened and endangered species, using methods which are humane and do not result in the prolonged suffering of animals.

TOPIC 6: The efficacy of import controls for high risk domestic cat varieties to prevent the impacts of feral and domestic cats, including on native wildlife and habitats.

The Australian Pet Welfare Foundation supports a robust Pest Risk Assessment as part of the decision process for the importation of domestic cats that are hybrids of wild cat species. The International Union for Conservation of Nature (IUCN) which harnesses the experience, resources and reach of its more than 1,400 Member organisations and the input of more than 15,000 experts, recommends that hybrids not be imported unless they have been in captivity and domesticated for more than five generations (IUCN 2020). This would require evidence they have been living in home environments during this time.

Recommendation 6:

That the recommendation by the International Union for Conservation of Nature (IUCN) be followed, namely, that hybrid varieties of wild and domestic cats are not imported unless they have been in captivity and domesticated for more than five generations.

TOPIC 7: Public awareness and education in relation to the feral and domestic cat problem

Public awareness and education regarding domestic cats should include awareness of the impact on people in shelters and pounds tasked with killing healthy and treatable cats and kittens. In addition, we need to know more than we know now about the effectiveness of public awareness and education campaigns in increasing responsible cat caring behaviours. There

needs to be greater awareness, for example, of the benefit to cats of confining them overnight to reduce injuries and infections from cat fights and car accidents – a message that may be more effective than one about protection of wildlife for cat owners who never see their cat hunt. Given the large amounts of money spent by state and local governments on education about responsible cat caring behaviours, the cost-effectiveness of these expenditures needs to be assessed in relation to the costs of implementing programs in low socioeconomic areas where the barriers to responsible cat caring behaviours stem not from a lack of knowledge but from a lack of money.

In parallel with greater awareness of the impacts on shelter and pound staff of killing animals, legislation is needed to ensure transparency of performance data that describe the live release rates of local governments and animal welfare agencies. Most, but not all, large animal welfare agencies are already transparent, but amongst local governments only Victorian councils are reasonably transparent, although the data they release may be several years old. Performance data for NSW local governments are compiled, but most residents do not know how to access it. In all the other states, members of the general public are unable to find out what happens to impounded cats without using freedom of information processes. The publication in readily available form – on a website, for example -- of annual data on intakes and outcomes ought to be required of all local governments and welfare agencies.

We noted earlier that the semi-ownership of cats is one of the most persistent hurdles to better management, but that well-conceived community cat programs can address this problem. Initial data from the City of Banyule demonstrates that provision of free desexing programs for owned and semi-owned cats is very effective in reducing numbers of cats impounded (from 8 cats to 1 cat per 1,000 residents), the adverse effect on the mental health of animal management staff, and is extremely cost effective (\$60K cost for desexing resulted in an estimated savings of \$397,500 for impoundment costs - see submission to inquiry from Jenny Cotterell, AMO, Banyule City Council).

This is supported by research which shows, for example, approximately 70% of semi-owners would be prepared to take ownership of the cat (Roetman et al. 2017). And they will then likely engage in more responsible cat ownership behaviours, make greater use of veterinary services, purchase food and pet-related products, and better control their cats' roaming behaviour. Such an increase in the number of responsibly owned cats would be significant, given that the number of semi-owned cats is estimated to be 20-60% of the owned cat population, depending on the location (Animal Medicines Australia 2016; Rand et al. 2019; Toukhsati et al. 2007; Zito et al. 2015).

It is also well documented that desexing cats reduces problematic behaviours, such as yowling, noxious odours, fighting and roaming, which improves social amenity (Webb 1995; Alley Cat Allies 2019). Clearly, such outcomes will also benefit the councils and animal welfare organisations looking to spend their money on programs that work, not least by reducing the exposure of shelter and pound staff to the traumatising effects of killing large numbers of healthy kittens and cats, which will also improve staff retention and job satisfaction.

A lot of government and public money has been spent on convincing the public of the need to kill cats (eg. publications from the Threatened Species Recovery Hub). This has polarized attitudes to cats in the community, hindering a dialogue between people who care about cats and those who care about wildlife. This has been a barrier to working together for a common goal of reducing the number of free-roaming cats in urban areas, and the issues they cause. Moral panic and demonizing science are seriously clouding our collective judgment about how to manage free-roaming cats (Lynn et al. 2019). Some of the publications have resulted in spurious claims; the claim, for example, that on a per capita basis pet cats kill 25% of the native animals that are killed by truly feral cats (Legge et al. 2020). Such misrepresentations hinder the development of a collaborative working environment. The demonization of cats in the media has also led to instances of the cruel injury or wanton killing of wandering pet cats. There is no evidence that the funds spent on convincing the public of the need to kill cats has resulted in any measurable benefit to wildlife, either in urban or in remote areas. Going forward, funding needs to be directed where it is most needed – to support effective strategies to increase numbers of threatened and endangered wildlife.

Recommendation 7:

1. That public awareness and education programs for cat management be evaluated for effectiveness and messaging to ensure they are evidence-based and increase responsible cat caring behaviours. Where these outcomes are not achieved, funds should be redirected to programs providing practical help to people who want to have their cats desexed, identified and contained.
2. That there be mandated annual reporting of intake and outcome statistics for cats (and dogs) by all local governments and animal welfare agencies.
3. Funding for education campaigns to convince the public of the need to kill cats be redirected to strategies that are demonstrated to best protect threatened and endangered species

TOPIC 8: The interaction between domestic cat ownership and the feral cat problem, and best practice approaches to the keeping of domestic cats in this regard.

The Australian Pet Welfare Foundation wishes to reiterate the importance of making distinctions between domestic cats (owned, semi-owned and unowned) in urban, peri-urban and rural (farm) areas of Australia, and truly feral cats. Each of these categories and subcategories of cats requires tailored management approaches.

The best practice approach to managing owned, semi-owned and unowned cats is to increase the proportion that are responsibly owned and desexed. There is a wealth of published research demonstrating on an international basis that non-lethal management approaches based on desexing, adoption of socialised cats, and leaving unsocialised desexed semi-owned/unowned in their home location, have led to significant reductions in urban cat populations. (Levy et al. 2014; Nutter et al. 2004; Spehar & Wolf 2018a, 2018b & 2019; Zito et al. 2018). Pilot studies in Australia (Swarbrick & Rand 2018; Tan et al. 2017) have shown the same thing. Returning desexed cats to their home location helps stabilise the social structure of the cats in that location and helps prevent the immigration of cats from surrounding areas. When a large enough proportion (about 54%) of the semi-owned/unowned cat population is desexed, and when immigrant cats are promptly managed through adoption or desexing and return to the colony, cat numbers decrease by 30% over 2 years and 50% over 5 years (Swarbrick & Rand 2018; Tan et al. 2017). This in turn minimizes the interaction between domestic cats and feral cats, although this interaction is likely of minimal importance given that the median area over which a pet cat travels during the day is 0.5 hectare (approx. 75 meters x 75 meters) and at night 1 hectare (approx. 100 x 100 meters) (Roetman et al. 2017).

Research from other countries has also shown that targeted desexing of semi-owned and unowned cats results in a substantial reduction in the intake of cats and kittens to local shelters, and reduced calls to local government relating to dead cats on streets; strongly suggesting that this approach also results in a smaller cat population in the community at large (Levy et al. 2014, Spehar & Wolf 2018a, 2018b & 2019). Such community cat programs are widely used by local authorities in the USA and Europe where they are often regarded as best practice and typically receive strong community support.

For example, in a Florida study where 60 cats/1,000 residents were desexed (about 54% of the semi-owned/unowned cat population), cat admissions to the local shelter decreased from 13 to 4 cats/1,000 residents, and euthanasia decreased from 8 to 0.4 cats/1,000 residents. Other studies from the USA have reported euthanasia rates for cats dropping from over 70% to \leq 5-

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

10% in shelters that have implemented such programs. Many of these shelters are now well below their carrying capacity for cats, with cat housing being reallocated for other activities, and the change is affecting the design of new shelter buildings. Community cat programs also decrease dog intake into shelters, and increase live release, because there are more resources to treat dogs with health or behaviour problems so they can be adopted (Levy et al. 2014, Million Cat Challenge 2017). There is growing support for large-scale trials to confirm the efficacy of such programs in an Australian context (Wolf et al. 2019).

Results from the City of Banyule demonstrate the efficacy and savings to local government of a best-practice approach to owned and semi-owned cats based on population control through desexing (see City of Banyule submission -Jenny Cotterell). This program started in 2012-13 and offers free desexing, microchipping, and registration for all non-desexed cats in the targeted suburbs. Those who accept the offer to enrol the cat they are caring for complete paperwork for the microchip database and register the cat in their name with the local government. Of those who enrol a cat, approximately 70% are semi-owners and 30% are owners. This strategy has reduced council impoundments from 1,004 cats in 2010-11 (8 cats/1,000 residents) to 152 in 2019-2020 (1 cat/1,000 residents), and euthanasia from 578 to 24 cats/year (from 5 to 0.2 cats/1,000 residents). Between 2017 and 2020, the council used a targeted approach for the desexing strategy, and over that 3-year period, impoundments decreased by 67% and euthanasia by 76%. It has also reduced cat-related complaints. Target areas were selected using existing information held by the council, which was used to identify cat hotspots in the local area using the addresses from which most cats surrendered to the shelter originated, and the areas where residents had expressed concerns about cats. Total cost to council from 2012-13 to 2019-20 was \$60,000 for desexing, and calculated savings from reduced cat impoundments alone was \$397,500.

It should be noted here that the implementation of mandatory desexing or mandatory confinement for cats is not an effective method for managing cats in urban areas, because it does not address the principal underlying barrier to desexing and containment, which is cost. High numbers of semi-owned and unowned cats are principally a problem in low socioeconomic areas where residents cannot afford the costs associated with desexing and containment for owned cats. When surveyed, most residents enrolling a cat in the Banyule free cat desexing program would be described as semi-owners, but said they had been caring for and interacting with the cat on a daily basis, often multiple times each day. They described themselves as being very attached to the cat, that it gave them a reason to get up in the morning, and that it helped them through the tough times. Human relationships with these cats preclude

use of control methods typically used for feral cats. Semi-owners also say that “feeding a stray cat makes me feel good”, that it is the “right thing to do” and “people who are important to me would approve of me feeding a stray cat” (Zito et al. 2015). Most residents reported that the primary reason they had not already had the cat desexed was because it was unaffordable. When they were offered free of charge desexing, microchipping, vaccination, and registration, they supported it, and took on official ownership of the cat.

Recommendation 8:

The focus for managing owned, semi-owned and unowned cats in urban areas should be based on population control through desexing, coupled with effective community education incorporated into a contemporary community cat program. This will minimize the interaction between free-roaming domestic cats (owned cats, semi-owned and unowned) and feral cats.

Conclusions

Each category of cats identified in this submission need carefully targeted and evidence-based strategies to mitigate the problems impacting the environment, including predation and adverse effects on human health, including mental health. There has been minimal attention directed to the investigation of more effective strategies for urban cat management, and that is a serious weakness of current public policy at all levels for managing cats in Australia. Unless that situation changes, “business as usual” will continue. Current management methods are not decreasing the number of free-roaming cats. Nor are they substantially mitigating the problems that they cause, including the effects on the mental health of shelter and pound staff who are killing large numbers of healthy and treatable animals.

The management of feral, owned, semi-owned and unowned cats can be significantly improved. Alternative control methods should be evaluated for their impacts on both wildlife and humans, before and after implementation. Given the complex interactions between predators and prey in any environment, the impact of specific interventions on the native species of value can be very different from that predicted, and in some cases worsen the situation (Lazenby et al. 2014, Bergstrom et al. 2009).

It does not make sense to continue spending scarce resources on studies that are not population-based, and which provide only hypothetical estimates of their impact. And it is long past time for Australia to dispense with a cat management metric that does little more than count the number of cats killed.

Feral cats

Management of feral cats needs to put a priority on strategies which increase numbers of threatened and endangered species, rather than be focused on the number of cats that can be killed. The effectiveness of management strategies in protecting wildlife needs to be documented using validated methods such as motion-detecting wildlife cameras and animal traps, before funding is made available for widespread implementation. We need to be smart about how we invest funds to protect target native species, and we need to ensure that the interventions chosen and implemented are effective.

Domestic cats (owned, semi-owned and unowned)

Better alternatives are also available for owned and semi-owned/unowned cat management, such as the Australian Community Cat Program, which has been pioneered by the Australian Pet Welfare Foundation in collaboration with the RSPCA Queensland, and with many other partner organisations. It is an initiative consistent with the work of the RSPCA, Australia's pre-eminent animal welfare organization. In its recent report 'Identifying Best Practice Domestic Cat Management', RSPCA Australia (2018) specifically recommended that "A research study should be conducted to evaluate whether, and under what specific circumstances, a program of trap, desex, adopt or return and support (TDARS) is an appropriate tool for urban cat management under Australian conditions."

It is also consistent with contemporary public opinion, which clearly favours non-lethal management approaches. Seventy-eight per cent of people recently surveyed in Brisbane, for example, said that they preferred non-lethal management methods based on desexing, compared to only 18% who preferred Brisbane City Council's current method, which is based on trapping and killing 90% of trapped cats (Rand et al. 2019).

Various other direct and indirect benefits can be expected to follow from the implementation of contemporary community cat programs across Australia. Their development and implementation will induce productive collaborations, for example, between universities, local governments, animal welfare and rescue groups, veterinary care companies, and international partners that already undertake such programs. These partners would not support a culling program, but are willing to support non-lethal approaches, because they will improve the mental health of their staff, improve animal welfare, and increase responsible pet ownership behaviours. Therefore, their direct and indirect involvement in rolling out and funding community cat programs in Australia is likely.

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

In the interests of fairness and courtesy, it is important to say that all the key stakeholders in the science and politics of better cat management in Australia are pursuing a common goal. They are looking for sensible ways to reduce numbers of free-roaming cats over the long term, using approaches that are sustainable, effective, and humane.

The way we do things now in Australian cities and towns, is that we try to trap and kill each year as many thousands of healthy but free roaming cats and kittens as we possibly can, pretty much regardless of the pain and suffering this inflicts on animals, and of the awful strain it creates for staff in shelters, municipal facilities and even in private veterinary practices (Frommer & Arluke 1999, Rohlf & Bennett 2005, Reeve & Rogelberg 2005, Baran et al. 2009, Scotney et al. 2015, Tiesman et al. 2015). This approach has failed, for decades, to solve the problem of cat overpopulation in urban areas.

A contemporary community cat program is likely to be more successful than current trap-adopt-or-kill methods. It will be most successful if it combines a reunification program for lost but owned cats, with a desexing campaign for owned, semi-owned and unowned cats in target areas where there are high levels of cat-related complaints or impoundments. Other elements should include identification by microchipping, registration (where required), vaccination, adoption of semi-owned cats by their carers, adoption of readily adoptable unowned cats, and ongoing monitoring of cats, along with community education and assistance to implement best-practice cat management.

When combined, these strategies are likely to achieve the greatest gains in reducing the number of free-roaming urban cats and the problems they cause. At first glance these programs look complex to implement, but pilot Australian work shows they are practical, effective, cost-saving for governments and welfare agencies, and attract the support of a range of stakeholders, including the community at large.

It is unacceptable on animal welfare, human welfare and ethical grounds to continue to pursue public policies for cat management in Australia that knowingly apply the same ineffective methods (i.e. trap-adopt-or-kill) over and over again, and fail to perform due diligence on alternatives that have been shown to be more effective in Australia and overseas.

The scientific basis has been laid for moving in new and better directions, with community cat management programs at their core. And the bottom line of our submission is that the time to make that move is now.

Summary

There is no scientific basis for the continuation of existing, lethal methods for managing domestic and feral populations of cats in Australia. Killing cats will not substantially decrease overall cat numbers or improve overall status of native species considered to be threatened or endangered, except in small localized areas such as islands, within containment fencing, and in individual colonies. Nor will such methods substantially alleviate the complaints and concerns Australians articulate about the impacts of free-roaming domestic cats in the urban and peri-urban places where the vast majority of Australians live.

Final recommendations:

Recommendation 1: At the federal and state level, for legislative and management purposes, two categories of cats be recognised - domestic and feral - and that the three subcategories of domestic cats also be recognised (owned, semi-owned and unowned).

Recommendation 2: For domestic cats (owned, semi-owned and unowned), contemporary community cat programs offer a better way forward. The existing legal and policy obstacles to their adoption and implementation across Australia in urban and peri-urban areas need to be removed.

Recommendation 3: For feral cats, future government funding should be tied to management strategies that result in a measurable increase in the numbers of endangered native species, rather than being assessed by how many cats are killed.

We respectfully submit that Parliament has a golden opportunity through the House Standing Committee's current Cat Inquiry to make a fundamental and much needed redirection of public policy for cat management in Australia. And we look forward, along with many others, to celebrating that outcome.

References

- ABC News (2019) Veterinarians abandon profession as suicide rate remains alarmingly high, accessed August 2020, <https://www.abc.net.au/news/2019-01-13/vet-shortage-as-suicide-rates-high/10708686>.
- Alberthsen C. (2014), The Australian Excess Cat Population: An Exploration of Cat Admissions and Out-comes to RSPCA Shelters, PhD Thesis, The University of Queensland.
- Alberthsen C., Rand J., Bennett P., Paterson M., Lawrie, M. and Morton, J. (2013) “Cat admissions to RSPCA shelters in Queensland, Australia: Description of cats and risk factors for euthanasia after entry”, *Australian Veterinary Journal*, 91, 35–42.
- Alberthsen C., Rand J.S., Morton J., Bennett P., Paterson M. and Vankan D. (2016) “Numbers and characteristics of cats admitted to Royal Society for the Prevention of Cruelty to Animals (RSPCA) shelters in Australia and reasons for surrender”, *Animals*, 6(3), 23-43.
- Alley Cat Allies (2019) Cats fighting, <https://www.alleycat.org/community-cat-care/catsfighting/> (accessed 18 September 2019).
- Animal Health Australia (2020), accessed August 2020, <https://animalhealthaustralia.com.au/wp-content/uploads/NSHMP-Sarcocystis.pdf>
- Animal Medicines Australia (2016), Pet ownership in Australia, accessed 01/10/2019, https://animalmedicinesaustralia.org.au/wp-content/uploads/2016/11/AMA_Pet-Ownership-in-Australia-2016-Report_sml.pdf.
- Australian Bureau of Statistics (ABS) (2016), Housing occupancy and utilisation, accessed August 2020, <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4130.0~2013-14~Main%20Features~Housing%20Occupancy%20and%20Utilisation~4>
- Baker P.J., Molony S.E., Stone E., Cuthill I.C., Harris S. (2008) “Cats about town: is predation by free-ranging pet cats (*Felis catus*) likely to affect urban bird populations?”, *IBIS*, 150, 89-96.
- Baran B.E., Allen J.A., Rogelberg S.G., Spitzmüller C., Digiacomo N.A., Webb J.B., Carter N.T., Clark O.L., Teeter L.A. and Walker A.G. (2009) “Euthanasia-related strain and coping strategies in animal shelter employees”, *Journal of the American Veterinary Medical Association*, 235(1), 83-88, DOI: 10.2460/javma.235.1.83.
- Benjamin K. and Thompson A. (2017) 10 Scientific Benefits of Being a Cat Owner. <https://www.mentalfloss.com/article/51154/10-scientific-benefits-being-cat-owner>.

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

- Bergstrom D.M., Lucieer A., Kiefer K., Wasley J., Belbin L., Pedersen T.K. and Chown S.L. (2009) “Indirect effects of invasive species removal devastate World Heritage Island”, *Journal Applied Ecology*, 46, DOI: 10.1111/j.1365-2664.2008.01601.x.
- Boone J.D., Miller P.S., Briggs J.R., Benka V.A.W., Lawler D.F., Slater M., Levy J.K. and Zawistowski S. (2019) “A long-term lens: cumulative impacts of free-roaming cat management strategy and intensity on preventable cat mortalities”, *Frontiers in Veterinary Science*, 6, 238.
- Carlisle-Frank P., Frank J.M. and Nielsen L. (2005) “Companion animal renters and pet-friendly housing in the US”, *Anthrozoös*, Vol 18, Issue 1, Pages 59-77, <http://www.tandfonline.com/doi/abs/10.2752/089279305785594270>.
- Centers for Disease Control and Prevention (2016), *Healthy Pets, Healthy People: Cats*, accessed February 2018, <https://www.cdc.gov/healthypets/pets/cats.html>.
- Chadwick, M. (2017) “Workshop – Responsible pet ownership in action: Transforming communities through social change”, *Getting them home keeping them home*, 7th National G2Z summit, 13-15 September, Mantra on View, Surfers Paradise, accessed August 2020, <https://www.g2z.org.au/pdf/Myles%20Chadwick%20%20Workshop%20abstract.pdf>.
- Chomel B.B. (2014) “Emerging and Re-Emerging Zoonoses of Dogs and Cats”, *Animals*, 4(3), 434-445, DOI:10.3390/ani4030434.
- Chu K. (2007) “Population characteristics and neuter status of cats living in households in the United States”, *Journal of the American Veterinary Medical Association*, 234, 1023-1030.
- Commonwealth of Australia (2015) *Threat Abatement Plan for Predation by Feral Cats*, accessed 01/10/2019, <https://www.environment.gov.au/system/files/resources/78f3dea5-c278-4273-8923-fa0de27aacfb/files/tap-predation-feral-cats-2015.pdf>.
- Danaher C. (2016) Bid to make Byron Bay pet-friendly for renters. 15 November <http://www.realestate.com.au/news/bid-to-make-byron-bay-pet-friendly-for-renters/>.
- Davis SW and Dubey JP (1995). Mediation of immunity to *Toxoplasma gondii* oocyst shedding in cats. *J Parasitol* 81, 882-6.
- Department of Environment and Energy (2017), *What have we learned from banding studies?* Department of Environment and Energy, Ed. Australian Government, <https://www.environment.gov.au/science/bird-and-bat-banding/about-banding/banding-studies>.

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

- Dickman C.R. (1996) Overview of the Impacts of Feral Cats on Australian Native Fauna, <https://www.environment.gov.au/system/files/resources/315373ff-04b3-49a7-ac5c-44f173e9b3f8/files/impacts-feral-cats.pdf>.
- Dubey J.P. (1995) “Duration of Immunity to Shedding of *Toxoplasma Gondii* Oocysts by Cats.” *The Journal of Parasitology* 81 (3): 410–15.
- Epe C. (2011) “Helminths in the dog and cat”, *Kleintierpraxis*, 56(3), 136-154.
- Franklin A. (2006) “Be[a]ware of the Dog”: A Post-Humanist Approach to Housing Housing, *Theory and Society*, 23(3), 137-156.
- Frommer S.S. and Arluke A. (1999) “Loving them to death: Blame-displacing strategies of animal shelter workers and surrenderers”, *Society and Animals*, 7, 1-16.
- Grayson J., Calver M. and Lymbery A. (2007) “Species richness and community composition of passerine birds in suburban Perth: is predation by pet cats the most important factor?” In *Pest or Guest: The Zoology of Overabundance*, Lunney D., Eby P., Hutchings P., Burgin S., Eds, Royal Zoological Society of New South Wales: Mossman, NSW, Australia, pp. 195-207.
- 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.
- International Union for Conservation of Nature (IUCN) (2020) <https://www.iucn.org/resources> accessed Aug 2020.
- Keil C. (1998) Loneliness, stress, and human-animal attachment among older adults. In C. C. Wilson & D. C. Turner (Eds.), *Companion animals in human health* (pp. 123-134). Thousand Oaks, CA: SAGE Publications Ltd. <https://dx.doi.org/10.4135/9781452232959.n7>.
- Kennedy B.P.A., Cumming B. and Brown W.Y. (2020), “Global Strategies for Population Management of Domestic Cats (*Felis Catus*): A Systematic Review to Inform Best Practice Management for Remote Indigenous Communities in Australia”, *Animals*, 10(4): 663, DOI: 10.3390/ani10040663.
- Kerr C., Ran, J., Morton J., Reid R. and Paterson M. (2018) “Changes associated with improved outcomes for cats entering RSPCA Queensland shelters from 2011 to 2016”, *Animals*, 8(6), 95.
- Kiermeier A (2008) National serological baseline survey of *Toxoplasma gondii* in lambs and sheep, accessed 15/08/2020 <https://www.mla.com.au/research-and-development/search-rd-reports/final-report-details/Product-Integrity/National-serological-baseline-survey-of-Toxoplasma-gondii-in-lambs-and-sheep/1539>.

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

- Kreisler R.E., Cornell H.N. and Levy J.K. (2019) “Decrease in population and increase in welfare of community cats in a twenty-three year trap-neuter-return program in Key Largo, FL: the ORCAT Program”, *Frontiers in Veterinary Science*, 6, 7.
- Lazenby B.T., Mooney N.J. and Dickman C.R. (2014) “Effects of low-level culling of feral cats in open populations: a case study from the forests of southern Tasmania”, *Wildlife Research*, 41(5), 407.
- Legge S., Murphy B.P., McGregor H., Woinarski J.C.Z., Augusteyn J., Ballard G., Baseler M., Buckmaster T., Dickman C.R., Doherty T. and Edwards G. (2017) “Enumerating a continental-scale threat: how many feral cats are in Australia?”, *Biological Conservation*, 206, pp.293-303, DOI: 10.1016/j.biocon.2016.11.032.
- Legge S., Woinarski J.C.Z., Dickman C.R., Murphy B.P., Woolley L.A., and Calver M.C. (2020) “We Need to Worry about Bella and Charlie: The Impacts of Pet Cats on Australian Wildlife”, *Wildlife Research*, DOI: 10.1071/WR19174.
- Levy J.K., Isaza N.M. and Scott K.C. (2014) “Effect of high-impact targeted trap-neuter-return and adoption of community cats on cat intake to a shelter”, *The Veterinary Journal*, 201, 269–274.
- Lilith M., Calver M. and Garkaklis M. (2010) “Do cat restrictions lead to increased species diversity or abundance of small and medium-sized mammals in remnant urban bushland?”, *Pacific Conservation Biology*, 16, 162-172.
- Loss S.R., Will T. and Marra P.P. (2013) “The Impact of Free-Ranging Domestic Cats on Wildlife of the United States”, *Nature Communications*, 4(1396): 1–8. DOI: 10.1038/ncomms2380.
- Lynn W.S., Santiago-Avila F., Lindenmayer J., Hadidian J., Wallach A., King B. (2019) “A moral panic over cats” *Conservation Biology* 33 (4): 769-776
- Maclagan S.J., Coates T. and Ritchie E.G. (2018) “Don't judge habitat on its novelty: Assessing the value of novel habitats for an endangered mammal in a peri-urban landscape”, *Biological Conservation*, 223, 11-18, DOI: 10.1016/j.biocon.2018.04.022.
- Matthews A., Dickman C.R. and Major R.E. (1999) “The influence of fragment size and edge on nest predation in urban bushland”, *Ecography*, 22(4), 349-356.
- McConnell A., Brown C., Shoda T. (2011) Friends with Benefits: On the Positive Consequences of Pet Ownership *J Personality & Soc Psycho*, 101(6), 1239-1252.
- McLeod, L.J., Hine D.W. and Bengsen A.J. (2015) “Born to Roam? Surveying Cat Owners in Tasmania, Australia, to Identify the Drivers and Barriers to Cat Containment”,

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

- Preventive Veterinary Medicine, 122 (3): 339–44, DOI: 10.1016/j.prevetmed.2015.11.007.
- Miller, P.S., Boone, J.D., Briggs, J.R., Lawler, D.F., Levy, J.K., Nutter, F.B., Slater, M. and Zawistowski, S. (2014) “Simulating free-roaming cat population management options in open demographic environments”, PLoS ONE, 9, e113553.
- Million Cat Challenge, HSUS Expo (2017) <https://youtu.be/NyE4XwUFZaY> or <https://petwelfare.org.au/video-benefits-community-cat-programs/>.
- Møller, A.P. and Erritzøe, J. (2000) “Predation against birds with low immunocompetence”, Oecologia, 122, 500-504, DOI: 10.1007/s004420050.
- Munday B.L. (1975a) Prevalence of Toxoplasmosis in Tasmanian meat animals. Aust Vet J, 51: 315-316.
- Munday B.L. (1975b) Prevalence of sarcosporidiosis in Australian meat animals. Aust Vet J. 51, 478-480.
- Murphy, B.P., Woolley L.A., Geyle H.M., Legge S.M., Palmer R., Dickman C.R., Augusteyn J. (2019) “Introduced Cats (*Felis Catus*) Eating a Continental Fauna: The Number of Mammals Killed in Australia”, Biological Conservation, 237 (January): 28–40, DOI: 10.1016/j.biocon.2019.06.013.
- National Research Council (1992) Biologic Markers in Immunotoxicology. The National Academies Press: Washington, DC, pp 224.
- Natoli E., Maragliano L., Cariola G., Faini A., Bonanni R., Cafazzo S. and Fantini C. (2006) “Management of Feral Domestic Cats in the Urban Environment of Rome (Italy)” *Preventive Veterinary Medicine* 77 (3–4): 180–85, DOI: 10.1016/j.prevetmed.2006.06.005.
- NSW Office of Local Government. Statistics About Dogs and Cats. Available online at: <https://www.olg.nsw.gov.au/public/dogs-and-cats/information-for-the-community/statistics-about-companion-animals>.
- Nutter F.B., Levine J.F. and Stoskopf M.K. (2004) “Reproductive Capacity of Free-Roaming Domestic Cats and Kitten Survival Rate”, Journal of the American Veterinary Medical Association 225(9): 1399–1402, DOI: 10.2460/javma.2004.225.1399.
- Power, E. (2013) Dogs and Practices of Community and Neighboring, Anthrozoös, 26(4), 579-591.
- Quelch J. (2015) Pets paying the price for a hard Queensland rental market, available at: <http://www.domain.com.au/news/pets-paying-the-price-for-a-hard-queensland-rental-market-20151107-gkt6bc/>.

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

- Rand J., Lancaster E., Inwood G., Cluderay C. and Marston L. (2018) “Strategies to reduce the euthanasia of impounded dogs and cats used by councils in Victoria, Australia”, *Animals* 8(7): 1–35, DOI:10.3390/ani8070100.
- Rand, J., Fisher, G., Lamb, K., and A. Hayward (2019) “Public opinions on strategies for managing stray cats and predictors of opposition to trap-neuter and return in Brisbane, Australia”, *Frontiers in Veterinary Science*, 5(290): 1–17, DOI: 10.3389/fvets.2018.00290.
- Reeve C.L. and Rogelberg S.G. (2005) “The caring-killing paradox: euthanasia-related strain among animal- shelter workers”, *Journal of Applied Social Psychology*, 35: 119-43.
- Robinson, S.A. and Copson G.R. (2014) “Eradication of Cats (*Felis Catus*) from Subantarctic Macquarie Island”, *Ecological Management and Restoration*, 15(1): 34–40, DOI: 10.1111/emr.12073.
- Roetman P., Tindle H., Litchfield C., Chiera B., Quinton G., Kikillus H., Bruce D. and Kays R. (2017) “Cat Tracker South Australia: Understanding Pet Cats through Citizen Science.”, Adelaide, DOI: 10.4226/78/5892ce70b245a.
- Rogelberg, S. G., Reeve, C. L., Spitzmuller, C., Digiacomio, N. A., Clark, O. L., Teeter, L. A., Carter, N. T. (2007). Impact of euthanasia rates, euthanasia practices, and human resource practices on employee turnover in animal shelters. *Journal of the American Veterinary Medical Association*, 230(5), 713-719.
- Rohlf V. and Bennett P.C. (2005) “Perpetration-induced traumatic stress in persons who euthanize nonhuman animals in surgeries, animal shelters, and laboratories”, *Society and Animals*, 13: 201-19.
- RSPCA Australia (2018), Summary of Findings and Recommendations - Identifying best practice domestic cat management in Australia, accessed 01/10/2019, <https://kb.rspca.org.au/wp-content/uploads/2019/01/Findings-and-Recommendations-Identifying-Best-Practice-Domestic-Cat-Management.pdf>.
- SBS News (2020) A look at Australia’s Veterinarian Crisis, accessed Aug 2020, <https://www.sbs.com.au/news/insight/a-look-at-australia-s-veterinarian-crisis>.
- Scallan E., Hoekstra R.M., Angulo F.J., Tauxe R.V., Widdowson, M-A., Roy S.L. (2011), “Foodborne illness acquired in the United States major pathogens”, *Emerging Infectious Disease*, 17, 7–15, DOI: 10.3201/eid1701.P11101.
- Scotney R.L., McLaughlin D., Keates H.L. (2015) “A systematic review of the effects of euthanasia and occupational stress in personnel working with animals in animal

- shelters, veterinary clinics, and biomedical research facilities”, *Journal of the American Veterinary Medical Association*, 247, 1121–1130.
- Spehar D.D. and Wolf P.J. (2017) “An examination of an iconic trap-neuter-return program: the Newburyport, Massachusetts case study”, *Animals* 7, 81.
- Spehar D.D. and Wolf P.J. (2018a) “The impact of an integrated program of return-to-field and targeted trap-neuter-return on feline intake and euthanasia at a municipal animal shelter”, *Animals*, 8, 55.
- Spehar D.D. and Wolf P.J. (2018b) “A case study in citizen science: the effectiveness of a trap-neuter-return program in a Chicago neighborhood”, *Animals* 7, 14.
- Spehar D.D. and Wolf P.J. (2019) “Integrated return-to-field and targeted trap-neuter-vaccinate-return programs result in reductions of feline intake and euthanasia at six municipal animal shelters”, *Frontiers in Veterinary Science*, 6, 77.
- Stobo-Wilson A., Murphy B., Gillespie G., Dielenberg J. and Woinarski J. (2020), “The mystery of the Top End’s vanishing wildlife, and the unexpected culprits”, *The Conversation*, <https://theconversation.com/the-mystery-of-the-top-ends-vanishing-wildlife-and-the-unexpected-culprits-143268>.
- Swarbrick H. and Rand J. (2018) “Application of a protocol based on trap-neuter-return (TNR) to manage unowned urban cats on an Australian university campus”, *Animals* 8, 77.
- Sykes, J.E. (2013) *Canine and Feline Infectious Diseases*, Elsevier Health E-Book.
- Tan K., Rand J. and Morton J. (2017) “Trap-neuter-return activities in urban stray cat colonies in Australia”, *Animals*, 7(6), 46-67, DOI: 10.3390/ani7060046.
- Tiesman H.M.; Konda S.; Hartley D.; Menendez C.C.; Ridenour M. and Hendricks S. (2015) “Suicide in U.S. Workplaces, 2003-2010: A comparison with non-workplace suicides” *American Journal of Preventive Medicine*, 48(6), 674-682.
- Toukhsati, S.R., Bennett, P.C. and Coleman G.J. (2007) “Behaviors and attitudes towards semi-owned cats, *Anthrozoös*, 20(2), 131-142, DOI: 10.2752/175303707X207927.
- VanWormer, E.; Conrad, P.; Miller, M.; Melli, A.; Carpenter, T.; Mazet, J.K. (2013) *Toxoplasma gondii*, source to sea: higher contribution of domestic felids to terrestrial parasite loading despite lower infection prevalence. *EcoHealth* 1–13.
- Webb, C. Management of unowned cat colonies. *Urban Animal Management Conference Proceedings* 1995.
- Woinarski J.C.Z., Murphy B.P., Legge S.M.S., Garnett T., Lawes M.J., Comer S., Dickman C. R. (2017) “How Many Birds Are Killed by Cats in Australia?”, *Biological Conservation* 214 (July): 76–87, DOI: 10.1016/j.biocon.2017.08.006.

Inquiry into Feral and Domestic cats
AUSTRALIAN PET WELFARE FOUNDATION

- Woinarski, J.C.Z., Murphy B.P., Palmer R., Legge S.M., Dickman C.R., Doherty T.S., Edwards G., Nankivell A., Read J.L. and Stokeld D. (2018) “How Many Reptiles Are Killed by Cats in Australia?”, *Wildlife Research* 45(3), 247–66, DOI: 10.1071/WR17160.
- Wolf P.J., Rand, J., Swarbrick H., Spehar, D.D., Norris, J. (2019) “Reply to Crawford et al.: Why Trap-Neuter-Return (TNR) Is an ethical solution for stray cat management”, *Animals* 9, 689.
- Wood L., Giles-Corti B., Bulsara M. and Bosch B. (2007) “More Than a Furry Companion: The Ripple Effect of Companion Animals on Neighborhood Interactions and the Sense of Community”, *Society and Animals* 15(1), 43-56.
- Zito S., Vankan D., Bennett P., Paterson M., Phillips C.J. (2015), “Cat ownership perception and caretaking explored in an internet survey of people associated with cats”, *PLoS ONE*, 10, e0133293, DOI: 10.1371/journal.pone.0133293.
- Zito, S., Morton, J., Paterson, M., Vankan, D., Bennett, P.C., Rand J. and Phillips, C.J.C (2016) “Cross-Sectional Study of Characteristics of Owners and Nonowners Surrendering Cats to Four Australian Animal Shelters”, *Journal of Applied Animal Welfare Science*, 19(2), 126-143, DOI: 10.1080/10888705.2015.1121145.
- Zito. S., Walker. J., Gates M.C. and Dale. A. (2019), “A preliminary assessment of the comparative welfare states of owned, managed stray, and unmanaged stray cats”, *Frontiers in Veterinary Science*, 6(40). DOI: 10.3389/fvets.2019.00040.