From:	Mhairi Roberts
To:	epc council
Cc:	ecosystems; Rebecca Cook
Subject:	RE: Inquiry into ecosystem decline in Victoria - Transcript - 11 March 2021
Date:	Wednesday, 31 March 2021 4:55:39 PM
Attachments:	image003.png Identifying-Best-Practice-Domestic-Cat-Management-in-Australia-RSPCA-Research-Report-May-2018.pdf

Dear Cat,

I have no changes to make on the transcript.

Please find further information below relating to the questions on notice:

1. Are you able to kind of highlight any of those differences, and is there any point I guess in highlighting those differences, or should there just be a blanket approach to managing it? And what can we learn from data in that space? As noted on page 59 of the transcript

   The RSPCA believes that any management program must adopt a holistic, strategic and humane approach and aim to reduce the impact of hunting by cats. I have attached the RSPCA Australia report Identifying Best Practice Domestic Cat Management in Australia which speaks to our recommendation on how to categorise cats. It has not been recommended to look at sex or breed differences – it is likely that this would further complicate an already complicated management issue.

2. Are you able to speak to any research that might be being done? I talked about desexing, but are there other ways of managing and keeping fertility rates down in some of these animals, like cats? Is there any research that you aware of that is being done in that space? As noted on page 61 of the transcript

   As mentioned above, please find attached the RSPCA Australia report Identifying Best Practice Domestic Cat Management in Australia which speaks to recommendations to manage domestic cats. This report includes a large reference list of research in this space. I would also refer the Committee to 'PestSmart' which is run by the Centre for Invasive Species Solutions which has a suite of resources available that speaks to management tools available for feral cats: https://pestsmart.org.au/toolkits/feral-cats/

Kind regards,

Mhairi Roberts
Policy and Advocacy Manager

RSPCA Victoria

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[redacted]

From: epc council <epc.council@parliament.vic.gov.au>

RSPCA
for all creatures **great** & **small**

Identifying Best Practice Domestic Cat Management in Australia

May 2018

RSPCA Australia gratefully acknowledges financial support from the Office of the Threatened Species Commissioner, through the Australian Government's National Landcare Program, for the development of the Discussion Paper on which this report is based.

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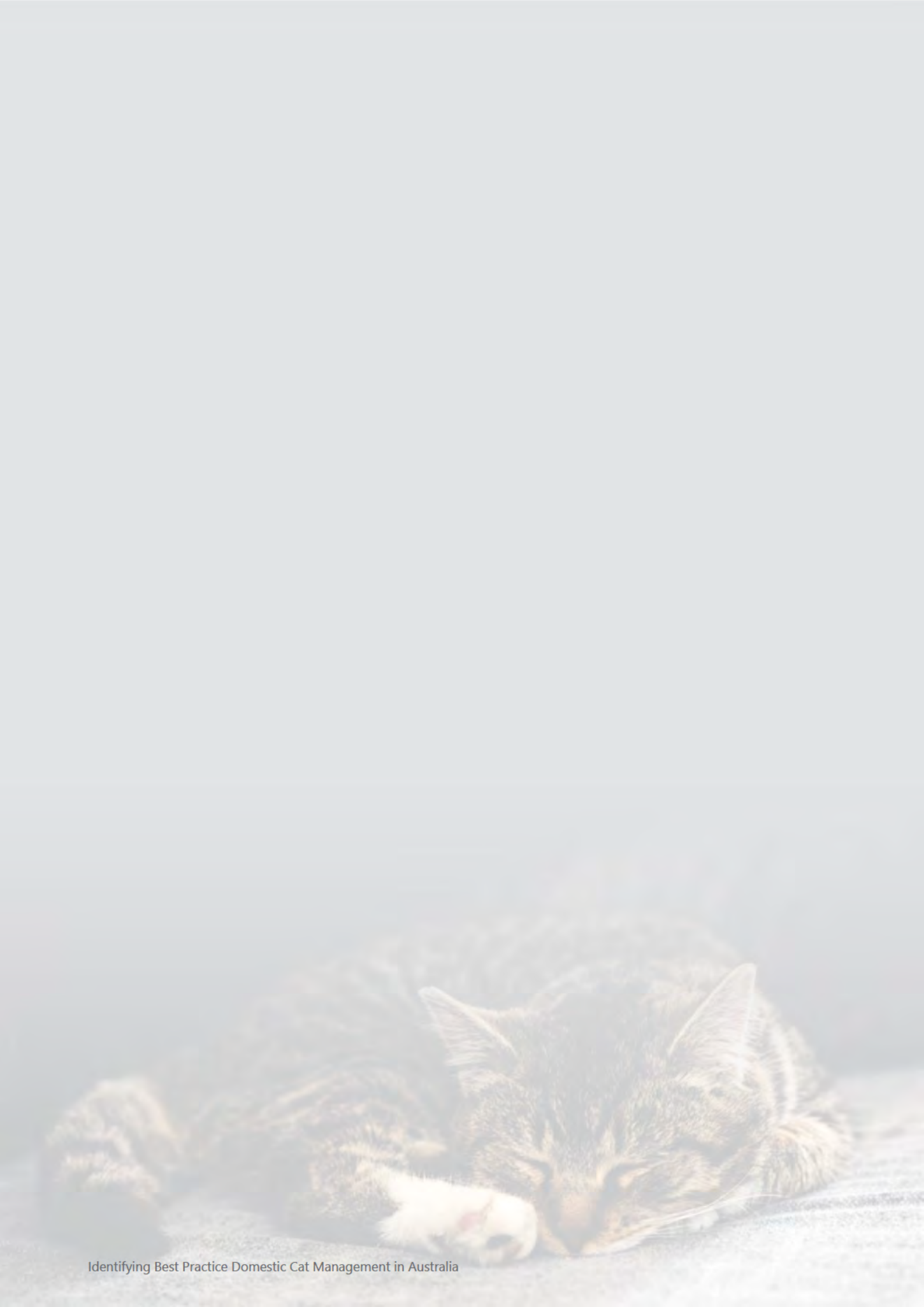


Foreword

RSPCA shelter staff, like those from many other organisations, are faced with the daily challenge of finding homes for a continuing intake of cats and kittens. This is despite significant efforts by many welfare and rescue organisations over recent decades to reduce cat overpopulation. The intake of cats into shelters and rescue groups is just one of the many symptoms that characterise the problem of cat overpopulation in Australia. In this report, we take a step back from the front line to examine how the RSPCA and the broader community might better tackle this problem at its source.

The concept for this report originated from a discussion during a meeting of the National Feral Cat Taskforce. The Taskforce provides a platform for national coordination of feral cat management activities, something that is currently lacking when it comes to domestic cat management. As a consequence of that meeting, the Office of the Threatened Species Commissioner, through the National Landcare Program, helped to fund the development of a discussion paper which was released for public consultation in May 2017.

We received a total of 1159 online and 759 email responses during a nine-week public consultation period, including 104 detailed submissions. RSPCA Australia is extremely grateful for the time, effort and valuable contributions made by those who provided comments. All but one of the recommendations were supported – a very encouraging response given that feedback came from many different sources – and one that suggests that reaching consensus on approaches to domestic cat management should be achievable.

This report is based on the discussion paper and our detailed consideration of the feedback obtained through the public consultation process. It examines existing knowledge, legislation and strategies for cat management to help identify potential best practice approaches that will protect cat welfare whilst reducing the negative impacts of domestic cats.

Managing domestic cats in the community is a complex and persistent problem. What is clear from this report is that the key to solving it is active collaboration between all stakeholders, from local governments, animal welfare and rescue groups, veterinarians, to cat owners themselves. This is not the first report to examine this issue, but through examining previous approaches and strategies and drilling down into what works and what does not, we hope that it will help ensure that future cat management strategies and activities are evidence-based and have the best possible chance of success.

Dr Bidda Jones
Chief Scientist
RSPCA Australia

SUMMARY OF FINDINGS AND RECOMMENDATIONS

1 Cat categories

Various definitions have been used to categorise cats in different populations, but most share a common basis in that they describe some aspect of a cat's relationship with humans.

The lack of universally agreed cat definitions causes confusion and conflict creating inconsistencies in legislation and difficulties in implementing cat management initiatives.

Cat management strategies aimed at influencing human behaviour must recognise the ownership status of cats as well as their level of socialisation to, dependence on and relationship with humans.

The most important definitional delineation is between feral and domestic cats as this has profound consequences for the treatment and fate of individual cats.

Recommendation 1

All jurisdictions should define all cats with some dependence (direct or indirect) on humans as **domestic** cats. Cats who are unowned, unsocialised, have no relationship with or dependence on humans and reproduce in the wild should be defined as **feral** cats.

Domestic cats (including owned/semi-owned and unowned cats) should be excluded from the legal definition of feral cats. This will achieve greater consistency in implementing management programs, legislation, research and evaluation activities as well as engendering community support.

Cat management strategies should recognise three subcategories of domestic cats using the following definitions:

- **Owned** – these 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** – these cats are fed or provided with other care by people who do not consider they own them. They are of varying sociability with many socialised to humans and may be associated with one or more households.
- **Unowned** – these cats are indirectly depending on humans with some having casual and temporary interactions with humans. They are of varying sociability, including some who are unsocialised to humans, and may live in groups.

2 Cat management legislation

Domestic cat management is legislated at both the state/territory and local government level. Some states have combined companion animal legislation whilst others have separate legislation for dogs and cats. There is no state-based cat management legislation in the Northern Territory (NT). Provisions for cat management may also be enacted by local government in the form of council bylaws.

There are significant inconsistencies in the provisions of domestic cat management legislation and bylaws.

In most states there are overlapping provisions between different types of legislation affecting cats, which can cause confusion or conflict amongst stakeholders and have a detrimental effect on how domestic cats are managed.

The purpose of cat management legislation is not always clearly stated. The Tasmanian *Cat Management Act 2009* makes specific reference to the management of domestic, unowned and feral cats that is not evident in other state legislation.

Recommendation 2

The significant inconsistencies between states/territories and between local councils, in legislation, approach and level of commitment to domestic cat management, need to be urgently addressed. State and territory jurisdictions should work together to share resources, coordinate research and evaluation activities and identify and implement consistent approaches to the management of unowned, semi-owned and owned cats.

3 Cat management advisory groups

Some states have established cat management advisory groups that can play an important role in monitoring and evaluating cat management strategies.

Recommendation 3

State governments should consider establishing a cat management advisory group with terms of reference that include:

- advising and advocating on changes to state and local government legislation
- monitoring the implementation of cat management legislation and compliance with mandatory requirements
- consulting with key stakeholders
- developing relevant codes of practice (COPs) and standard operating procedures (SOPs) for cat management
- identifying key metrics to evaluate the effectiveness of cat management strategies
- funding relevant research and evaluation.

4 Cat management plans

A cat management plan may be a useful tool for local councils to identify key priorities, develop strategic and operational plans as well as evaluation measures.

Local councils require support and financial resources to implement effective cat management programs.

Development and distribution of templates for cat management plans and other relevant documents as well as SOPs would greatly assist councils.

Key data relating to cat management is either not collected or inconsistent information is recorded making it difficult to evaluate and compare management strategies.

Recommendation 4

State governments should encourage and support local councils to develop and implement cat management plans that include:

- defining and quantifying cat management aspects with a focus on impact
- setting clear, achievable and consistent objectives
- using humane, ethical and sustainable strategies
- identifying the responsibilities of key stakeholders
- consideration of owned, unowned and semi-owned cats
- securing sufficient resources for implementation
- facilitating the collection and storage of standardised data
- formally evaluating management strategies using agreed measures.

5 Community collaboration

Community collaboration has successfully contributed to humane domestic cat support and management in several locations across Australia.

Councils that partner with reputable local welfare/rescue groups are able to meet public expectations by cost-effectively minimising the number of healthy, adoptable cats killed and increasing the number of desexed domestic cats adopted into the community.

Formal written agreements help ensure key roles and responsibilities are agreed by all parties engaging in a collaborative partnership.

Recommendation 5

Best practice cat management requires the involvement of all stakeholders in decision making and solutions. Where possible, councils and cat welfare groups should establish formal collaborative partnerships to implement humane and effective cat support and management programs.

6 Feral cat management

Declaring feral cats as a pest under state legislation is regarded by many as a key step in recognising that urgent action is required to address their impacts.

However, there is a high level of public concern that this has a detrimental impact on the treatment of both feral and domestic cats, including inciting deliberate cruelty and unlawful killing.

Ensuring the definition of a feral cat excludes domestic cats (see Recommendation 1), recognising all cats as sentient animals, and avoiding demonising feral cats in information materials may help mitigate this.

Some of the issues arising from overlapping definitions of feral and domestic cats could be avoided through better coordination between government departments.

Recommendation 6

A coordinated approach to the management of feral and domestic cats is essential to ensure that laws and strategies are complementary, not opposing, and that no vital aspects in terms of definitions, responsibilities and initiatives are overlooked. Legislation to control feral cats must recognise that they are sentient animals capable of experiencing pain, suffering and distress, and provide protection from cruelty.

7 Animal welfare impacts of control methods

Best practice feral cat management requires an understanding of the animal welfare impacts (humaneness) of control techniques and how to carry them out in the best possible way.

All existing control methods for feral cats cause some pain, suffering or distress: more humane methods need to be developed and adopted as a matter of urgency.

Mechanisms to improve standards include mandatory compliance with a COP and SOPs, reviewing SOPs, developing additional SOPs for all new methods and requiring the most humane techniques to be used.

Recommendation 7

Practitioners responsible for implementing feral (and domestic) cat management should have an understanding of the animal welfare impacts of available methods, and know how to carry them out in the best way possible. Compliance with COPs and SOPs for the humane treatment of cats, should be a mandatory requirement for cat management activities.

8 Semi-owned cats

Shelters and rescue groups have applied considerable creative thinking and resources to try to increase cat adoption rates. Despite these efforts, large numbers of cats (including unowned/semi-owned cats) are still not being adopted.

Increasing the number of local councils who promote the adoption of impounded cats could alleviate the burden on cat rescue groups and shelters. Specifically identifying and targeting semi-owners of cats could help reduce surrender rates and the number of semi-owned cats living in the community.

Recommendation 8

Cat management plans and strategies should recognise semi-owned cats as a separate category to unowned cats and ensure that cat semi-owners are specifically targeted in education, desexing and other relevant cat management programs.

9 Trapping programs

Unconfined owned cats and semi-owned cats can be affected by trap and kill measures in addition to the unowned cats targeted.

Trap and kill programs in peri-urban and urban areas are very difficult to effectively implement. Ineffective implementation results in failure to reduce cat numbers in the long term and consequently no significant improvement for issues of concern such as wildlife predation.

The community is increasingly opposed to lethal cat control programs, particularly in urban areas.

Some councils who are involved in cat trapping also promote adoption of trapped unowned and socialised cats on a small scale.

Recommendation 9

Trap and kill programs should not be considered as an effective long-term solution to cat management. Where trapping is used, procedures should follow best practice and include a community education program and a process for adoption of kittens and cats.

10 TNR programs

There are reports of trap, neuter, return (TNR) programs stabilising and reducing unowned and semi-owned cat populations.

Poor implementation is likely to have contributed to unsuccessful TNR programs where substantial and persistent reductions in cat populations have not been demonstrated.

Data on the impact on wildlife have not been collected or reported in association with successful TNR programs.

Ten factors are identified which contribute to successful TNR programs, including high levels of desexing in a targeted area, removal of kittens and socialised adults for adoption, monitoring and rapid desexing of immigrant cats, strong community engagement, and support and ongoing data collection and evaluation.

Concern over the use of TNR could be mitigated by specifying conditions on its use, ensuring adoption of cats is an integral part of the program (this approach is termed TDARS or trap, desex, adopt or return and support) and assessing the effect on wildlife predation.

Recommendation 10

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.

11 Targeted low-cost desexing of semi-owned cats

Targeted low-cost desexing programs for semi-owned cats could help improve the welfare and reduce the numbers of semi-owned cats and kittens born.

Education programs targeting cat semi-owners are a vital component of any strategy aimed at trying to manage semi-owned cats.

Allowing semi-owned cats to be desexed and remain with their semi-owner, even if the semi-owner cannot or will not take full 'ownership' would require the revision and clarification of current cat classification systems in some jurisdictions.

Recommendation 11

A research study should be conducted to evaluate whether a targeted low-cost desexing program, combined with education of cat semi-owners, is an effective tool for managing semi-owned cats.

12 Rental access

Significant progress has been made in reducing cat surrender through initiatives from animal welfare organisations.

An important factor in surrender and abandonment of cats is the limited availability of cat-friendly rental accommodation. Changes to tenancy laws and promoting the advantages of renting to pet owners may help to improve this.

Cat abandonment continues despite being illegal under animal welfare legislation in all states/territories in Australia.

Recommendation 12

Cat surrender and abandonment could be reduced through increasing the availability of cat-friendly rental accommodation and promoting the value of the human-cat bond.

13 Cat containment

Cat containment regulations need to mandate 24-hour containment, rather than night-time curfews, if they are to significantly reduce wildlife predation, breeding of unwanted cats and cat nuisance.

Enforcement of cat containment regulations can prove difficult.

Implementation of cat containment should be preceded by programs to educate owners about the benefits of containment and how to ensure the welfare of contained cats.

More data are needed on the impact of cat containment on prevention of wildlife predation, health and welfare of confined pet cats and risks associated with cat trapping.

The greatest benefit from cat containment would come from combining these regulations with mandatory desexing and identification (so that cats found outdoors can be identified as owned), and strategies to manage unowned cats.

Recommendation 13

Education programs are needed to increase the acceptance and uptake of 24-hour cat containment, with subsequent regulation in areas of high conservation value.

14 Identification

Microchipping is an extremely valuable tool for cat identification and data collection.

Microchipping has some limitations in terms of accuracy of owner details and requires a scanner to identify cats, which can delay cats being reunited with their owner.

There are benefits for cats to also wear a collar and identification tag.

Recommendation 14

Cat management plans should aim to increase the number of cats who are identified through mandatory microchipping.

15 Mandatory desexing

There is mixed evidence on whether mandatory desexing legislation has contributed to reducing shelter and pound intake and euthanasia rates in Australia.

Where mandatory desexing has not achieved these aims, evidence indicates this is due to a lack of active enforcement of legislation and low public awareness of its requirements.

A number of factors have been identified which, if implemented in parallel with mandatory desexing, are likely to increase the success of this strategy.

Recommendation 15

Mandatory desexing has the potential to be successful in reducing shelter and pound intake and euthanasia rates where it is well-promoted within the community, supported by veterinary practitioners, targeted at pre-pubertal desexing prior to sale or transfer, supported through targeted low-cost desexing programs and adequately enforced.

16 Targeted low-cost desexing of owned cats

Targeted low-cost desexing programs for owned cats have significant potential to reduce cat overpopulation and also generally receive strong community support.

Income and geographic targeting can be successfully used to determine eligibility for these programs.

Recommendation 16

Increasing access to targeted low-cost desexing initiatives, especially areas of low socio-economic status or those overrepresented in shelter and pound intakes, should be considered a key strategy for domestic cat management.

17 Pre-pubertal desexing

Cats need to be desexed prior to four months of age to prevent first litters. Pre-pubertal desexing has benefits for the welfare of individual cats as well as assisting cat management in terms of reducing unwanted cat numbers.

Recommendation 17

The promotion of pre-pubertal desexing as normal practice is key to reducing the number of unwanted kittens born. Engagement with cat owners and the veterinary community is vital to increase acceptance and uptake of pre-pubertal desexing by veterinary practitioners.

18 Cats per household

Limiting the number of cats that can be kept may assist in reducing public nuisance from cats, preventing kitten farms and resolving cases of animal hoarding.

Most councils have a standard maximum limit of two cats per household, however, many households successfully care for more than two cats and increasing this limit may help increase cat adoptions.

Recommendation 18

Council limits on the number of cats that can be kept per household without a permit should be set at four cats rather than two, on the condition that all cats are desexed, microchipped, contained and well cared for.

19 Cat owner education

A combination of consistent public messages from government and animal welfare organisations, education programs in schools and social marketing campaigns can result in positive progress for cat management.

Legislation alone is not an effective instrument for addressing cat population, nuisance and predatory issues.

The use of best-practice principles of behaviour change and persuasive communication to improve the design of education programs should be encouraged.

Recommendation 19

Changing community attitudes, beliefs and behaviours should be a key component of every strategy to manage cat populations. Education programs should focus on increasing cat owner understanding of the benefits of cat management, such as containment, identification and desexing of their cat, and for decreasing euthanasia of kittens and cats in shelters and pounds.

20 Reporting and evaluation

Evaluation of cat management strategies is essential in order to determine their effectiveness. Key evaluation measures and processes for data collection need to be agreed by all stakeholders and applied to all new and existing initiatives.

There is an urgent need for standardisation and reporting of shelter/pound admission and outcomes data if they are to be accessible for evaluation purposes.

Evaluation of different management strategies and programs is either not undertaken, reported or not easily accessible.

Recommendation 20

Key stakeholders should agree on measures to be used to enable comparative evaluation of cat management strategies and programs. Evaluation outcomes should be reported and incorporated into the development of cat management plans at the national, state and local level.

21 Research

Research related to cat management is generally undertaken in an ad hoc manner focusing on a specific area rather than as part of an integrated and coordinated approach.

Several areas for further investigation have already been identified but there is a lack of adequate research funding for this.

Recommendation 21

Further research is required to inform future cat management strategies and ensure that limited resources are effectively targeted. This will require allocation of resources, coordination and priority setting at a national level.

1 INTRODUCTION

The purpose of this report is to identify current best practice approaches to domestic cat management, to help address poor welfare and high euthanasia rates of domestic cats and mitigate their impacts on humans and wildlife. This document builds on knowledge gained from previous cat management strategies, including examining the effectiveness of existing legislation, reviewing current research, and considering relevant aspects of feral cat management.

Although considerable efforts have been made to reduce the unwanted domestic cat population, the complexity of the problem makes effective cat management very difficult. Effective cat management requires a high level of government and community support, and communication and coordination between all stakeholders; aspects which are often difficult to achieve and maintain over time. A number of reports and papers have been produced that discuss the problems associated with cat management (Toukhsati 2007; Denny and Dickman 2010; Zito et al. 2015a) and in recent years several state jurisdictions have either introduced or reviewed their cat management legislation. Despite this, evaluation of previous initiatives and coordination of a consistent national approach is lacking.

Over recent years the Australian community's acceptance of cat management measures such as desexing, cat containment, registration and microchipping has increased, as has public concern over the adverse impact of cats on wildlife as well as the euthanasia of healthy cats. With this shift in the level of public understanding of the significance of cat related issues and the urgent need for solutions, it is hoped that this report will help identify more effective, consistent and humane strategies for the management of domestic cats in the future.

1.1 Key problems

There are an estimated 3.3 million owned cats in Australia; cats are the second most popular pet and 29% of households own a cat (RSPCA Australia 2016). However, while many of these cats are highly valued by humans as companions and pets, many others are not well-cared for and have no defined owner. The exact number of unowned domestic cats in Australia is unknown, but estimates suggest there are 0.7 million cats, of varying sociability but still with some dependence on humans, living on the fringes of our towns and cities (Legge et al. 2017). Our failure as a society to responsibly manage domestic cats results in three types of overlapping problems: those that affect the welfare of cats themselves, those that affect humans, and those that affect other animals, predominantly wildlife.

1.1.1 Animal welfare issues

The influx of unowned or surrendered cats and kittens into animal shelters and pounds continues to outstrip the capacity for rehoming. Despite the best efforts of animal welfare organisations over many decades to increase the adoption of cats, there is still a relatively high rate of euthanasia of healthy and treatable domestic cats and kittens, especially when compared to domestic dogs.

While allowing cats free access to the outdoors provides them with more choice in their environment and behaviour, it comes with a significant risk to their health and welfare. Free-roaming cats are more likely to be exposed to disease, to be run over or injured through fighting, to stray and become lost, and to be picked up by enforcement agencies and potentially euthanased. Entire female cats that are allowed to roam or who have access to male cats are at high risk of pregnancy. This includes cats as young as four months, which is before the traditional age of desexing. Unplanned pregnancy puts owned cats at risk of being surrendered and adds to cat overpopulation and euthanasia rates.

Methods used to control free-roaming domestic or feral cats can have serious adverse impacts on their welfare. This is particularly the case with lethal feral cat control methods, such as the use of poisons, but there are also problems with the use of traps and the handling, transport and treatment of captured cats.

Finally, whether or not a cat is categorised or defined as feral or domestic determines their treatment, their ultimate fate and the level of legal protection for their welfare. In some jurisdictions any unidentified free-roaming cat is regarded as a feral cat, creating conflict between cat owners and regulatory authorities.

1.1.2 Social issues

The most commonly reported problem caused by free-roaming cats in residential areas is that they cause a nuisance through roaming, fighting and fouling.

Cats may also be regarded as a health risk as they are the primary host of the gut parasite *Toxoplasma gondii* which causes toxoplasmosis in humans. Transmission from cat to human occurs through contact with infected cat faeces. While most healthy adults infected with *T. gondii* are asymptomatic, the disease can have serious health consequences for pregnant women or people with a compromised immune system. Cats infected with *T. gondii* can also infect other mammals, with toxoplasmosis being a significant cause of abortion in sheep and goats. In Tasmania and Kangaroo Island, free-roaming cats are also implicated in the spread of the sarcocystis parasite to sheep which can reduce carcass values at processing.

The hunting habits of free-roaming cats elicit strong feelings from the community. People do not like owned cats catching and killing other animals, especially native species. Unfortunately, blaming cats for their instinctive hunting behaviour tends to encourage the demonisation of cats in society. In extreme cases this has resulted in individuals publicly condoning cruelty to cats (e.g. via social media posts and videos) and the indiscriminate killing of cats.

Dealing with the negative impacts of poor cat management, such as injuries, deaths and the euthanasia of healthy animals has an adverse psychological effect on cat owners and those involved in cat management such as shelter workers, veterinarians and council rangers. There are also financial costs to individuals and animal welfare organisations who rescue, desex, rehabilitate and adopt out unowned cats.

Despite these potential social issues, the majority of Australians have a very positive view of domestic cats. However, it is common for individuals to simultaneously hold different opinions about domestic and feral cats and how to deal with them. Many devoted cat owners who regard domestic cats as valued companions requiring our care and protection also advocate strongly for the killing of feral cats. These conflicting views can make it difficult to reach broad agreement on cat management strategies.

1.1.3 Wildlife predation

Hunting and killing is a very strong natural instinct, even for owned cats who are fed daily (Barratt 1997; Meek 1998; Lilith et al. 2006; Hutchins 2013; Loss et al. 2013; Kitts-Morgan 2015; MacDonald et al. 2015; Woinarski et al. 2017a). Studies show that the majority of domestic cats do hunt when given the opportunity, but the impact of their predation on biodiversity depends greatly on their location. In highly urbanised settings, there is evidence that introduced species are more commonly hunted than native species. A Canberra survey of cat owners found that 75% of owned cats hunted, with 64% of prey being rodents, 14% native birds and 10% introduced birds and a

few reptiles and frogs (Barratt 1997). Indeed, cat predation on introduced black rats was shown to have a positive effect on tree-nesting birds in remnant bushland in metropolitan Sydney (Matthews et al. 1999). Other studies have also found that cats will selectively predate sick and old rather than healthy birds (Baker et al. 2008; Moller and Erritzoe 2000). In comparison, domestic cats living in a NSW National Park, preyed mainly on native mammals (49%), then introduced mammals (26%), followed by native birds (19%) and reptiles (6%) (Meek 1998).

Irrespective of whether domestic cats kill native or introduced animals, prey animals will suffer and die as a result of the hunting and killing process. Minimising these impacts and protecting wildlife at the local level is one justification for the containment of domestic cats (Jessup 2004). Urban and suburban environments, including people's gardens, may serve as important habitats for birds and other native animals (Angold et al. 2006; Tratalos et al. 2007; Pennington et al. 2008; Seewagen & Slayton 2008; Longcore et al. 2009). Connecting with wildlife in this way is extremely important to many people who value this opportunity and wish to safeguard resident species, particularly birds.

However, there is no direct evidence that domestic cats in urban areas have caused the decline of any threatened species in Australia. It is well understood that in these areas, land clearing and development and other human activities pose a much greater threat to the survival of vulnerable native species than do domestic cats (Grayson et al. 2007; Lilith et al. 2010; Cogger et al. 2017). Furthermore, land clearing has been identified as a significant animal welfare issue due to pain and suffering from physical injury and habitat loss and ultimate death (Finn and Stephens 2017).

Nonetheless, there are other valid reasons to contain cats, including to prevent wandering, reproduction, disease and injury (e.g. from fighting, car accidents), public nuisance and the impact on the welfare of wildlife through predation.

In contrast, there is an increasing body of evidence that predation by feral cats has a major threat to biodiversity in Australia. Feral cats are found across most of the land mass of Australia: the most recent review estimates a population fluctuating between 2.1 and 6.3 million (Legge et al. 2017). Their presence has contributed to the extinction of 22 Australian mammals (Woinarski et al. 2015a), and they are believed to be a current and major threat to at least 142 species of mammals, reptiles, frogs and birds (Australian Government 2014; Woinarski et al. 2017b).

1.2 Scope and methodology

This report originated from a discussion at the April 2016 meeting of the National Feral Cat Task Force and subsequent conversations with the Office of the Threatened Species Commissioner (OTSC). Preparation of initial drafts was funded in part by the National Landcare Program through the OTSC. The OTSC recognises the importance of responsible domestic cat ownership as this may impact feral cat populations as well as on public attitudes towards feral cat management.

The report focuses primarily on legislation, strategies and techniques for domestic cat management. Where appropriate it also covers feral cat management strategies and legislation but does not comment directly on management techniques for feral cats. However, reference to legislative aspects and the threatened species strategy regarding feral cat management have been included.

The purpose of developing the report was to:

- examine the current status of legislation and other formal strategies in place for cat management in Australia
- discuss ideal legislative settings for domestic and feral cats
- identify the best ways to implement, enforce and evaluate domestic cat management legislation and formal cat management strategies
- identify key roles for state government, local government, non-government organisations and the community
- identify ways to increase public understanding of the importance and benefits of responsible cat ownership
- identify how to improve the retention of owned cats and the adoption of unowned and semi-owned cats
- identify the best ways to implement, enforce, and evaluate strategies to reduce stray (unowned) and semi-owned cat populations
- identify how to increase the proportion of cats desexed prior to reaching sexual maturity
- identify how to increase compliance with responsible ownership requirements
- comment on the feasibility of integrating cat management with dog management.

1.2.1 Consultation process

A draft discussion paper was circulated for comment to RSPCA Member Societies and members of the Threatened Species Commissioner's Feral Cat Task Force in September 2016. Feedback from this process and additional information from the literature was incorporated into the Discussion Paper which was made available for comment via the RSPCA Australia website on 30 May 2017. Comments were accepted for a total of nine weeks up to 3 August 2017. Notification of the public consultation period was provided via the following processes:

- direct email to all RSPCA Australia supporters and contacts with specific interests in cat welfare/cat management
- social media posts via RSPCA Australia and the Threatened Species Commissioner Facebook and Twitter accounts, including Facebook live and multiple posts over the course of public consultation
- letters to all local councils in Australia from the Threatened Species Commissioner
- news article in the Local Government Association magazine, distributed to all councils in Australia
- direct email to the following groups and organisations:
  - Animal Welfare League Queensland
  - Animals Australia
  - Australian and New Zealand College of Veterinary Scientists
  - Australian Animal Rescue
  - Australian Cat Federation
  - Australian Conservation Foundation
  - Australian Institute of Animal Management
  - Australian National Cats
  - Australian Veterinary Association
  - Australian Wildlife Rehabilitation Council
  - Cat Alliance of Australia
  - Cat Haven WA
  - Cat Protection Society of NSW
  - National Animal Rescue Groups of Australia
  - National Animal Welfare League
  - National Feral Cat Task Force
  - RSPCA Member Societies
  - SA Dog and Cat Management Board
  - Sentient, The Veterinary Institute for Animal Ethics.

Respondents were able to provide feedback through detailed submissions or by completing an online survey which focused on the 22 recommendations contained in the Discussion Paper. Online survey respondents were asked whether they supported each recommendation and given four options to choose from: (a) Yes, fully support; (b) Yes, support with reservations; (c) No, and; (d) Not relevant. They were also able to leave detailed comments to explain their responses.

A total of 1159 online and 759 email responses, including 104 detailed submissions were received. The online survey results indicated that a majority of respondents supported all but one of the recommendations (majority support was defined as more than 50% of respondents answering 'Yes, fully support' or 'Yes with reservations'. Fourteen of the 22 recommendations were fully supported by at least 50% of respondents and only seven recommendations received more than 15% 'No' responses. Further information on the response to the online survey and a selection of comments for each recommendation are provided in the *Response to Public Consultation on the Discussion Paper* available via the RSPCA Australia website.

Each submission and comment received was read and considered in developing this report. A number of significant changes have been made, including removing two of the original recommendations, revising the wording of several other recommendations, retitling and restructuring the report to clarify its focus on the management of domestic cats, and a new recommendation on the need for consistent terminology for different categories of cats. RSPCA Australia is grateful to all those who contributed to the public consultation process and thus helped improve the content and clarity of this document.

2 CAT CATEGORIES – THE IMPORTANCE OF DEFINITIONS

2.1 Introduction

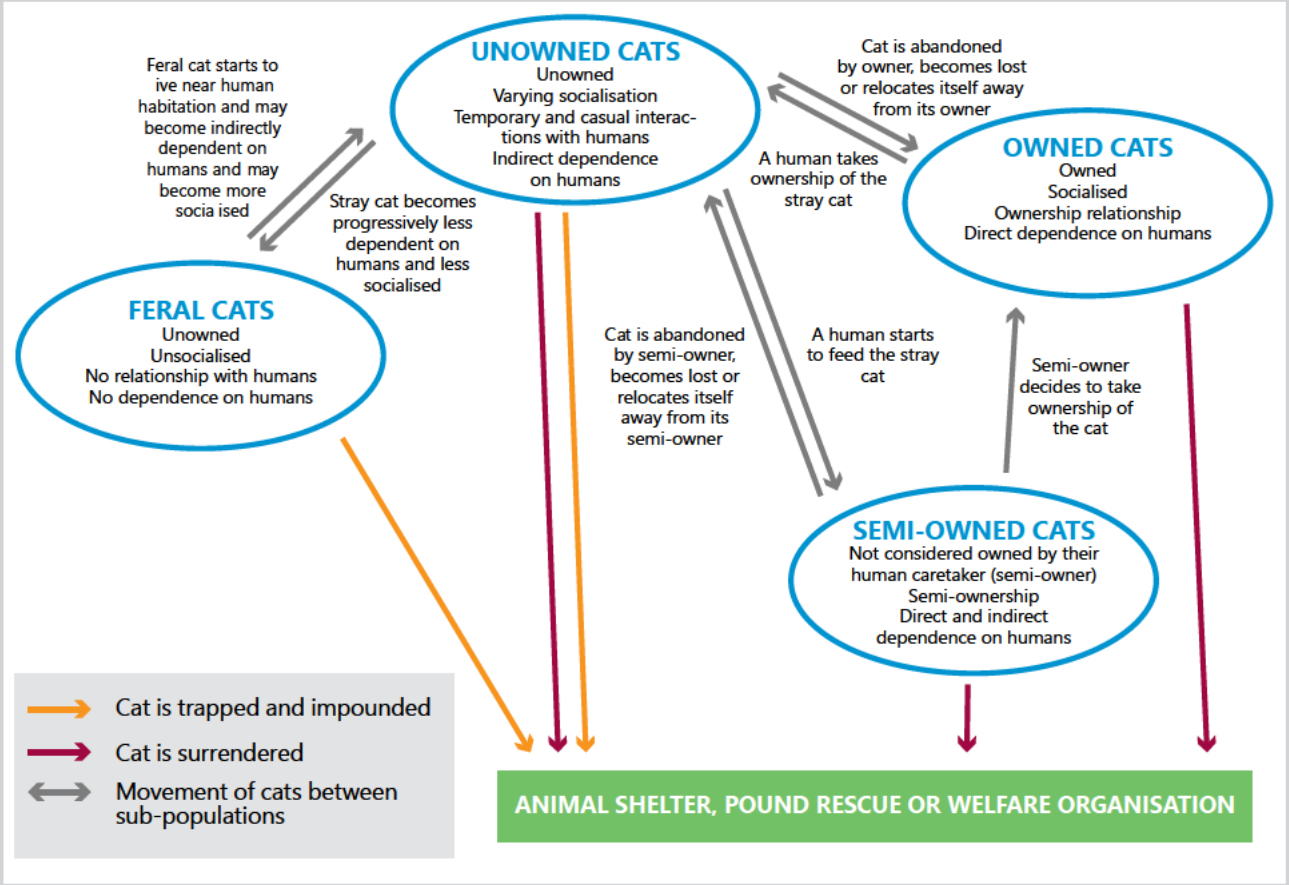
In the scientific and popular literature relating to cat overpopulation, the terms used to categorise cats in different populations are inconsistent. Sometimes more than one term is applied to the same group of cats, or terms used for different groups overlap significantly in their definitions, resulting in further confusion (Slater 2001; Akucewich et al. 2002; Hughes and Slater 2002; Afonso et al. 2006; Toukhsati et al. 2007; Farnworth et al. 2010a). Whatever terms we use to describe cats in different contexts within Australia, it is important to remember they all belong to the same single species, *Felis catus*.

Despite the confusion in definition and nomenclature, the terms we use to categorise cats in different populations share a common basis: they describe some aspect of a cat's relationship with humans — whether they are 'owned', confined, socialised, or dependent on humans (Haspel and Calhoon 1990; Moodie 1995; Zasloff and Hart 1998; Levy et al. 2003a; Levy et al. 2003b; Toukhsati et al. 2007; Webb 2008).

There is also agreement in most of the literature that there are various populations of cats which make up a larger, interconnected network of populations called a 'metapopulation' (Jarman et al. 1993; Toukhsati et al. 2005; Webb 2008; Marston 2009; Alberthsen 2014; Miller et al. 2014b; Miller et al. 2014a). This is a similar concept to the cat continuum described in Australia by Webb (2008) and Zito (2015) which also incorporates the human-cat relationships involved, such as perception of ownership and feelings of responsibility for the cat, association time, attachment, caretaking and interaction behaviours, and the cat's dependence on humans. This concept is represented diagrammatically in Figure 1 which illustrates the fluid relationships between these different sub-populations and, in the process, demonstrates why they are so difficult to manage.

Cat populations have commonly been divided into three groups using the terms 'domestic', 'stray' and 'feral' (Moodie 1995; New Zealand Government 2007). However, while the terms 'domestic' and 'feral' relate to the level of ownership or dependence on humans, the word 'stray' refers to the activity of cats that roam, not an ownership status. Most councils in Australia consider cats and dogs to be 'stray' once they leave the confines of their owner's property. Thus, a free-roaming cat may be called 'stray' whether they are owned and temporarily escape or are allowed to wander, are regular visitors to one or more households, or are unowned. Australian studies have shown that 61-75% of people who feed a stray cat believe that the cat is, or might be, owned by someone else (Sharp and Hartnett,

FIGURE 1: POPULATIONS OF CATS AND THEIR INTERACTIONS WITH HUMANS
(adapted from Zito 2015 with additional input from Andrew Byrne)



2009; Toukhsati et al. 2007). This definition is at odds with the general meaning in common usage of a 'stray' being an unowned cat. As the term is likely to be confusing, it will not be used further in this document.

One group of cats that has been largely ignored in management strategies to date, but which has been shown to make a significant contribution to cat overpopulation is semi-owned cats (Toukhsati et al. 2007; Levy et al. 2014; Zito et al 2015b). Zito et al. (2015b) described this sub-population of cats as 'having been fed or cared for often, or always for at least one month, by a person who does not perceive ownership for the cat'. Thus, these cats have a human 'caretaker' who can be targeted with management advice, but this must be done in a way that differs from communications with cat owners. Cat semi-owners do not consider themselves to be cat owners and so will not comply with regulations and other measures directed at cat owners. The semi-owned cat reflects the attitude of the carer who does not consider themselves as the owner but as someone who may provide food on a regular basis, often in the belief that the cat they are feeding is already owned (Toukhsati et al. 2012a). In general, a semi-owned cat is one who can be identified by a carer whereas an unowned cat is not. The Australian Veterinary Association recognises semi-owned cats as a category and acknowledges the need to use different management strategies for each category of cats (see AVA Policy Management of Cats in Australia 2016).

Groups of unowned cats are sometimes called 'colony' or 'community' cats: these are cats of varying sociability, may have casual and temporary interactions with humans and indirect dependence on humans, or long-term interactions, and direct dependence on humans (Tan et al. 2017). They live in areas in cities/towns where they can scavenge food or are fed by one or more people, e.g. in school/university grounds, factory areas and shopping complexes. The cats may have been owned and abandoned or lost, or may be the progeny of straying owned, semi-owned or unowned cats with little human contact and dependence.

It is acknowledged that it is not always possible to classify an individual cat according to their ownership status: for example, an owned cat who is not microchipped or wearing an identification tag cannot be directly traced to their owner. However, there is a much broader purpose in classifying cats according to ownership status as it assists in

the planning, development and implementation of appropriate management strategies. Thus, it is crucial that cat management strategies aimed at influencing relevant human behaviour recognise the ownership status of cats as well as their level of socialisation to, dependence on and relationship with humans (see Figure 1).

2.2 Proposed definitions

To account for the above factors, this document will use the following terms to describe different populations and sub-populations of cats:

- **Domestic** – all cats with some dependence (direct or indirect) on humans. There are three sub-categories of domestic cats:
  - **Owned** - these cats are identified with and cared for by a specific person, and are directly dependent on humans. They are usually sociable although sociability varies.
  - **Semi-owned** – these cats are fed or provided with other care by people who do not consider they own them. They are of varying sociability with many socialised to humans and may be associated with one or more households.
  - **Unowned** – these cats are indirectly dependent on humans with some having casual and temporary interactions with humans. They are of varying sociability, including some who are unsocialised to humans, and some may live in groups (e.g. common aggregation sites including rubbish tips, food outlets, coastal fishing spots associated with urban environments etc).
- **Feral** – these cats are unowned, unsocialised, have no relationship with or dependence on humans, and reproduce in the wild.

2.2.1 Implications of cat categories

The legal definitions used to describe different categories of cats are of significant importance as they have a direct impact on cat management strategies and enforcement practices. The most significant deliniation is that between feral and domestic cats as this can have profound implications for the treatment and fate of individual cats.

For example, under the Queensland (Qld) *Biosecurity Act 2014*, feral cats are declared pests and the definition of a feral cat includes all cats other than those that are owned. Thus unowned and semi-owned domestic cats in Queensland are subject to the same legal requirements as feral cats which includes a prohibition on feeding, removal (e.g. for adoption) or return without a permit. This legislation essentially obliges local councils to use trap-and-kill programs as the primary method of domestic cat management, which is neither effective nor supported by the community. This has created tension and conflict, particularly where residents fear their own cat may be trapped and killed, and welfare groups are denied the opportunity to rescue and adopt suitable cats. This type of conflict could be avoided by considering the available options for rehoming or transferring trapped cats that have the potential to be adopted, ensuring there is an appropriate minimum holding period after trapping, and liaising with local rescue groups. In jurisdications where unowned cats are not legally defined as feral, many councils are working effectively with reputable local rescue groups to trap, desex and adopt homeless cats (see Section 3.2.6).

One of the consequences of labelling cats as feral and therefore as 'pests' is the demonisation of cats as aggressive predators, leading to a lack of consideration for their welfare and, in the most extreme cases, deliberate inhumane treatment (RSPCA Australia 2018). There is a high level of concern amongst cat owners and carers over an apparent escalation in horrific acts of cruelty and indiscriminate killing of cats and the establishment of 'cat action' groups, such as *Cat Busters Australia*, who justify their behaviour by claiming they are saving native animals by killing cats. These acts are shared through the use of social media to post images of cat 'hate' crimes, e.g. cats killed with a bow and arrow, or being drowned, tortured or abused.

1 Cat categories

Various definitions have been used to categorise cats in different populations, but most share a common basis in that they describe some aspect of a cat's relationship with humans.

The lack of universally agreed cat definitions causes confusion and conflict creating inconsistencies in legislation and difficulties in implementing cat management initiatives.

Cat management strategies aimed at influencing human behaviour must recognise the ownership status of cats as well as their level of socialisation to, dependence on and relationship with humans.

The most important definitional delineation is between feral and domestic cats as this has profound consequences for the treatment and fate of individual cats.

RECOMMENDATION 1

All jurisdictions should define all cats with some dependence (direct or indirect) on humans as **domestic** cats. Cats who are unowned, unsocialised, have no relationship with or dependence on humans and reproduce in the wild should be defined as **feral** cats.

Domestic cats (including owned, semi-owned and unowned cats) should be excluded from the legal definition of feral cats. This will achieve greater consistency in implementing management programs, legislation, research and evaluation activities as well as engendering community support.

Cat management strategies should recognise three subcategories of domestic cats using the following definitions:

- **Owned** – these 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** – these cats are fed or provided with other care by people who do not consider they own them. They are of varying sociability with many socialised to humans and may be associated with one or more households.
- **Unowned** – these cats are indirectly depending on humans with some having casual and temporary interactions with humans. They are of varying sociability, including some who are unsocialised to humans, and may live in groups.

3 CAT MANAGEMENT LEGISLATION AND FORMAL STRATEGIES

3.1 Introduction

Legislation is often viewed as the key to resolving cat management issues. While legislation is important, there are many reasons why mandating specific aspects of cat management can only provide part of the solution. The challenge is to identify which aspects will be most cost effective and what other measures are required to provide an ethical, humane and sustainable approach. In addition to legal requirements, other strategic approaches to cat management have been implemented in different states. Some have been very successful and generally rely upon good collaboration between key stakeholders with the focus on non-lethal methods to reduce domestic cat populations and promotion of responsible cat ownership. The following sections attempt to summarise legislative and strategic approaches to cat management currently in place across Australia.

3.2 Domestic cats

3.2.1 Commonwealth legislation

There is no legislation relating to domestic cat management at the Commonwealth level other than to prevent the importation of wild-domestic cat hybrids into Australia. Hybrids between species (regardless of how many generations removed from an original mating or wild ancestor) are not permitted into Australia unless specifically listed on the live import list under the *Environment Protection and Biodiversity Conservation Act 1999*. The list specifically excludes one cat hybrid – the Savannah cat, a cross between a domestic cat and an African Serval – as this was assessed as an extreme risk to the Australian environment. No other domestic-wild cat hybrids have been assessed but it is unlikely that any cat hybrid would be permitted to be imported into Australia for the same reasons.

3.2.2 State legislation

Dog and cat management is regulated at both the state/territory and local government level. In states where companion animal management legislation has combined both dogs and cats (e.g. South Australia (SA), Queensland, Victoria, New South Wales (NSW) and the Australian Capital Territory (ACT), recent changes have been applied to cats as well as dogs. This has been a significant step as mandatory standards for cat management in these states and territories have not been an area of consideration until recent times, compared to Tasmania and Western Australia (WA) where cat specific legislation was established in 2009 and 2011 respectively (Table 1).

TABLE 1: STATE-BASED COMPANION ANIMAL LEGISLATION WITH DETAILS OF RECENT REVIEWS AND IMPLICATIONS FOR CAT MANAGEMENT

STATE*	LEGISLATION	REVIEW DETAILS	OUTCOME
ACT	Domestic Animals Act 2000	2004 for declared containment areas 2016 – two new proposed cat containment areas	Since 2005, cat containment areas have been declared in 12 Canberra suburbs adjacent to nature reserves
NSW	Companion Animals Act 1998	NSW Pest Animal Review supports greater education of responsible cat ownership	Proposed that breeder details be added to microchip database information
Qld	Animal Management (Dogs and Cats) Act 2008	Mandatory registration was repealed in 2013	Councils able to implement mandatory registration
SA	Dog and Cat Management Act 1995	Instigated in response to high numbers of unwanted dogs/cats and to stop puppy farms. Select Committee Inquiry reported in July 2013 with 12 recommendations mainly relating to dog/cat owners including registration of companion animal breeders	Amendments passed August 2016 to be introduced on 1 July 2018 Key aspects: • Breeder registration; compliance with enforceable welfare standards; breeder registration number to be included in all advertisements and provided to buyer • Cats must be desexed by 6 months • Cats must be microchipped by 3 months
Tas	Cat Management Act 2009	The Tasmanian Cat Management Plan 2017-2022 which includes amendments to *Cat Management Act 2009* was finalised in August 2017 after being circulated for public consultation in 2016	Recommended changes to *Cat Management Act 2009* include; • Mandatory desexing by 4 months or 1kg bodyweight (was 6 months) • removal of care agreement so that desexing and microchipping is undertaken by owner before sale or transfer • May have up to 4 cats per household without need for permit
Vic	Domestic Animals Act 1994	Major review of dog/cat breeding legislation in 2013 with key changes to stop puppy farms	Since 2015, introduction of registration and compliance with Code for both dog and cat breeders if have at least 10 fertile females
WA	Cat Act 2011	Announced in 2011, implemented in 2013; review due 2018	

* *There is no territory-based legislation relating to cat management in the NT*

In addition, local government jurisdictions have the capacity to create bylaws pertaining to the management of cats and dogs (see Section 3.2.4). These have generally focused on registration, identification, maximum number of animals per household and nuisance complaints. State Acts and Regulations describe offences, appointment and powers of authorised officers, as well as appeal requirements. It should be noted that the NT does not have territory-based legislation relating to cat management but Darwin and Alice Springs councils do have some relevant bylaws.

In recent times, legislative reform on companion animal management has focused on helping to prevent puppy farming (intensive breeding where conditions compromise welfare) and to reduce the number of unwanted dogs and cats. This has created a new direction in legislative requirements mainly relating to breeders becoming registered and licensed, and in some states, mandating the desexing of dogs and cats.

Mandatory desexing of cats and dogs was first implemented in the ACT under the *Domestic Animals Act 2000*, primarily in response to high levels of euthanasia of healthy dogs and cats. Mandatory desexing is also a requirement under the WA *Cat Act 2011* and the Tasmanian *Cat Management Act 2009*. Mandatory desexing will be introduced in SA under the *Dog and Cat Management Act 1995* from 1 July 2018 and it has recently been proposed in NSW.

In terms of structure and content of cat management legislation, only some Acts actually describe the purpose of the legislation. For example, the Tasmanian *Cat Management Act 2009* states that the purpose of the Act is to:

a) *promote the responsible ownership and welfare of cats, including the desexing and microchipping of domestic cats; and*

b) *provide for the effective management of cats, in particular allowing for the humane handling and management of unidentified, stray and feral cats; and*

c) *reduce the negative effects of cats on the environment.*

It should be noted that this Act covers both feral and domestic cat management, however, feral and domestic cat management strategies are vastly different and it is essential that a clear distinction is made between them. Hence the importance of consistently separating the definition of feral cats from the three sub-categories of domestic cats: owned, unowned and semi-owned. Where an interface between domestic cats and feral cats exists, management programs need to be coordinated through effective communication with all stakeholders to achieve maximum benefits.

Who must comply with cat management laws?

In general, the laws apply to owners to compel them to be responsible for their cat. However, there are also provisions regarding people who trap stray cats in order to transfer these cats to the local council and/or an authorised person for euthanasia/rehoming/reclaiming (e.g. WA and Victoria). Some states permit any person to kill a trapped unowned cat under certain provisions, such as being at least one kilometre from the closest residence (e.g. SA).

Recent amendments to legislation in several states also target cat breeders for the first time requiring them to comply with specific requirements. These vary between states but include requirements for breeder registration, microchipping and vaccinating kittens prior to sale and, in some states, desexing prior to sale or transfer.

Who administers cat management laws?

The administration of cat management legislation is primarily the responsibility of local government authorities. The reason for two levels of legislation (state and local government) for companion animal management is unclear. However, it is presumed that flexibility is needed to allow councils to decide which aspects are of local importance as well as being able to prioritise resource allocation for effective enforcement. State laws are generally framed to authorise local government to enforce specific state-based requirements or provide for them to introduce local bylaws. In general, local bylaws mainly relate to the limit of the number of cats per household and nuisance complaints caused by cats.

There is wide disparity in the level of commitment to cat management and associated activity by local councils. Some councils are very active in rehoming cats and promoting responsible cat ownership and subsidised desexing, whilst others appear to only undertake minimal community engagement activities. Education and community programs appear to be having some success in specific jurisdictions (see Section 3.2.6).

3.2.3 Key requirements of state-based cat legislation

Despite all jurisdictions other than the NT regulating cat ownership and management, there are significant differences in the offences contained within the different acts and regulations. Not all states cover all aspects and there is also inconsistency within some aspects. For example, WA is the only state which requires owned cats to display a collar and tag at all times but all states require cats to be microchipped. Victoria and WA appear to have the most comprehensive laws at present. A more consistent approach between states would ensure all critical areas that require regulation are addressed in a similar manner to optimise effectiveness nationally. Table 2 highlights the key elements of each state's companion animal legislation relating to cat management: the following sections provide further information on each of these elements.

TABLE 2: KEY ELEMENTS OF STATE-BASED COMPANION ANIMAL LEGISLATION RELATING TO CAT MANAGEMENT[a,b]

ELEMENT	ACT	NSW	Qld	SA	Tas	Vic	WA
Title of legislation	*Domestic Animals Act 2000*	*Companion Animals Act 1998*	*Animal Management (Dogs and Cats) Act 2008*	*Dog and Cat Management Act 1995*	*Cat Management Act 2009*	*Domestic Animals Act 1994*	*Cat Act 2011*
Identification (microchip)	Yes prior to sale or transfer by 12 weeks of age	Yes prior to sale or transfer by 12 weeks of age	Yes prior to sale or transfer	Yes by 3 months of age (pending)	Yes by 6 months of age	Yes prior to sale or transfer	Yes by 6 months of age
Trapping	Yes	No	Yes	Yes	Yes	Yes	Yes
Desexing	Yes by 3 months of age	No	No	Yes by 6 months of age (pending)	Yes by 6 months of age	No	Yes by 6 months of age or before sale or transfer
Breeder registration	Yes from 3 months of age for entire cat Must comply with welfare standards	No	No	Yes (pending) Must comply with welfare standards	No	Yes if have >three fertile cats Must comply with welfare standards	Yes by 6 months of age
Cat registration	No	Yes by 12 weeks of age or transfer, for life	No	No	No	Yes from 3 months of age	Yes
Nuisance	Yes	Yes	No	No	No	Yes	Yes
Containment & curfews	Yes	Yes	No	Yes	Yes	No	No
Animal Management Plans	No	No	No	Yes	No	Yes	No
Abandonment [c]	No [c]	No [c]	No [c]	No [c]	Yes	Yes	No [c]
Feeding unowned cats [c]	No	No	No [c]	No [c]	No	Yes	No

a There is no territory-based legislation relating to cat management in the NT

b Does not include legislation relating to animal welfare, biosecurity or conservation or to local council bylaws

c Provisions exist under other legislation

Identification

All states and the ACT require cats to be microchipped. Most states require all kittens to be microchipped by a maximum of three months of age or prior to sale or transfer, but in Tasmania and WA the maximum age is six months. WA is the only state that requires cats to wear a collar with an identification tag displaying owner contact details, in addition to mandatory microchipping.

Trapping

Trapping, seizing, transfer, destruction and disposal of cats is permitted under certain conditions in all states. Trapping is often conducted in conjunction with cat containment requirements. This provision is aimed at removing wandering domestic cats to help prevent cat breeding, reduce nuisance complaints and wildlife predation. It should be noted that in most states there are also overlapping provisions in conservation or biosecurity legislation for trapping cats (aimed at feral cats but which may overlap with the accepted definition of domestic cats), which can create confusion and have a detrimental effect on how domestic cats are managed.

Desexing

In 2001, the introduction of the *Domestic Animals Act 2000* meant that the ACT became the first Australian jurisdiction to mandate the desexing of all cats by six months of age, unless the owner obtains a permit to keep the animal 'intact'. The cost of the permit was set higher than the price of desexing as an incentive for owners to comply. Since that time, the age for mandatory desexing has been reduced to three months. The WA *Cat Act 2011* and the Tasmanian *Cat Management Act 2009*, also require all cats by six months of age to be desexed. Amendments to the SA *Dog and Cat Management Act 1985* will also require all cats to be desexed by six months of age effective from 1 July 2018. Some cats reach sexual maturity as young as four months of age, so a mandatory requirement to desex by six months will not prevent some first litters from being born, as many owners are unaware that kittens can become pregnant at such a young age. In NSW, both the Companion Animal Taskforce and Natural Resources Commission have recommended compulsory desexing of owned cats.

In Queensland, it is a legal requirement for veterinarians to permanently mark cats that have been desexed with an ear tattoo. This indicates that a cat might have been previously owned, even if no microchip or collar is present and also assists shelters to determine desexing status in females.

Breeder registration

Cat breeder registration has mainly been introduced in parallel with requirements for dog breeders. However, the ACT requires a permit to be obtained to retain an entire animal, irrespective of whether they are used for breeding. Victoria only requires registration for breeders who have three or more breeding females. Thus there is some inconsistency in relation to the definition of a breeder. Also, all states that have introduced breeder registration have exemptions for breeders who are members of a recognised breed society. Although, it does not directly impact on cat management issues, it is a significant loophole in terms of standards of care and welfare if registered breeders are not compelled to comply with a welfare COP (see below). It is important that all breeders are registered through a government authority and cats and kittens are not sourced from non-registered breeders.

In all but one state (WA) where breeder registration/licensing is required, a condition for registration/licensing as a breeder is compliance with a welfare COP to ensure minimal standards of care are complied with. WA does not have a welfare COP for cat breeders. Breeder registration and compliance with standards will be effective in SA from 1 July 2018.

Cat registration

Only NSW, Victoria and WA require mandatory cat registration. Its main purpose is to determine ownership but in those states without mandatory cat registration, compulsory microchipping is considered adequate to identify owners. Some councils that promote and enforce cat registration utilise the associated fees to support local cat management initiatives, e.g. Mitcham Council in SA. By doing this councils are more likely to receive support from the community for cat registration.

In 2009, the Queensland State Government compelled all councils (through amendments to the *Animal Management (Cats and Dogs) Act 2008*) to introduce compulsory registration for cats. The new laws required that cats be registered with the local council, wear physical identification and also allowed for council to provide incentives for desexing in registration fees. However, the laws were repealed after just three years. Some parts

of Queensland, such as Mackay, do still require the registration of cats (see Section 3.2.4), but this is a local government, not a statewide, requirement.

SA, Tasmania, ACT and NT do not impose statewide cat registration requirements. However, as in Queensland, in most jurisdictions councils are able to implement local bylaws requiring registration. In the ACT the Responsible Cat Ownership Steering Committee has recommended that cat registration be introduced (Eyles and Mulvaney 2014) and a permit is already required for owners who have more than three cats.

Nuisance

The ACT, NSW, Victoria and WA all have provisions relating to addressing nuisance complaints associated with domestic cats. In other states, councils are able to implement local bylaws which allow officers to take action regarding wandering cats who may disturb neighbours.

Containment and curfews

ACT, Victoria and Tasmania are the only three states/territories that include clauses in legislation to compel owners to confine their cats for a specified time in specific areas (a cat curfew), however, the laws differ. For example, the ACT *Domestic Animals Act 2001* (Part 3 Division 3.2 S81) allows the Minister to declare cat containment areas, whereas the Tasmanian *Cat Management Act 2009* (Part 4 S 18, 19, 20) and Victorian *Domestic Animals Act 1994* (S26 (1), (2)) authorise councils to declare cat containment areas, including specified times cats are not to be found in specified areas. In the ACT, there are currently 12 declared cat containment areas where cats must be confined to the owner's property at all times (a 24-hour curfew). In 2016, the ACT Minister for Territory and Municipal Services sought public consultation on two further cat containment areas. In addition, the ACT Responsible Cat Ownership Steering Committee recommended changes to the *Domestic Animals Act 2000*, to declare specific areas subject to cat containment, making it an offence for owned cats to roam in these areas (Eyles and Mulvaney 2014). Councils in those states which do not have legislation authorising them to declare curfews on cats in specific areas are still able to set containment bylaws, at least for individual cats causing a nuisance. There are no state-based laws totally prohibiting the keeping of cats in specific areas.

Animal management plans

Councils in SA and Victoria are the only two states where it is a mandatory requirement to prepare animal management plans (see Section 3.2.5).

Abandonment

Abandoning an animal is an offence under most state animal welfare legislation. In Tasmania and Victoria it is also illegal to abandon a cat under animal management legislation. As abandoned cats are often entire and have the potential to predate native wildlife, inclusion of abandonment under animal management legislation provides local government officers (in addition to officers authorised under animal welfare legislation) with the ability to take action if a cat is abandoned. It is also an offence under conservation legislation to release a cat in SA and in Queensland under animal welfare legislation.

Feeding unowned cats

Victoria is the only state that prohibits the feeding of stray or feral cats under animal management legislation. In Queensland, the *Biosecurity Act 2014* prohibits feeding of feral cats which, under this Act's definition of feral cats, includes unowned and semi-owned domestic cats.

3.2.4 Local government bylaws

Where there is a lack of adequate state-based legislation and where councils are given authority to regulate cat management, some local government authorities have established their own cat bylaws. The main focus of these bylaws has been to address the number of wandering cats causing a nuisance. This has been done by limiting the number of cats per household, compelling owners to confine their cats to their property, and requiring identification, registration and desexing. It should be noted that in NSW, councils are not able to implement local bylaws which, in the absence of state-based legislation, poses significant challenges for domestic cat management.

As with state-based cat management legislation, there are also significant inconsistencies with local government bylaws, as evidenced in Table 3 which shows the bylaws for 27 councils in SA. Differences even occur in adjacent council areas: for example, Mitcham City Council in Adelaide has introduced mandatory registration and microchipping whilst the adjacent Marion City Council requires compulsory desexing. More consistency will be achieved through new provisions under the *Dog and Cat Management Act 1995*.

In Queensland, the Gold Coast City Council was one of the first councils to introduce comprehensive cat bylaws that include mandatory desexing and breeder licensing. The council has also been active with community engagement programs including subsidised desexing (see Section 3.2.6). The Mackay Regional Council in Queensland has also been active in cat management by requiring cats over the age of 12 weeks to be registered. Cat registration is required each year with the fees being used for the local animal control programs (e.g. maintaining a pet database, reuniting lost pets with their owners and pound operating costs).

TABLE 3: COUNCIL BYLAWS ON CAT MANAGEMENT IN SA 2012/13. (SA SELECT COMMITTEE ON DOGS AND CATS AS COMPANION ANIMALS FINAL REPORT JULY, 2011, PAGE 54):

A: Limit on cat numbers
B: Mandatory registration
C: Mandatory microchipping
D: Mandatory desexing
E: Mandatory identification
F: Expiate nuisance cats
G: Cat curfew
H: Expiate cats wandering

	BYLAW							
COUNCIL	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Adelaide City Council	X							
Adelaide Hills Council	X							
Barossa Council	X				X			
DC of Barunga West	X					X		
DC of Berri-Barmera	X							
DC of Ceduna	X							
City of Charles Sturt	X							
DC of Cleve	X					X		
DC of the Copper Coast	X					X		
City of Holdfast Bay	X					X		
Kangaroo Island Council	X	X	X	X			X	X
Light Regional Council	X							
DC of Loxton-Waikerie	X					X		
City of Marion	X			X				
City of Mitcham	X	X	X					
Mid Murray Council	X							
DC of Peterborough	X							
City of Playford	X				X	X		X
Port Augusta City Council	X				X	X		X
DC of Renmark Paringa	X				X	X		X
DC of Robe	X				X	X		X
MC of Roxby Downs	X	X	X	X				X
DC of Streaky Bay	X				X	X		X
Tatiara DC	X					X		X
City of Victor Harbour	X	X	X			X		X
City of Whyalla	X	X	X				X	
DC of Coober Pedy	X				X	X		X

2 Cat management legislation

Domestic cat management is legislated at both the state/territory and local government level. Some states have combined companion animal legislation whilst others have separate legislation for dogs and cats. There is no state-based cat management legislation in the NT. Provisions for cat management may also be enacted by local government in the form of council bylaws.

There are significant inconsistencies in the provisions of domestic cat management legislation and bylaws.

In most states there are overlapping provisions between different types of legislation affecting cats, which can cause confusion or conflict amongst stakeholders and have a detrimental effect on how domestic cats are managed.

The purpose of cat management legislation is not always clearly stated. The Tasmanian *Cat Management Act 2009* makes specific reference to the management of domestic, unowned and feral cats that is not evident in other state legislation.

RECOMMENDATION 2

The significant inconsistencies between states/territories and between local councils, in legislation, approach and level of commitment to domestic cat management, need to be urgently addressed. State and territory jurisdictions should work together to share resources, coordinate research and evaluation activities and identify and implement consistent approaches to the management of unowned, semi-owned and owned cats.

3.2.5 Other state and local government management approaches

Cat management advisory groups

Given the challenges and complexities associated with cat management, many benefits can be gained through a state-based advisory group to help guide legislation, community engagement, research and development of resources. An important area to consider is the effect on domestic cat management legislation posed by changes in other legislation such as conservation or animal welfare acts (see Section 2.2.1). Several states/territories have established advisory groups using different frameworks to provide guidance on cat management issues.

South Australia (SA)

The Dog and Cat Management Board was established following the introduction of the *Dog and Cat Management Act 1995*. The Board comprises eight members with different expertise including experience in local government, legislation, financial management, education and training, veterinary science, keeping and management of dogs and cats, and community health. It is the only statutory body of its kind in Australia.

The Board undertakes many functions including planning, promoting and providing advice about the effective management of dogs and cats throughout SA, undertaking or facilitating research and educational programs as well as advising the relevant Minister and the Local Government Association on the operation of the Act. As an independent statutory authority, the Board has been able to publicly test ideas, advocate for positions that government has not yet adopted and negotiate potential legislative changes with stakeholders.

The Board has coordinated and implemented a number of key activities including:

- promotion of responsible cat ownership through website materials and bus stop posters promoting desexing, microchipping and cat containment – evaluation has been limited to monitoring website traffic seeking more information on containment
- conducting surveys of cat owners to collect data on levels of desexing, microchipping and containment
- facilitating research, e.g. University of SA Citizens Science Cat Tracker Project to demonstrate the distances owned cats will travel in the local neighbourhood (Roetman et al. 2017)
- development of guidelines and templates for councils on cat bylaw preparation.

ACT

The ACT Responsible Cat Ownership Steering Committee commissioned the report 'Responsible pet ownership and the protection of wildlife: Options for improving the management of cats in the ACT', which recommended improvements in cat regulations, community education and unowned cat management (Eyles and Mulvaney 2014).

NSW

The NSW Responsible Pet Ownership Reference Group was established in 2015 to provide advice to the government on strategic cat and dog management including policy, legislation, community engagement and council programs. The group has representation from animal welfare, veterinary, local and state government and the pet industry.

3 Cat management advisory groups

Some states have established cat management advisory groups that can play an important role in monitoring and evaluating cat management strategies.

RECOMMENDATION 3

State governments should consider establishing a cat management advisory group with terms of reference that include:

- advising and advocating on changes to state and local government legislation
- monitoring the implementation of cat management legislation and compliance with mandatory requirements
- consulting with key stakeholders
- developing relevant COPs and SOPs for cat management
- identifying key metrics to evaluate the effectiveness of cat management strategies
- funding relevant research and evaluation.

Cat management plans

A cat management plan is a way of documenting the policies and programs established to manage cats in a specific jurisdiction, in order to address the requirements of domestic animal legislation.

In SA and Victoria it is a mandatory requirement under state legislation for local councils to prepare animal management plans. The emphasis of these has been on dog management but there are some councils that are incorporating more provisions relating to cat control. For example, Kangaroo Island is viewed as having one of the most stringent feral and domestic cat management requirements due to strong community support to protect native wildlife and minimise disease transmission to livestock by enforcing responsible ownership and removing free roaming unowned cats (Natural Resources Kangaroo Island 2015). In 2005, council bylaws were introduced to ensure all domestic cats are registered, desexed and confined, which have achieved very high compliance. Current discussions are underway to gauge community support for Kangaroo Island to become totally cat-free.

Tasmania is aiming to achieve an integrated approach for feral and domestic cat control through its recently developed state-based Tasmanian Cat Management Plan 2017-2022.

The plan is specific to Tasmania but is based on generic principles aimed at reducing the environmental, health and social impact of cats. These principles include:

- clarification of roles and responsibilities of eight key stakeholders (state government; local government; cat owners, breeders and sellers; animal welfare organisations; land owners; industry and community groups; researchers and Australian government) to achieve collaboration
- quantifying the problem, setting clear achievable objectives and implementing effective evaluation strategies

- incorporating effective communication, education and training opportunities to gain community support and increase capacity to contribute to the success of the management plan
- improving legislation to enable more effective enforcement relating to responsible cat ownership
- supporting research to improve effectiveness and humaneness of control measures.

Although cat management plans are useful, resources are required to develop and implement them. Many councils face significant financial challenges and would benefit from support to develop and/or implement key strategies. For example, the WA State Government offered a $10,000 grant to councils that wished to coordinate subsidised desexing to assist local cat owners on low incomes when the new requirement for mandatory desexing was introduced in 2013.

The development of templates for developing bylaws, cat management plans and formal agreements as well as SOPs which can be adapted by local councils would encourage commitment, implementation and consistency.

An important aspect of a cat management plan is to be able to evaluate whether council services are adequate to deliver their legislative requirements and are effective in improving the welfare of cats and addressing management problems. However, such evaluation depends on collecting and reporting relevant data for pound and shelter admissions and outcomes, including accurate euthanasia rates. In most local council areas, data relating to cat management are either not collected, or the way in which they are recorded is inconsistent, making it difficult to evaluate and compare different management strategies or to examine outcomes over time.

4 Cat management plans

A cat management plan may be a useful tool for local councils to identify key priorities, develop strategic and operational plans as well as evaluation measures.

Local councils require support and financial resources to implement effective cat management programs.

Development and distribution of templates for cat management plans and other relevant documents as well as SOPs would greatly assist councils.

Key data relating to cat management is either not collected or inconsistent information is recorded making it difficult to evaluate and compare management strategies.

RECOMMENDATION 4

State governments should encourage and support local councils to develop and implement cat management plans that include:

- defining and quantifying cat management aspects with a focus on impact
- setting clear, achievable and consistent objectives
- using humane, ethical and sustainable strategies
- identifying the responsibilities of key stakeholders
- consideration of owned, unowned and semi-owned cats
- securing sufficient resources for implementation
- facilitating the collection and storage of standardised data
- formally evaluating management strategies using agreed measures.

3.2.6 Collaborative strategies

Many programs and campaigns have been developed to improve responsible cat ownership, primarily with the aim of reducing the number of unwanted cats entering the population and lowering euthanasia rates of healthy cats. However in recent years, the importance of a holistic, collaborative and coordinated approach to managing owned, semi-owned, and unowned domestic cats has been recognised. Evidence of the success of different approaches to domestic cat management is discussed in detail in Section 4. In this section we describe a number of existing strategies that involve collaboration between stakeholders from the non-government, government, and in some cases private, sectors.

Australian Cat Action Plan

The Australian Cat Action Plan (ACAP) has been developed under the Getting to Zero program, an initiative by the Animal Welfare League Queensland. The Getting to Zero program aims to improve responsible pet ownership so that no healthy or treatable dogs and cats are euthanased. The ACAP focuses on domestic cats and has involved discussions with Animals Australia, Animal Welfare League Australia, Australian Cat Federation, Australian Institute of Animal Management, Australian National Cats, Australian Veterinary Association, Australian Wildlife Rehabilitation Council, RSPCA Australia, National Animal Rescue Groups of Australia and Sentient.

The key actions of the ACAP include to:

- increase levels of desexing prior to sexual maturity (4 months of age) and by owners on low income through effective low-cost/subsidised programs and veterinary training for early age desexing
- ensure all cats are desexed, vaccinated, microchipped and socialised prior to sale/transfer (including rescue organisations with some exemptions)
- encourage containment of owned cats to reduce the risks associated with roaming
- require all breeders to be registered and for details to be recorded on a microchip database; sellers to record new owner details on a database
- require all breeders and sellers to comply with mandatory care and welfare standards
- increase availability of cat-friendly accommodation, especially rental properties
- publish rehoming and euthanasia statistics for pounds, shelters and cat rescue groups.

Some progress has already been made in terms of legislative change at the state level regarding desexing, microchipping and breeder registration. However, more work needs to be done to gain consistency in legislation as well as to provide widespread access to low-cost desexing and cat-friendly rental accommodation. It is thought that publication of rehoming and euthanasia statistics will compel shelters and rescue groups to continue to improve adoption rates whilst other measures such as mandatory identification and desexing will help to increase retention by owners, increase reclaim rates and reduce overpopulation.

'Who's for Cats?' campaign

Few welfare or government agencies have focused efforts on trying to address the contribution that semi-owned cats make to unwanted cat numbers. The only campaign on record is the 'Who's for cats?' campaign in Victoria that operated from November 2007 to November 2008. This campaign was a joint initiative of the Animal Welfare Science Centre, Victorian Department of Primary Industries, Australian Veterinary Association, RSPCA Victoria, Cat Protection Society, Lort Smith Animal Hospital, Monash University, The Lost Dog's Home, and Victorian Animal Aid. Under the Australian Animal Welfare Strategy, funding was provided to expand the campaign nationally but due to administrative delays in releasing funds and a lack of resources at the state level, this did not occur.

The main focus of the 'Who's for Cats?' campaign was to encourage semi-owners to either take ownership of the cat they cared for or surrender them to a shelter or municipal pound (Webb 2008; Victorian Department of Primary Industries 2009). This campaign was not really a new approach to cat management but rather an expansion of the traditional impoundment and euthanasia of unowned cats. The campaign was regarded as a success when measured against the key performance indicators of 'changing behaviour' and 'community collaboration', but it

also led to an increase in cat impoundments and euthanasia rates (Victorian Department of Primary Industries 2009). On reflection, it appears the program did not sufficiently engage with cat semi-owners to achieve outcomes that were acceptable to them as well as to government. A review of the media revealed considerable anger from the public and subsequent research has shown that cat semi-owners continue to semi-own cats and contribute to shelter intakes (Zito 2015a, b; 2016a).

Council and community collaboration

The role of local cat welfare/rescue groups is vital in the rescue and adoption of homeless cats, but achieving better outcomes for cats requires a 'whole of community' approach. A single entity whether it be a council, rescue group or veterinary practice, is limited in what it can attain. Some rescue groups work closely with local veterinary practices to facilitate discounted desexing and other treatments whilst others collaborate with councils and some rescue groups have partnerships with both.

An increasing number of councils have developed working relationships with reputable local welfare/rescue groups and the community to develop more humane, effective and sustainable cat management initiatives. The case studies described in Box 1 highlight the significant benefits that such programs can deliver. These programs have primarily focused on removing, desexing and adopting unowned and semi-owned cats. A number of these programs have achieved success in increasing cat adoption and reducing euthanasia rates, indicating that this approach could be taken up by other councils where the opportunity arises.

In some remote and regional areas, this type of collaboration may not be possible if rescue and veterinary support is limited or unavailable. However, it may be possible to work with such groups where they exist in nearby larger regional centres. Evidence indicates that the development of a formal written agreement, such as a Memorandum of Understanding (MOU), can assist in clearly defining the roles and responsibilities of each organisation involved.

Stakeholder collaboration involves all participants working towards the same goal of effectively and humanely reducing and controlling cat numbers. Cooperation between stakeholders with differing viewpoints, such as wildlife conservationists and cat caretakers, will be crucial to effective community management of cat populations (Palmer 2014). Collaboration between social scientists and ecologists to manage wildlife-related conflict issues is also needed, as knowledge and application of concepts from social science are important in understanding and addressing problems with human dimensions like cat overpopulation (Mascia et al. 2003; Dayer and Manfredo 2004). It is also essential that all frontline responders (e.g. animal management officers, veterinary practice staff, animal welfare and rescue organisation staff) are fully aware of legal aspects of cat management, as well as best practice approaches, given that they are an important information resource for the community.

5 Community collaboration

Community collaboration has successfully contributed to humane domestic cat support and management in several locations across Australia.

Councils that partner with reputable local welfare/rescue groups are able to meet public expectations by cost-effectively minimising the number of healthy, adoptable cats killed and increasing the number of desexed domestic cats adopted into the community.

Formal written agreements help ensure key roles and responsibilities are agreed by all parties engaging in a collaborative partnership.

RECOMMENDATION 5

Best practice cat management requires the involvement of all stakeholders in decision making and solutions. Where possible, councils and cat welfare groups should establish formal collaborative partnerships to implement humane and effective cat support and management programs.

BOX 1

Examples of effective council and community collaboration

Getting to Zero (G2Z)

G2Z is a community change model developed by Animal Welfare League Queensland with the goal of achieving zero euthanasia of all healthy and treatable cats and dogs. The model is based on successful cooperative strategies in the City of Gold Coast between local government, veterinarians, breeders, pet shops, wildlife organisations, other welfare and rescue groups, and the general community. These strategies have contributed to the reduction of the cat euthanasia rate in the City of Gold Coast (the sixth largest city in Australia with a population of 560,000) from 50% in 2001-2 to 8% in 2016-17. The 8% of cats' euthanased were untreatable due to irremediable suffering or irremediable aggression. Community-based strategies to achieve this included:

- Informing the community of the number of animals who are abandoned and killed each year and involving all stakeholder groups in solutions to both prevent abandoned animals and save existing lives
- A community veterinary clinic to provide low-cost desexing and pre-pubertal desexing to prevent accidental first litters
- Annual contributions by local government to desexing subsidy programs
- A coalition of local stakeholders to develop legislation and cooperative involvement in solutions
- Responsible breeding legislation to complement desexing subsidies
- Common educational messages to the general community, local schools, universities, breeders, animal welfare and wildlife groups, councils.

Collaboration between groups and communities working towards the G2Z goal is encouraged nationally through the G2Z website www.g2z.org.au and G2Z Summit every two years.

SAFE (Saving Animals from Euthanasia Inc), City of Karratha and Pets and Vets (WA)

Karratha is a regional town in the north-west of WA with a population of about 22,000. SAFE Karratha was founded in 2003 and operates a low-cost foster care program for abandoned and relinquished animals until a permanent home can be found. Prior to SAFE's inception, the City of Karratha (the City) humanely killed every unclaimed impounded animal, amounting to hundreds of cats and dogs over several years. This approach was damaging the reputation of the City as well as having a serious negative impact on staff morale from the ongoing humane killing of healthy and adoptable animals. However, embarking on a council-based rehoming program was not considered feasible or affordable. In 2009, an MOU was signed by SAFE and the City for a collaborative animal rescue model with the aim of preventing healthy, adoptable animals from being killed. SAFE accepts animals from the City, arranges desexing through partnership with the local veterinary practice and then arranges foster care whilst promoting adoption for each animal. Since 2014, the City has reduced the cat euthanasia rate by 31%, which has not only saved hundreds of cats but reduced associated costs by over $10,000. The City provides $16,250 quarterly towards the operating costs of SAFE which it believes is a sound investment in a successful collaboration. Interviews with Dr Tim Montgomery, (Karratha Pets and Vets) and Darrell Hutchins (City of Karratha) on the SAFE Karratha/City of Karratha collaborative animal rescue model are available online.

Perth councils and Cat Haven (WA)

A total of 13 councils in the Perth metropolitan area work collaboratively with the Cat Haven WA to provide an impounding service for domestic cats including veterinary, behavioural and general care. Cats are either delivered by or collected from councils and on arrival at the Cat Haven they are checked for identification, health status and temperament. Suitable cats are then desexed, microchipped, vaccinated and treated for parasites before being made available for adoption or placed in temporary foster care. The Cat Haven staff are trained in safe and humane cat handling and in differentiating a frightened socialised cat from one that is unable to be handled, thereby maximising the number of adoptable cats. In addition, councils are able to contract the Cat Haven ranger services for rescue and trapping work. These collaborative partnerships have enabled councils to provide a cost-effective and humane cat management program as well as financial support for the Cat Haven's ongoing work to help domestic cats. Prior to the WA *Cat Act 2011* being implemented, no councils were working collaboratively with the Cat Haven.

City of Sydney Street Cat Rehoming Program (NSW)

City of Sydney Street Cat Rehoming Program is run in collaboration with Inner City Strays, the NSW Cat Protection Society, Alexandria Veterinary Hospital, Princes Highway Veterinary Hospital, and Maggie's Rescue. It provides funding for desexing, veterinary treatment, food, etc. and has rescued 89 street cats since October 2015.

3.2.7 Animal welfare codes and standards

A cat welfare code is incorporated under animal welfare legislation in Victoria (Private Keeping of Cats) which includes useful information on the health and welfare of cats such as recommending desexing by eight weeks of age. The ACT is the only other jurisdiction to have incorporated a cat welfare code (Animal Welfare (Welfare of Cats in the ACT) Code of Practice 2007) under animal welfare legislation. Incorporating a cat welfare code under legislation has many benefits including raising the importance of safeguarding cat welfare and providing specific requirements to minimise adverse welfare.

A draft national welfare code for domestic cats was developed in 2010 under the Australian Animal Welfare Strategy (AAWS), a national initiative which facilitated discussion and collaboration between key animal welfare stakeholders. Unfortunately, the AAWS did not continue and the code was never endorsed. However, the draft serves as a model for those states that do not have such a code and is a helpful document towards understanding the essential needs and appropriate treatment of domestic cats.

Some cat management activities pose particular welfare risks, including cat containment, trapping, seizing, transport and humane killing. Animal welfare can be seriously compromised if these activities are undertaken by untrained people without appropriate guidance: this is especially problematic when it comes to trapping of cats by members of the public.

Trapping guidelines developed by various states and councils contain some similar information but are not totally consistent. Different approaches are used by different states to manage these risks including requiring residents to sign an indemnity form and demonstrate that they fully comprehend trapping instructions and their legal responsibilities (e.g. City of Casey, Victoria) or that council traps are only used by council staff who set and retrieve trapped cats (e.g. City of Albany, WA) or promotion of humane trapping guidelines (e.g. Victoria). Similarly, the ACT Responsible Cat Ownership Steering Committee has recommended that trapping only be conducted through a government supervised program to ensure good welfare standards (Eyles and Mulvaney 2014). However, in most jurisdictions, there is no formal requirement for operators to be trained in trapping or handling of cats and where traps are hired privately there is no monitoring of the fate of trapped cats. This lack of guidance and oversight of trapping activities in some areas raises serious animal welfare concerns. Local government can play an important role in addressing this by requiring their own staff, private citizens and pest control contractors to be trained and competent and for all trapping of domestic cats in urban and peri-urban areas to be undertaken in compliance with an agreed COP and SOPs. This is discussed further in Section 3.3.3 and addressed in Recommendation 7.

3.3 Feral cats

3.3.1 Introduction

A detailed examination of cat ecology, the impacts of feral cats on biodiversity, as well as the methods for feral cat management have been described elsewhere (Denny and Dickman 2010; Sharp and Saunders 2012; Lazenby et al. 2015; Commonwealth of Australia 2015a,b; Biosecurity Tasmania 2016, 2017; Woinarski et al. 2015a, 2017a,b) and thus are not covered here. An examination of the effectiveness of these methods is beyond the scope of this report, but it is clear that controlling feral cats in the Australian landscape is a significant, if not impossible, challenge in terms of both its effectiveness and humaneness. Successful approaches have required the implementation of two or more strategies: even in an island situation, it has not been feasible for a single control method to eradicate cats (Denny and Dickman 2010) and all control methods have some adverse animal welfare impacts. On mainland Australia, artificial 'islands' have been created through the establishment of wildlife sanctuaries through the use of exclusion fencing. The Australian Wildlife Conservancy maintains the largest cat and fox-free areas on mainland Australia and in this way protects 519 bird species and 204 mammal species from the impacts of feral cats. Outside of these areas, ongoing lethal control is the standard approach to feral cat management.

3.3.2 Commonwealth legislation

Predation by feral cats is listed as a key threatening process, first under the *Endangered Species Protection Act 1992* and then under the *Environment Protection and Biodiversity Conservation Act 1999*. As a result of this listing, in 1999 the first Feral Cat Threat Abatement Plan (TAP) was developed, with the aim of promoting 'the recovery of endangered or vulnerable native species and communities, and to prevent further species becoming endangered by reducing predation by feral cats to non-threatening levels'. Revision of the TAP in 2008 included greater emphasis on the need for closer cooperation of stakeholders and for an implementation plan with performance indicators, priority setting and a timeframe of actions to achieve an integrated approach to cat control. A further review was undertaken in 2014 to produce the current version of the Threat abatement plan for predation by feral cats (Commonwealth of Australia 2015b), with the revised objectives being to:

- effectively control feral cats in different landscapes
- improve effectiveness of existing control options for feral cats
- develop or maintain alternative strategies for threatened species recovery
- increase public support for feral cat management and promote responsible cat ownership.

This last objective recognises the relationship between public support for feral cat control and domestic cat management. The TAP provides a blueprint for actions required to control feral cats across Australia (Denny and Dickman 2010) but the implementation of feral cat management occurs at the state and territory level.

3.3.3 State legislation

Most states have some legislated provisions for the control of feral cats, but the precise nature of these varies between jurisdictions. Legislation regarding feral cats has primarily focused on the need to undertake control measures to reduce the impact on threatened species and native wildlife in general. In 2015, state and territory Environment Ministers agreed to support legislative changes to enable landholders to undertake feral cat management on their properties (Australian Government 2014, 2015). In some states/territories (SA, Queensland and NT), feral cats have been listed as a pest species under relevant biosecurity or natural resource management legislation. In Tasmania, feral cats are declared an invasive species under the *Cat Management Act 2009* (Tasmanian Government 2009), which allows landholders to undertake control measures.

Declaring feral cats as a pest is regarded by many as a key step in recognising that urgent action is required to address the impacts of feral cats. Other potential benefits of this approach include clarifying the roles and responsibilities of stakeholders to achieve more effective planning, coordination, collaboration and accountability. It may also require landowners to control or kill feral cats on their property or to notify authorities about their presence, places restrictions on the keeping and release of feral cats, as well as attracting resourcing for control programs.

However, declaring feral cats as a pest species also raises many serious concerns, especially from cat owners or those with a general interest in animal welfare (RSPCA Australia 2018).

Firstly, the term 'pest' ascribes a label which influences beliefs and attitudes towards that animal, often resulting in them receiving less consideration and respect. Furthermore, unless the term 'feral cat' is clearly defined to only cover cats that have no relationship with or dependence on humans (see Section 2.2), it may be applied to a domestic cat who displays fearful behaviour such as hissing, or flight/fight responses, or indeed to any unidentified cat. There is a high level of public concern that declaring feral cats as a pest species has a detrimental impact on domestic cats, including inciting deliberate cruelty and unlawful killing. If this is to be avoided, it is vital that the definition of a feral cat excludes domestic cats and that cats are not demonised in information or campaign materials produced to support the control of feral cats (see Section 2.2.1).

Requiring landholders to trap and potentially kill feral cats without any requirement to establish their actual impact or assess the effectiveness of control activities may also be seen as lacking in justification and being inconsistent with an adaptive pest animal management approach. Declaring a species as a pest also provides legal protection for landholders undertaking trapping and poisoning, which may lead to less incentive to choose the most humane methods available.

Declaring feral cats as a 'prohibited' rather than a 'pest' species, may allow humane control programs to be implemented without the stigma that is associated with the 'pest' label. This could be applied to high conservation

value areas where specific impact evaluation is conducted to determine the effectiveness of control measures. In any case, legislation aimed at managing feral cats should recognise them as sentient animals capable of experiencing pain, suffering and distress and afford them protection from cruelty under animal welfare legislation.

NSW Pest Animal Review

The NSW Natural Resource Commission released a report in August 2016 which included a recommendation to declare feral cats as a pest species and acknowledged the importance of domestic cat management in relation to achieving effective feral cat control (NSW Natural Resource Commission 2016). The NSW government's response did not support the pest species recommendation as it was not deemed necessary in order to implement control measures (NSW Department of Primary Industries 2017). For domestic cat management, the government referred the recommendations including containment, breeder registration, cat trapping by property owners and desexing prior to ownership transfer, to the NSW Responsible Pet Ownership Reference Group for further consideration.

6 Feral cat management

Declaring feral cats as a pest under state legislation is regarded by many as a key step in recognising that urgent action is required to address their impacts.

However, there is a high level of public concern that this has a detrimental impact on the treatment of both feral and domestic cats, including inciting deliberate cruelty and unlawful killing.

Ensuring the definition of a feral cat excludes domestic cats (see Recommendation 1), recognising all cats as sentient animals, and avoiding demonising feral cats in information materials may help mitigate this.

Some of the issues arising from overlapping definitions of feral and domestic cats could be avoided through better coordination between government departments.

RECOMMENDATION 6

A coordinated approach to the management of feral and domestic cats is essential to ensure that laws and strategies are complementary, not opposing, and that no vital aspects in terms of definitions, responsibilities and initiatives are overlooked. Legislation to control feral cats must recognise that they are sentient animals capable of experiencing pain, suffering and distress and provide protection from cruelty.

3.3.4 Feral cat management strategies

Australian Government Threatened Species Strategy

The Threatened Species Strategy (TSS) has identified predation by feral cats as one of three key factors leading to the extinction of many species of native wildlife. The strategy is a positive step in achieving national agreement and collaboration for feral cat management by identifying key success factors, sharing resources and gaining consistency in identifying and ensuring best practice for feral cat control. Of the five targets of the Threatened Species Strategy relating directly to feral cat management, the following two are most relevant to best practice cat management:

- 10 million hectares of feral cat action, using the best techniques for each location
- Best practice feral cat action implemented across two million hectares of Commonwealth land.

In 2015, the Feral Cat Taskforce was established to drive delivery of the TSS targets aimed at tackling feral cats and their impacts. The Taskforce comprises representatives from commonwealth/state/territory government, natural

resource management organisations, the RSPCA and environmental, conservation and invasive animal research organisations. The key activities of the Taskforce are to:

- link initiatives, innovations and progress on managing feral cat threats
- build relevant partnerships and national cooperation on feral cat management
- inform government policy, planning and investment on strategic feral cat management
- provide clear and accessible data, monitoring and public reports on feral cat management activity.

The Taskforce's work is primarily framed by the Threatened Species Strategy's key actions and targets on feral cats, with reference to the feral cat TAP (see Section 3.3.2). However, there is some concern that under the Threatened Species Strategy a strong emphasis has been placed on setting a target for the number of feral cats killed, rather than an 'impact' target that can demonstrate a direct improvement in threatened species survival in ecologically sensitive areas.

It should be noted that it is currently unknown to what extent domestic cats, including unowned cats, contribute to the feral cat population. Woinarski et al (2015b) stated that this issue may be relatively insignificant compared to other factors.

3.3.5 Animal welfare codes and standards

State and territory governments have responsibility for safeguarding the welfare of animals under animal welfare legislation. Many feral cat management techniques, including trapping and poisoning, cause suffering to affected cats and thus constitute an act of cruelty. However, operators who use these methods to control pest animals are generally exempt from prosecution, as pest animal management legislation generally overrides animal welfare legislation. This provides little incentive to avoid cruelty or replace current methods with more humane methods.

However, there are measures in place to minimise adverse impacts on both target animals and non-target species. Key to this is ensuring operators have an understanding of the animal welfare impact of available control methods, and know how to carry them out in the best way possible. This is being achieved through the development of welfare COPs and SOPs for the most commonly used techniques, and the assessment of their relative humaneness.

Feral cat management is covered by the Model Code of Practice for the Humane Control of Feral Cats (COP) and the following SOPs:

- CAT003: Trapping of feral cats using padded-jaw traps
- CAT001: Ground shooting of feral cats
- CAT002: Trapping of feral cats using cage traps.

Unfortunately, compliance with these model COPs and SOPs is not mandatory, but they can be incorporated under state-based animal welfare legislation.

In response to significant animal welfare concerns about many pest animal control techniques, in 2008 a model for assessing the humaneness of pest animal control methods was developed by the NSW Department of Primary Industry with funding from the Australian Government. The model assesses each control method with regard to the overall welfare impact prior to death and the humaneness of the mode of death. The model assumes all techniques are used in accordance with best practice, using the relevant SOPs as a basis. The scores for each technique for each species are then plotted on a matrix that provides a means of comparing their relative humaneness. Assessments of a number of existing and potential feral cat control methods using this method are published on the PestSmart website. These indicate that all existing control methods for feral cats cause some pain, suffering or distress: more humane methods need to be developed and adopted as a matter of urgency.

Additional SOPs are required for use of poison baits for feral cat control, including baits containing 1080 and para-aminopropiophenone (PAPP). There is also a need to review all existing SOPs to ensure current best practice aspects in relation to animal welfare are incorporated. The 2014 Feral Cat Threat Abatement Plan supported the need to develop SOPs for these new tools as well as updating the COP to include these. It also recommended in the TAP that the SOPs and COP are agreed and adopted by state governments.

7 Animal welfare impacts of control methods

Best practice feral cat management requires an understanding of the animal welfare impacts (humaneness) of control techniques and how to carry them out in the best possible way.

All existing control methods for feral cats cause some pain, suffering or distress: more humane methods need to be developed and adopted as a matter of urgency.

Mechanisms to improve standards include mandatory compliance with a COP and SOPs, reviewing SOPs, developing additional SOPs for all new methods and requiring the most humane techniques to be used.

RECOMMENDATION 7

Practitioners responsible for implementing feral (and domestic) cat management should have an understanding of the animal welfare impacts of available methods, and know how to carry them out in the best way possible. Compliance with COPs and SOPs, for the humane treatment of cats, should be made a mandatory requirement for cat management activities.

4 APPROACHES TO EFFECTIVE DOMESTIC CAT MANAGEMENT

4.1 Introduction

Due to the overwhelming numbers of impounded and surrendered cats and kittens entering pounds and shelters, compounded by practices which do not facilitate reclaiming or adoption, many thousands of healthy, treatable cats are killed each year in Australia. The exact number is not known as there is no requirement to report animal outcomes except in NSW. Based on limited data for 2009/10, 50,000 cats were received into NSW shelters and pounds with just over 32,000 (64%) of these being humanely killed. Considering that NSW is the most densely populated state in Australia and is likely therefore to have the highest intake of cats, based on these figures, the annual national total is likely to exceed 100,000 cats killed. While many of these cats would have been euthanased for veterinary or behavioural reasons, a significant proportion would have been potentially adoptable (Alberthsen et al. 2013; Murray et al. 2008).

In addition to the welfare and ethical implications relating to the euthanasia of high numbers of healthy, treatable cats, there are significant impacts on shelter and pound workers, veterinarians and the general community. The requirement to kill a continual intake of healthy, treatable cats has a detrimental and lasting effect on the mental and emotional well-being of people witnessing and performing this procedure (Rohlf and Bennett 2005; Baran et al. 2009). Attempting to cope with grief and stress can be severely debilitating, particularly for shelter workers whose primary motivation is to help save animals.

Reducing intake, especially of unowned cats, will have a significant impact on reducing the humane killing of healthy and treatable animals. However, more can be done once cats enter a pound, shelter or rescue group. Shelters around the world have been seeking strategies to resolve this issue. One successful model developed by the British Columbia Society for the Prevention of Cruelty to Animals (BCSPCA) has shown increased adoption probability, decreased shelter death probability and fewer cats requiring infectious disease isolation (Karsten et al. 2017). Also, the Getting to Zero model developed by Animal Welfare League Queensland details the principles, structures and strategies for achieving zero killing of healthy and treatable cats and dogs through collaboration between government, shelters, veterinary clinics and the wider community (see Section 3.2.6).

An increasing number of pounds are also embracing the goal to prevent the humane killing of any healthy, treatable animal. For example, the Sutherland Shire Animal Shelter (City of Sydney) has a policy that only dogs or cats deemed dangerous or that have an illness

affecting their quality of life are euthanased. Other councils, such as Liverpool Plains, also in NSW, are replacing their pounds with shelters which have an active rehoming program.

The following sections examine the full range of approaches used to manage unowned, semi-owned and owned domestic cats, based on a review of the available literature with additional information provided through public consultation on the Discussion Paper. Each approach is considered in terms of its potential role in future cat management.

4.2 Managing unowned and semi-owned cats

Unowned cats are found in and around human habitations, may depend opportunistically on some resources indirectly and unintentionally from humans, and have no identifiable owner, although they may have been previously owned or become lost (Aguilar and Farnworth 2012; Finkler and Terkel 2012; Alberthsen 2014). It is also likely that a proportion of unowned cats were originally unwanted kittens of owned or semi-owned cats (Casey et al. 2009; Marston 2009). Semi-owned cats are under the direct and intentional care of humans but their carers do not consider themselves to be their owner (Toukhsati et al. 2012a). Unowned and semi-owned cats both add to cat overpopulation and predation of wildlife.

The problem of unwanted cats in urban areas is anthropogenic and consequently requires stakeholder and community engagement to devise cat management plans that have a good chance of success (Medina et al. 2016). In order to achieve this, relevant social, cultural, political and economic issues must be considered (Proulx 1988; Oppel et al. 2011; Medina et al. 2016).

There are three main strategies that can be used to reduce unowned and semi-owned cat populations:

- limiting the flow of cats from the owned cat population into the unowned and semi-owned populations
- reducing the number of unowned and semi-owned cats through removal of cats (by non-lethal or lethal methods)
- controlling reproduction of unowned and semi-owned cats.

Limiting the flow of owned cats into the unowned population involves desexing, reducing abandonment and the incidence of cats roaming and not returning home, topics addressed in Section 4.3. Limiting the flow of semi-owned cats into the unowned cat population involves controlling their reproduction and supporting the long-term responsible care of semi-owned cats; these topics are included below.

4.2.1 Reducing the number of unowned and semi-owned cats

Adoption

There is a limited capacity to absorb unowned cats into the owned population, especially as there is already an oversupply of surrendered owned cats needing adoption and easily obtained cheap or free cats from other sources. In an effort to limit cat numbers, animal shelters generally desex cats prior to rehoming as a matter of policy but some private rescue groups, and many council pounds, do not, thus potentially contributing to cat overpopulation. In addition, the situation is compounded by the higher cost of buying desexed kittens/cats when undesexed kittens can be obtained very cheaply and easily. Low-cost adoption of desexed kittens/cats from all welfare/rescue groups could help compete with other cheap sources of kittens/cats.

Although unowned cats (including unidentified previously owned cats not claimed by their owner) are the major source of cats entering shelters, addressing the issues leading to surrender or abandonment of owned cats can help to provide more positive options for unowned cats in shelters. If the number of surrendered and abandoned owned cats can be reduced, this will help create more adoption opportunities for semi-owned and unowned cats. It is acknowledged that a proportion of semi-owned and unowned cats will not be of suitable temperament or socialisation status for rehoming, resulting in their euthanasia (Levy 2012; Levy and Hurley 2013). Nonetheless, animal welfare organisations and councils can employ a range of strategies to increase adoptions of cats and kittens by, for example, creative marketing and advertising campaigns, off-site adoption centres, adoption drives, and improving the accessibility and attractiveness of adoption centres (Fournier 2004; Marsh 2010; Marsh 2012; Lord et al. 2014; Zito et al. 2015b). Examples in Australia include: 'Adopt Meow' $50 cat adoption drive, 'Big Adopt-Out' Pop up adoption events and 'The Paws Awaken' $20 adult cat adoption drive from RSPCA Queensland.

In addition, the Petbarn franchise has actively supported adoptions through cat hubs in their stores in collaboration with the RSPCA and over 20 other partners including Cat Haven, Animal Welfare League Queensland, The Cat Corner and the Australian Animal Protection Society resulting in more than 25,000 cats being adopted Australia-wide. Some councils also promote adoption of impounded cats and this could be undertaken on a larger scale to alleviate the burden on cat rescue groups and shelters.

There are currently no specific data on the adoption of surrendered semi-owned cats as historically this category has not been differentiated from unowned cats. However, there is the opportunity to identify semi-owners where they present at animal shelters, and offer them support, for example through low-cost or free desexing, as an alternative to surrender. The potential benefits of this approach are explored later in this section.

Potential role in future cat management

Despite the range of strategies used by welfare organisations to increase adoptions of cats, the available information indicates that large numbers of cats (including unowned/semi-owned cats) are still not being adopted. This suggests that adoption strategies alone are not sufficient to have a substantial positive impact for these groups of cats. There is a need and opportunity to explore new strategies, such as specifically targeting semi-owners of cats, to help reduce the number of semi-owned cats living in the community.

8 Semi-owned cats

Shelters and rescue groups have applied considerable creative thinking and resources to try to increase cat adoption rates. Despite these efforts, large numbers of cats (including unowned/semi-owned cats) are still not being adopted.

Increasing the number of local councils who promote the adoption of impounded cats could alleviate the burden on cat rescue groups and shelters. Specifically identifying and targeting semi-owners of cats could help reduce surrender rates and the number of semi-owned cats living in the community.

RECOMMENDATION 8

Cat management plans and strategies should recognise semi-owned cats as a separate category to unowned cats and ensure that cat semi-owners are specifically targeted in education, desexing and other relevant cat management programs.

Trapping programs

There are two potential outcomes for unowned and semi-owned cats who are trapped and permanently removed from the population: a live outcome where cats, usually kittens, are rehomed through adoption (known as trap and adopt; see above), or a lethal outcome where trapped cats are killed (known as trap and kill). The term 'trap and remove' is sometimes used to refer to activities that involve trapping and adopting, or trapping and humane killing. Rehoming is attempted on a small scale by some councils where possible (e.g. individual trapping of nuisance cats) but may be problematic on a large scale due to extra resources required unless local community support was available (pers comm Colin Hyde). Lethal trapping programs that incorporate adoption of suitable cats/kittens are more likely to receive community support than those that do not.

Trapping and subsequent humane killing is generally considered to be a relatively humane method of controlling cat populations compared to other lethal methods. Trapping generally has less impact on non-target species and poses less danger to humans and pets than other lethal methods (Palmer 2014). Nevertheless, even the best practice use of well-designed traps cannot fully alleviate the significant welfare risks associated with trapping cats. Welfare outcomes are affected by a range of factors including the type of trap used, positioning of a trap with regard to environmental exposure, frequency of checking, potential for injury during escape attempts and distress caused by containment (Robertson 2007).

Some jurisdictions have developed guidelines for trapping unowned, domestic cats but these are not consistent. Ideally, all cat trapping programs should comply with a welfare COP and procedures to ensure best practice (Section 3.3.3). One example is the 'Humane cage trapping of domestic, unowned and wild cats' (2012) publication developed in Victoria (Moore 2008). In addition, an ongoing commitment is needed to continuously refine existing methods and identify new methods to improve humaneness for trapping of cats. Some councils require that trapping is only to be done by authorised officers who will set up, monitor and remove trapped cats (usually individual cats that are causing a nuisance) to a local cat management facility. There are benefits in other jurisdictions adopting a similar approach to achieve consistency and minimise welfare risks associated with trapping. This in turn may help gain greater community acceptance for trapping programs. In other states including Victoria and SA, property owners are legally permitted to trap cats on their property using recommended methods with the cat being transferred to a designated cat management facility.

There is evidence that the current system of trap and kill programs alone result in minimal overall reduction in cat numbers, due to the very small percentage of cats actually affected by this method, and the limited capacity of shelters and pounds to remove unwanted cats (Hatley 2003; Levy 2012; Levy and Hurley 2013; Tan et al. 2017). Recent research from Australia found that low-level culling of feral cats led not to a population decrease, but an increase in cat numbers (Lazenby et al. 2015). This study raises important considerations about traditional trap and kill efforts (typically triggered by nuisance complaints) undertaken by animal control agencies or through animal welfare organisations when members of the public trap and bring unowned cats into animal shelters. These isolated and indiscriminate efforts are effectively low-level culling and, as currently practiced, are unlikely to result in any significant long-term improvement for issues of concern, such as wildlife predation, spread of disease, public health, or cat welfare. Computer-based modelling has consistently predicted failure of lethal control methods to eliminate cat populations unless high removal rates are achieved consistently and for long periods; these conditions are considered unrealistic in urban areas (Andersen et al. 2004; Foley et al. 2005; Budke and Slater 2009; Schmidt et al. 2009; McCarthy et al. 2013). One simulation model estimated that over 82% of cats in a population of 200 cats would need to be removed to result in elimination of the population over 4,000 days (McCarthy et al. 2013). Other estimates for effective removal rates range from over 50% of the female population (Andersen et al. 2004) or 55-60% in the absence of immigration (Nutter 2005); again this is unrealistic as immigration will always occur.

In order to achieve significant cat population decline, an intensive and large-scale culling program that killed a high proportion of the cat population and was maintained over a long period of time would be necessary. Models have predicted that colonies can be kept small by very high-level culling every one or two years, but that this will not lead to long-term reduction in the numbers of cats as colonies will re-establish due to immigration (Nutter 2005). To achieve attrition of open cat populations (i.e. populations where immigration and emigration can occur) requires an estimated 30 to 50% of the population to be trapped and culled every six months for at least a decade (Miller et al. 2014b).

It is important that the socio-political and practical implications of a trap and kill program be taken into account when considering if this is a viable option for urban and peri-urban cat management (Hatley 2003). It would not be possible to ensure that unconfined owned cats and semi-owned cats will be unaffected by such a program (Robertson 2007). Furthermore, many members of the community are opposed to lethal cat control programs, particularly in urban areas (Ash 2001; Robertson 2007; Marston et al. 2008; Wilken 2012; Hurley 2013; Levy and Hurley 2013; Paterson 2014; Walker et al. 2017) and non-lethal cat control measures, or even inaction, are more often accepted (Loyd and DeVore 2010; Medina et al. 2016; Liordos et al. 2017). Although some communities may support lethal control, if they feel it is adequately justified. For example, one Hawaiian study found that a survey of key stakeholders and randomly selected respondents preferred trap and kill, followed by trap and adopt, with trap, neuter and return (TNR) the least preferred option out of seven management techniques (Lohr and Lepczyk 2014). However, it is unlikely that implementation of intensive, high level and large-scale culling would be accepted in most urban areas. Indeed such programs can meet with fierce opposition, protests and even sabotage attempts in some cases (Hatley 2003; Nogales et al. 2004; Parkes et al. 2014).

If an intensive and large-scale culling program was considered, a persuasive, intense and continuing campaign to educate the public about the welfare impact of cat predation on wildlife and human health and the need for culling would be necessary (Proulx 1988; Medina et al. 2016). The public education campaign would need to be planned and implemented well before any culling operation commenced and would need to include public service announcements on television, radio, social media and in newspapers, and education in schools. It can be difficult to develop effective communication programs; it is necessary to begin the development process with a clear understanding of target audiences, including their attitudes and beliefs (Jacobson 2009; Fishbein and

Ajzen 2010). Changing public attitudes takes time and the ideas need to be continually put before the public. In addition, local government programs aimed at reducing immigration of cats into the unowned population would need to be strictly enforced (Hatley 2003). However, domestic cat control, and particularly the lethal control of cats in urban areas, has never been popular with federal, state or local government. Previous efforts to address cat overpopulation issues have been poorly funded and have rarely received ongoing support.

Another important component contributing to the success of a lethal cat removal program is to eliminate the source of food that cats were relying on. If this is not done then immigration into the area to utilise the source of food reduces the likelihood that the program will be successful (Winter 2004). Removal of food should be done after trapping has been in place for some time as cats are likely to disperse if a regular food source is no longer available.

Trap and kill programs are far from simple to implement effectively and would involve significant investments of resources to have any chance of success. The effort required to eradicate cats from even geographically isolated islands with intensive lethal control methods including trapping, shooting and poisoning is very high. It was found that the mean reported effort to eradicate feral cats from six large islands was 543 ± 341 person-days per 1000 ha of island over 5.2 ± 1.6 years (Parkes et al. 2014).

Trapping activities in peri-urban and urban areas need to be considered carefully due to the difficulty in implementing a program that would be able to remove sufficient numbers of cats effectively. In addition, eradication methods would need to be continually applied as there would be immigration and introduction of new cats into the population, through abandonment and new litters from remaining cats.

Potential role in future cat management

The indiscriminate trapping and killing of unowned cats in urban areas is unlikely to result in any significant long-term improvement for issues of concern, such as impact on wildlife, spread of disease, public health, or cat welfare. Lethal control methods only have the potential to eliminate cat populations if high removal rates are achieved consistently and for long periods; this is considered unrealistic in urban areas due to community opposition, potential for owned cats to be mistakenly caught and killed and other difficulties in implementation such as lack of sufficient and sustained resources.

If trap and kill programs cannot be effectively introduced then they are unlikely to be successful in reducing the number and impact of cats. As a result, the future management of unwanted cats in urban areas may be best served by concentrating on non-lethal control methods if these can be more effectively implemented.

9 Trapping programs

Unconfined owned cats and semi-owned cats can be affected by trap and kill measures in addition to the unowned cats targeted.

Trap and kill programs in peri-urban and urban areas are very difficult to effectively implement. Ineffective implementation results in failure to reduce cat numbers in the long term and consequently no significant improvement for issues of concern such as wildlife predation.

The community is increasingly opposed to lethal cat control programs, particularly in urban areas.

Some councils who are involved in cat trapping also promote adoption of trapped unowned cats on a small scale.

RECOMMENDATION 9

Trap and kill programs should not be considered as an effective long-term solution to cat management. Where trapping is used, procedures should follow best practice and include a community education program and a process for adoption of kittens and cats.

4.2.2 Controlling reproduction of unowned and semi-owned cats

Desexing options

Surgical ovariohysterectomy (or ovariectomy) and castration remain the mainstay and gold standard for inducing permanent sterility in cats (desexing). Permanent sterilisation of cats contributes to controlling the cat population, with evidence of other health and behavioural benefits (Murray et al. 2008). Recently, vasectomy has been assessed as a theoretical alternative to castration (McCarthy et al. 2013) but there is no field evidence to support use of vasectomy alone. Additionally, there are significant cat welfare concerns as hormonally intact cats are more likely to fight and roam resulting in injury, disappearance and/or death and are more prone to the nuisance behaviours that so often result in cat impoundment and destruction.

The development of a safe, practical, cost-effective single-dose lifelong non-surgical sterilant for cats of both sexes would revolutionise cat population control. There have been many advances in this area over the last ten years and there is active research continuing into potential methods including immunocontraception with a single-administration vaccine against gonadotropin releasing hormone (GnRH), long-term therapy with GnRH agonists administered in controlled-release devices, targeting cells in the brain or gonads with cytotoxins, gene therapy which leads to protein expression that suppresses reproduction and gene silencing of peptides essential to reproduction (Johnston and Rhodes 2015). Continued support for this type of research is essential to achieve successful cat management in the future.

Recently geographic information systems (GIS) have been used overseas to identify specific areas that contribute disproportionate numbers of kittens to shelter intakes (Reading et al. 2014), and areas where there are high concentrations of unowned cats (Aguilar and Farnworth 2012) and unmanaged cat colonies (Aguilar et al. 2013). These areas can then be made the focus of targeted desexing and education campaigns (Aguilar and Farnworth 2012) and used to assess the efficacy of implemented programs (Reading et al. 2014).

Trap, neuter and return programs

Trap, neuter and return (TNR), also known as trap, desex and return, is used as an alternative to lethal cat control in some developed countries. A number of animal welfare organisations internationally support some form of TNR as a humane method of cat population control (ICAM Coalition 2007; AAFP 2013; RSPCA UK 2014a; ASPCA 2017; BCSPCA 2017; Levy et al. 2003a).

In TNR programs, cats are trapped, desexed, vaccinated and then returned to their original location. Caretakers typically provide food and shelter and monitor the cats. When foster or permanent homes are available, young kittens and friendly adults are removed and placed for adoption.

Much controversy surrounds the use of TNR, with proponents strongly supporting it as a non-lethal option to managing unowned cats, while conservationists tend to oppose it due to concerns over wildlife predation by returned cats (Lepczyk et al. 2010). Indicators that have been used to assess the success of TNR programs include:

- reduction in euthanasia of cats in shelters and pounds
- decrease in cat colony size
- reduction in nuisance complaints relating to the cats
- reduction in unowned cat intakes into local animal shelters and animal control facilities.

Using these measures, there are variable reports of TNR's success as a cat management tool (Jones and Downs 2011; Levy et al. 2014; Slater 2001; Kilgour et al. 2017; Tan et al. 2017). Some cat colonies managed with TNR that have been studied have declined in numbers (Levy et al. 2003a; Natoli et al. 2006; Spehar and Wolf 2017) but other studies report an increase in cat numbers over time (Castillo and Clarke 2003; Gunther et al. 2011); an increase in population is particularly evident when there are high rates of immigration into the colony from unowned or abandoned owned cats (McCarthy et al. 2013; Miller et al. 2014a). In many places legislation is already in place to discourage abandonment, but enforcement is difficult to achieve (Robertson 2007).

Population modelling suggests that 75-80% of breeding adult cats in a colony need to be desexed to result in a decrease in the cat population (Foley et al. 2005; McCarthy et al. 2013; Miller et al. 2014b). However, the actual percentage of cats needing to be desexed will depend on many factors including the mean lifespan of cats in the colony, migration rates, population density, urbanisation, climate, availability of resources and other environmental factors (Schmidt et al. 2009; Miller et al. 2014b; Boone 2015; Kilgour et al. 2017).

The majority of reported studies of TNR are from the USA (Centonze and Levy 2002; Levy et al. 2003a; Levy and Crawford 2004; Stoskopf and Nutter 2004; Weiss et al. 2013) and all but one (Tan et al. 2017) are from overseas (Natoli et al. 2006; Finkler and Terkel 2010; Kilgour et al. 2017).

An increasing body of evidence suggests that long-term TNR programs can effectively reduce free-roaming cat populations, especially those programs that include an adoption program, monitoring and desexing of new cats arriving into the colony (Hughes and Slater 2002; Levy et al. 2003a; Stoskopf and Nutter 2004; Kilgour et al. 2017; Spehar and Wolf 2017). High impact TNR combined with the adoption of socialised cats and nuisance resolution counselling for residents can be an effective tool for reducing shelter cat intake (Levy et al 2014).

Greater reduction of colony size has been related to longer duration of management of the colony with TNR, and early reduction in colony size is associated with removal of kittens and friendly adults for adoption (Tan et al. 2017). In addition, TNR programs have potential benefits beyond just reducing cat numbers, including the potential to improve cat health and reduce cat related conflict with the local community due to the reduction in cat nuisance behaviours in desexed animals, such as aggression (Finkler and Terkel 2010; Gunther et al. 2016; Kilgour et al. 2017). Some authors have also suggested that maintaining a small number of desexed cats in a community is beneficial in terms of controlling rats and mice (Kilgour et al. 2017) as rats and mice have been shown to represent a high proportion of urban cat prey in those countries where this has been documented (Barratt 1997; Tschanz et al. 2010).

The factors that affect the potential efficacy of TNR (for example, the immigration rate and environment) vary considerably between different areas and countries (Kilgour et al. 2017). It is also important to note that the definition of 'success' of a cat management program is likely to differ for welfare organisations, conservation biologists, local government and policy makers (Longcore et al. 2009) and this creates controversy (Dauphine and Cooper 2009; Kilgour et al. 2017). For welfare organisations and cat advocates, success is likely measured in terms of improved cat health and welfare, a stable or reducing population and reduced admissions and euthanasia of unowned cats in animal shelters (Zaunbrecher and Smith 1993; Longcore et al. 2009). For conservation biologists complete and rapid extinction of a cat colony and reduction or elimination of cat predation on wildlife is likely to be the measure of success (Jessup 2004; Nogales et al. 2004; Longcore et al. 2009). For local government and policy makers success will most likely be measured by reduction of nuisance complaints, improved public opinion and reduced cat management costs and conflicts. It is important to note that no assessments of success of TNR programs based on the impact on wildlife have been reported.

Successful TNR programs

The following are examples of TNR programs reported as being successful:

- In the USA, the Texas A&M University campus implemented a TNR program to manage their cat population. The numbers of cats and kittens and the number of cat complaints received by the university's pest control service were found to have decreased over the two-year study period (Hughes and Slater 2002).
- In the USA, a TNR program on the University of Central Florida campus was monitored over an 11-year period. The cat population decreased by 66% over that time and no kittens were born on site after the fourth year of the program. There was some immigration of cats into the colony (strays and abandoned cats) but the new cats were desexed or adopted before they could reproduce (Levy et al. 2003a). This TNR program included an adoption component and 47% of cats were removed for adoption during the study period (Levy et al. 2003a).
- Another US study of six cat colonies in which TNR programs were introduced found that all of the colonies stabilised and had population declines compared with control colonies in which the cats were not neutered. There was a mean population decline in the TNR colonies of 36% during the first two years of study and the populations continued to decline after the two-year study period. In contrast the three control colonies had a mean increase in population of 47% over the same period (Stoskopf and Nutter 2004). Seven-year follow up on these same colonies found that the TNR colonies were stable in composition and declining in size while non-TNR control colonies increased in size and had high turnover of cats. There was consistent low level immigration into both TNR and control colonies. After two and a half years since the implementation of TNR, one of the colonies ceased to exist, and the other colonies reduced to five or less cats in the seven years of follow-up (initial colony sizes ranged from 10 to 27 with a mean of 13 ± 6 cats per colony). The researchers concluded that TNR is an effective strategy that provides a viable option for stray cat management (Nutter 2005).

- In Rome, Italy, a well-established long-term TNR program covering 103 cat colonies saw an overall decrease of 22% in cat numbers (1655 to 1293) over the two to six-year study period. In 55 colonies the number of cats decreased, with 20 remaining stable: results showed that the larger colonies and those that had been operating longer tended to decrease in size. However 28 colonies (27% of the total) increased in size over the study period. Results indicated that larger colonies and those that had been managed for a longer period were more likely to decrease in size compared to smaller colonies that had only been managed for 1-2 years. Abandonment was considered to be the main contributing factor to increasing colony size (Natoli et al. 2006).
- Another TNR program in Florida, USA, desexed approximately 54% of the cat population in the targeted area over the two-year study period. In addition, the program involved adoption of socialised cats and nuisance resolution counselling for residents. The study compared per capita shelter intake and euthanasia in the target and a non-target area. Compared to the target area, the per capita shelter intake was 3.5-fold higher and per capita shelter euthanasia was 17.5-fold higher in the non-target area. Shelter cat intake from the target area decreased by 66% compared to a decrease of 12% in the non-target area. It was concluded that high-impact TNR combined with the adoption of suitable cats and nuisance resolution counselling for residents is an effective strategy to reduce shelter cat intake. In addition, only 0.5% of cats admitted to the TNR clinic in the study needed to be euthanased due to health issues and only 0.3% cats died peri-operatively (Levy et al. 2014).
- In California, a recent study showed that after four years where over 10,000 cats/kittens were desexed and returned to their trap location, there was a reduction in shelter intake by 29% and euthanasia dropped from over 70% to 23% of impounded cats (Johnson and Cicirelli 2014).
- At the University of NSW a 'Campus Cat' program has been operating since 2008 which has effectively reduced resident cat numbers from 80 to 15, including 53 immigrant cats (pers comm Helen Swarbrick).
- An anonymous questionnaire was used to gather data on TNR of urban stray cats in Australia. Summarising this information, colony size was reported to have decreased from a median of 11.5 cats to 6.5 cats over 2.2 years, through adoption of a median of three cats or kittens per colony, and desexing a median of 69% of the colony. Cats were fed once or twice daily, and provided with prophylactic health care. Most colonies were in major cities, and at private residences, industrial sites, and streets or alleyways. Programs were largely funded by private sources, with some funding by animal welfare organisations (Tan et al. 2017).

Unsuccessful TNR programs

The following are examples of TNR programs that were reported as unsuccessful:

- One US study reported that two colonies that were part of a TNR program in Florida had their population size increase over the year of study due to immigration of new cats dumped at the highly visible sites (Castillo and Clarke 2003).
- In Israel, a study compared rates of immigration, emigration, and kitten survival over one year between two cat colonies that were subjected to TNR with two cat control colonies that were undesexed. The number of adult cats in the two TNR colonies increased over the study period due to higher immigration and lower emigration rates than in the control colonies in which the number of adult cats decreased. In addition, it was found that kitten survival in the TNR colonies was higher than in the control colonies. The researchers suggested that the increase in cat numbers in the TNR colonies was a result of sexually intact cats immigrating into the desexed colonies more readily and desexed cats reducing their emigration rates, possibly due to a reduction in reproductive and competitive pressures (Gunther et al. 2011).
- The Australian survey of TNR described above found that, compared to colonies which declined in size, colonies which did not decline or increased in size were managed for a shorter time (median 0.5 vs 3.2 years) and had fewer cats and kittens removed for adoption (median of 0% versus 0.56% of initial colony size), and fewer desexed (65% versus 75%) (Tan et al. 2017). A similar association between duration of management and success in reducing colony size was found in Rome (Natoli et al. 2006).

Simulation model reports

- A theoretical population model was used to assess the countywide implementation of TNR in San Diego County, California and Alachua County, Florida in the US. This study concluded that there was not a consistent reduction in per capita growth, the population multiplier, or the proportion of female cats that were pregnant over 10 years in San Diego and after seven years in Alachua County (Foley et al. 2005).

- One study using computer-based modelling estimated that it would take 12.8 years to eliminate a cat population with a TNR program with an annual neutering rate of 75% to 85% that was maintained throughout that time (Nutter 2005).
- Another computer-based model predicted that desexing of over 75% of the female cat population would effectively control the cat population (Andersen et al. 2004).
- Similar modelling was used to compare the theoretical effect of a three-year single-treatment nonsurgical contraception program with traditional surgical TNR. This model indicated that stabilisation of the cat population size would require that over 51% of non-desexed female cats were surgically desexed annually. Once the population had been stabilised it was predicted that approximately 14% of the total female population would need to be desexed annually or 71% of the total female population would have to be desexed at all times to maintain a stable population (Budke and Slater 2009).
- Another theoretical model was used to predict the effects of TNR on an actual cat colony using different capture and immigration rates in the model. If there was no immigration into the colony (which is unrealistic), the cat population size was predicted to decrease 46% after 25 years of TNR implementation and this was the same for a lethal control program (Schmidt et al. 2009).
- One study compared an additional approach to lethal control and TNR: 'trap-vasectomy-hysterectomy-return' (TVHR). In this model TVHR was predicted to be superior to both lethal control and TNR in reducing cat population as it resulted in a decrease in feral cat populations at lower capture rates than either lethal control or TNR. In addition, cat days in the environment (one way of assessing potential impact on wildlife) were also predicted to decrease more rapidly with increased capture rates for TVHR (McCarthy et al. 2013). However, this approach has not been fully evaluated in the field and would need field studies to adequately assess its efficacy and impact on cat welfare. In another study it was reported that vasectomised male cats were more likely to be killed by vehicles than intact or castrated males (Nutter 2005). This is likely to be related to the greater distances that vasectomised male cats were found to travel and larger home range size compared to intact or castrated males. It was suggested that the greater distance travelled and larger home range size for vasectomised male cats resulted from the cats' search for breeding females because the females in their home colonies were desexed (Nutter 2005).
- A recent study presented data from a simulation model that compared the potential effects on unowned cat populations of TNR with trap and remove methods of cat control (in the model cats were trapped and permanently removed from the population without specifying their fate). The model demonstrated TNR's potential to stabilise and reduce cat populations and the relative effectiveness of TNR in comparison to the traditional trap and kill method (Miller et al. 2014b). However, it is to be noted that this model assumed that the trapping efficiencies for trap and kill and TNR were identical and this may understate TNR's effectiveness. The authors acknowledged that economic, social and other considerations must factor prominently into the final choice(s) among multiple management options. One of the most important social considerations is the public support for the control method. TNR has been shown to have broad public support compared to trap and kill methods in overseas studies but this has not yet been adequately studied in Australia. There is often a significant disparity between public opinion and the operating policy of local governments, animal control and even some welfare organisations (Loyd and Hernandez 2012).

Welfare concerns

Another controversial issue related to TNR is the concern about the welfare of cats that are desexed and returned to colonies to live; this is largely due to the potential for a negative impact of anthropogenic pressures on the health, behaviour and lifespan of the cats (Levy et al. 2003; Jessup 2004; Finkler et al. 2011a; Loyd et al. 2013; McManus et al. 2014). Some research has found high rates of kitten morbidity and mortality in high-density free-roaming cat populations (Izawa and Ono 1986; Mirmovitch 1995; Gunther and Terkel 2002; Stoskopf and Nutter 2004; Gunther et al. 2011). It has been reported that the two most common outcomes for individual cats in colonies were disappearance from the colony or death, most often due to motor vehicle trauma (Nutter 2005).

One concern expressed regarding the welfare of colony cats is that they are likely to be at high risk of infectious disease. However, the baseline health status and infection rate of FIV (feline immunodeficiency virus), FeLV (feline leukemia virus), *Cryptosporidium* spp., *Giardia* spp. and *Toxocara cati* of colony cats have been found to be similar to that reported in both feral and owned cats (Lee et al. 2002; Luria et al. 2004; Levy and Crawford 2004; Nutter 2005; Levy et al. 2003a). Other studies have reported a higher incidence of FIV in feral cats compared to companion cats (Nutter 2005; Norris et al. 2007). Unowned cats have been reported to have higher seroprevalences of

Bartonella henselae and *Toxoplasma gondii*, and it has been proposed that this was due to greater exposure of unowned cats to the vectors or hosts of these organisms (Dubey 1973; Nutter 2005). One study of urban 'stray' cats in Brazil found that fleas were present on 28% of the cats, and *Haemobartonella felis*, piroplasmas (*Cytauxzoon* spp. or *Babesia* spp.) and FIV infected 38%, 47% and 21% of the cats respectively. No cat was found to be infected by *Dirofilaria immitis* (heartworm) or FeLV (Mendes-de-Almeida at al. 2004). Infectious conditions of cats will vary in different countries and locations and this will affect the welfare of those cats, which in turn will require careful evaluation if a TNR program is to be considered. In addition, the accumulation in the environment and effect of ectoparasites and other pathogens that can be carried by cats and affect other species must also be considered (Longcore et al. 2009), including fleas *Haemobartonella felis*, *Ricksettia spp*, and *Coxiella spp* (Chomel et al. 1996; Shaw et al. 2001; Akucewich et al. 2002) hookworms or roundworms (Uga et al.1996; Anderson et al. 2003; Dubn´a et al. 2007) and *Toxoplasma gondii* (Dubey 1973).

The capture, transportation and surgery of cats for TNR certainly could cause some distress and some cats will be pregnant when desexed. However, overall it is possible to minimise distress during the TNR procedure and pregnant females can be safely desexed with careful management (Levy et al. 2003a; Association of Shelter Veterinarians' Veterinary Task Force to Advance Spay-Neuter 2016).

A recent study raised concerns about the welfare of free-roaming cats living in highly developed and crowded cities in Israel due to the high number of public complaints related to cat injuries and distress. Higher incidences of welfare problems were associated with higher levels of breeding and numbers of kittens. The authors suggested that controlling the reproduction of the cats, thereby reducing the number of births (and associated parturition dangers) and number of kittens (which tend to suffer high mortality) could have the potential to reduce the welfare concerns associated with free-roaming cats (Gunther et al. 2015). The location of a colony in terms of its proximity to high risk areas (such as busy roads) has the potential to affect the morbidity, mortality and quality of life of resident cats and needs to be considered when assessing suitability for TNR.

Despite these concerns, the evidence indicates reasonable welfare for cats in managed TNR colonies that have been researched, which would negate the strong opposition to TNR on health and welfare grounds.

Recent research in New Zealand found that the welfare of cats in managed cat colonies was comparable to that of owned cats, while even unmanaged cats' quality of life scores were fair-to-good (Dale 2015). In a number of studies of TNR programs, only a small proportion of the cats trapped needed to be euthanased due to debilitating conditions (Wallace and Levy 2006). In addition, desexed free-roaming female cats have been found to have reduced cortisol levels and aggression compared to entire free-roaming female domestic cats (Finkler and Terkel 2010). This suggests that the welfare of the individual cats is improved by desexing, likely due to reduced social and reproductive pressures, evidenced by lower aggression of the desexed females.

Other evidence has shown that desexed cats in colonies lived significantly longer than their non-desexed counterparts (Nutter 2005). In another recent study it was reported that the morbidity rate for cats in colonies significantly decreased with increased desexing rate. The authors concluded that desexing may improve cat welfare (Gunther et al. 2016).

Since the welfare of free-roaming cats has been associated with the amount of care that is provided to them (Slater 2007) the better the care provided to the cats in a cat colony the better the animal welfare related outcomes are likely to be (Gunther et al. 2015). This evidence should provide some reassurance to those who are concerned that unowned cats have poor welfare and consequently believe that unowned cats should be humanely killed rather than desexed and managed in their environment.

Potential role in future cat management

There seems to be four major concerns in relation to the implementation of TNR programs in Australia: its potential effectiveness, the welfare of cats subject to TNR, the cost of implementation and the impact of cats on wildlife. Most research indicates that TNR is effective in that it can successfully reduce cat numbers and nuisance and result in the eventual extinction of cat colonies. The evidence also indicates that cats in managed TNR colonies have reasonable welfare if they are managed appropriately. When it comes to cost, although substantial investments of both time and money are required, these costs diminish over time and both TNR and catch and kill programs require significant investment if properly implemented. In terms of wildlife impacts, TNR has not been implemented and assessed in areas where predation on wildlife is considered a significant issue. TNR would be unlikely to be considered suitable in such areas. Where TNR results in the reduction and eventual extinction of cat colonies, then wildlife impacts will also be reduced, but this aspect has not yet been properly assessed.

There is great variability in how well TNR programs are implemented and it seems likely that poor implementation in the past has contributed to TNR programs not producing substantial and persistent reductions in cat populations. In addition, those programs that are effective often fail to effectively document or publicise their success. When implemented well, TNR programs have the potential to be a useful cat management tool in urban areas: Box 2 identifies ten key factors that contribute to the success of such programs based on the information presented here.

International evidence suggests it is likely that the public would support the implementation of TNR as an alternative to widespread lethal cat management in urban areas but conservationists are likely to have concerns about the potential impacts of cats on wildlife. This was reflected to some extent in the spread of comments on this topic from the public consultation process (RSPCA Australia 2018). However, these concerns may be mitigated by specifying conditions on its use, ensuring adoption of cats is an integral part of the program (this approach is termed TDARS or trap, desex, adopt or return and support) and assessing and reporting the effect on wildlife predation.

All of the studies documenting specific TNR programs have been conducted overseas. One Australian study has presented survey data from individuals undertaking TNR in colonies in Australia (Tan et al. 2017), but there are no published analysis of specific Australian TNR programs. Thus, it is difficult to fully assess TNR as a potential cat management tool in Australia at this time. Since factors affecting the potential efficacy of TNR vary considerably between different areas and countries, prospective data obtained under Australian conditions are needed to determine the potential of TNR to assist in controlling urban cat populations in this country. This could be achieved by implementing a study of TNR in Australia in an appropriate setting using the above success factors as a starting point. Cat colony management guidelines could be created and a requirement of participating in the study could be to adhere to the guidelines and for the semi-owner or cat colony carer to register the cat(s) on a centralised register for monitoring and assessment of the program's outcomes.

10 TNR programs

There are reports of trap, neuter, return (TNR) programs stabilising and reducing unowned and semi-owned cat populations.

Poor implementation is likely to have contributed to unsuccessful TNR programs where substantial and persistent reductions in cat populations have not been demonstrated.

Data on the impact on wildlife have not been collected or reported in association with successful TNR programs.

Ten factors are identified which contribute to successful TNR programs, including high levels of desexing in a targeted area, removal of kittens and socialised adults for adoption, monitoring and rapid desexing of immigrant cats, strong community engagement and support and ongoing data collection and evaluation.

Concern over the use of TNR could be mitigated by specifying conditions on its use, ensuring adoption of cats is an integral part of the program (this approach is termed TDARS or trap, desex, adopt or return and support) and assessing the effect on wildlife predation.

RECOMMENDATION 10

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.

BOX 2

Factors contributing to successful TNR programs

1) *A high proportion of female cats in the target population are desexed.*
Modelling suggests that desexing rates of over 75% of female cats within a colony are needed to achieve reductions in colony size (Anderson et al. 2004; Nutter 2005). If resources are limited, it is more effective to desex a high proportion of cats in one colony than a small proportion in several colonies (Levy et al. 2014).

2) *Immigration of cats is prevented or minimised.*
TNR is likely to be successful in reducing and controlling cat numbers only if immigration into the colony can be prevented or reduced to a very low level and where any cats that do join the colony are desexed or adopted before they can reproduce (Guttilla and Stapp 2010; Paterson 2014). Immigration can be minimised by implementing public education programs aimed at improving responsible cat ownership and where geographical boundaries prevent the immigration of cats into the program area.

3) *The cat population is continually monitored.*
The ability to monitor cat numbers and arrival of new cats into colonies so that new arrivals can be adopted out or desexed promptly will contribute to the success of a TNR program (Gunther et al. 2016).

4) *Data is collected and evaluated.*
Ensuring appropriate data is collected in a consistent manner will assist in ongoing evaluation. Many TNR programs have involved researchers (Hughes and Slater 2002; Levy et al. 2003). However, a recent study of successful community-based programs also demonstrates good data collection and evaluation (Spehar and Wolf 2017).

5) *Cat adoption is an integral part of the program.*
An adoption component is considered a crucial part of successful TNR programs (Levy et al. 2003). Combining adoption with TNR can offset immigration into colonies and help reach the removal threshold necessary for population decline (Andersen et al. 2004).

6) *Carers/semi-owners are involved.*
Involving cat semi-owners in any TNR plan is vital as they can provide support and access to cat colonies, can help to maintain positive public perceptions of the TNR program and encourage community support and engagement (Haspel and Calhoon 1990; Centonze and Levy 2002; Ash and Adams 2003; Finkler et al. 2011a; Zito et al. 2015a; Kilgour et al. 2017).

7) *The cat colony is well managed and the program adequately resourced over the long term.*
A significant factor determining the success of a TNR program is likely to be good ongoing management of the cat colonies involved. This requires effective communication and building of trust with all stakeholders, and the involvement of all participants (Gunther et al. 2016; Kilgour et al. 2017). TNR programs must have long-term commitment and resourcing in order to achieve their aims (Levy et al. 2003; Kilgour et al. 2017; Tan et al. 2017)). Good management will also include appropriate colony selection for the TNR program, including assessing the risk to the cats and community related

to infectious disease and environments posing significant risk to the cats' welfare. The use of best practice guidelines assists in maximising chances of ongoing success.

8) *Stakeholders have an understanding of the program and its aims.*
To achieve public support, information about the impacts of cats on wildlife and human health, the need for TNR and how TNR works would be an important component of implementing a widespread TNR program.

9) *Program outcomes are properly evaluated and reported.*
In order to effectively assess the success of TNR programs it is vital that the cat populations being targeted are accurately measured prior to management efforts and throughout the study (Kilgour et al. 2017). If TNR is to be used for urban cat population management, the use of tools like population modelling, population monitoring and adaptive management will be necessary to engage all stakeholders and improve its effectiveness (van Heezik 2010; Boone 2015). This would involve the implementation of standardised TNR approaches based on best-practice methods that are coordinated under the framework of 'adaptive management', where monitoring data are regularly evaluated in order to improve the management program.

10) *The program does not conflict with wildlife management priorities.*
TNR programs are not suitable in urban areas adjacent to ecologically sensitive areas where wildlife protection is a priority (Guttilla and Stapp 2010) Although TNR can lead to the extinction of a cat colony over time, this is likely to take 5-13 years. Therefore, TNR is not a suitable tool when acute issues (e.g. significant cat impacts on threatened or endangered species) require rapid extinction of a cat colony (Stoskopf and Nutter 2004).

Targeted low-cost desexing

Targeted low-cost desexing campaigns have traditionally involved proactively encouraging and facilitating cat owners to have their cats desexed (see Section 4.3.2). However, there may be potential benefits to specifically target cat semi-owners to desex the cat in their care. This differs from a TNR program in that it applies to cats that are cared for by specific people who consent to having the cat desexed and returned to them.

Free or low-cost cat desexing by animal shelters, animal welfare organisations or through local government programs should help encourage cat semi-owners to desex the cat(s) in their care. The success of such programs is likely to be increased by also facilitating desexing through targeted education, community engagement campaigns, and providing assistance for cats to be transferred to the veterinary surgery, e.g. volunteer support to pick up and drop off cats. In addition, some councils coordinate a local volunteer network which includes support to care for companion animals, especially for older residents. For example, City of Charles Sturt in Adelaide initiated the Companion Animal Project in 2015 that has, to date, focused on dog walking assistance. However, there may be an opportunity to extend this type of initiative to provide transport assistance to owners and semi-owners to facilitate cat desexing.

Cat semi-owners are likely to be more amenable to non-lethal than lethal cat management strategies since they are reported to be attached to the cats they care for and feel protective of them (Zasloff and Hart 1998; Centonze and Levy 2002; Zito 2015, Zito et al. 2015a). Consequently, efforts to combat the contribution of semi-ownership to unwanted cat numbers should concentrate on encouraging and facilitating more responsible caretaking, in particular desexing, regardless of whether the semi-owner accepts ownership for the cat (Toukhsati et al. 2007; Toukhsati et al. 2012b; Zito 2015). Acceptance of ownership is not necessary to achieve the goal of reducing the contribution of semi-owned cats to unwanted cat numbers and improving cat welfare. Recent research indicates that education campaigns specifically aimed at cat semi-owners are likely to be more effective at redirecting this behaviour than eliminating it (Zito 2015). The goal is not to encourage cat semi-ownership but rather, where people are already doing this, to support them in the interests of improving cat welfare and management success as long as certain conditions are met.

Potential role in future cat management

Targeted low-cost desexing programs for semi-owned cats could form a valuable option for reducing the number of unwanted kittens born to semi-owned cats, reducing the number of semi-owned cats (and likely reducing the impact of cats on wildlife as a result) and improving their welfare (as carers would be less likely to become overwhelmed by having too many cats).

Education programs targeting cat semi-owners are a vital component of any strategy to manage semi-owned cats. This approach would require the revision and clarification of current cat classification systems in some jurisdictions to allow semi-owned cats to be desexed and remain with their semi-owner, even if the semi-owner cannot or will not take full 'ownership'.

11 Targeted low-cost desexing of semi-owned cats

Targeted low-cost desexing programs for semi-owned cats could help improve the welfare and reduce the numbers of semi-owned cats and kittens born.

Education programs targeting cat semi-owners are a vital component of any strategy aimed at trying to manage semi-owned cats.

Allowing semi-owned cats to be desexed and remain with their semi-owner, even if the semi-owner cannot or will not take full 'ownership' would require the revision and clarification of current cat classification systems in some jurisdictions.

RECOMMENDATION 11

A research study should be conducted to evaluate whether a targeted low-cost desexing program, combined with education of cat semi-owners, is an effective tool for managing semi-owned cats.

4.3 Managing owned cats

Good management of owned cats is an important component of managing the overall cat metapopulation and in ensuring good animal welfare, community satisfaction and reduced wildlife predation. Many of the strategies to manage owned cats address more than one of these objectives.

Owned cats are under the direct and intentional care of humans and are considered owned by their carers. Owned cats contribute to both cat overpopulation and adverse welfare outcomes for wildlife through predation.

There are three main methods that can be used to manage owned cat populations:

- reducing owned cat surrender and abandonment
- promoting and facilitating responsible cat ownership including desexing before sexual maturity
- improving cat owner education.

4.3.1 Reducing owned cat surrender and abandonment

High rates of surrender overload animal shelter and rehoming systems and reduce the number of places available for unowned cats needing to be adopted. A detailed review of cat surrender is beyond the scope of this report but there is extensive literature available on this topic (Miller et al. 1996; DiGiacomo et al. 1998; Salman et al. 1998; Shore et al. 2003; Kass 2005; Rinzin et al. 2008; Casey et al. 2009; Marston 2009; Alberthsen 2014; Zito 2015, Zito et al. 2016b). Many welfare organisations have made some progress in tackling this issue through a number of initiatives including: adoption counselling that incorporates advice on pet-friendly accommodation (e.g. RSPCA Queensland), provision of financial aid to help potential surrenderers care for their cat such as food banks (Sacramento Pet Food Bank 2011; Bi-state Pet Food Pantry 2014; Project Maddie 2014) and low-cost health care (Lort Smith 2014; The Humane Society of the United States 2014). Australian examples of aid to potential surrenderers include Lort Smith and Animal Welfare League. Lort Smith offers a 25% discount on fees for standard consultation, desexing and vaccination for health and pension card holders. In 2015, Lort Smith provided veterinary care for over 24,000 animals. The Animal Welfare League operates three community veterinary clinics in Australia (Gold Coast, Ipswich and Hobart) through the provision of low-cost veterinary services to help reduce the number of abandoned pets. Further discounts and payment plans are available to ensure that no animal will suffer or be euthanased due to the financial situation of the owner.

Cat abandonment is illegal under animal welfare legislation in all states/territories in Australia but continues regardless. It seems likely that abandoned cats add to the unowned and feral cat populations, although there is no reported evidence to confirm this. Cat abandonment can be associated with the following circumstances (but is not limited to just these circumstances):

- tenants move out of a rental property but leave their cat at the property
- tenants are unable to find a rental property that permits cats
- the human-cat bond is not established thereby devaluing the relationship
- the cat is not desexed (no investment by the owner) or microchipped (no trace).

Of owners surrendering cats to RSPCA shelters in Australia, 36% said it was because of inability to find rental accommodation where cats were allowed (Alberthsen et al 2013). In Australia, although 33% of the population lives in rented accommodation, only 4% of advertised rentals allow pets. The preconception by landlords that pet owners cause more property damage is not evidence-based. Pet owners stay twice as long, pay more rent and are no more likely to cause damage than non-pet owners (Carlisle-Frank et al. 2015). Many organisations have called for the removal of 'no-pet' clauses in rental agreements on the basis that these are discriminatory and increase surrender of cats. In October 2017, the Victorian Government announced changes to legislation to prohibit landlords from preventing a tenant with a pet from renting without a substantial and legitimate reason.

The Australian Companion Animal Council has produced two excellent publications which dispel the myths that perpetuate the notion to refuse tenants with pets:

- A Guide for Tenants – Renting with Pets
- A Guide for Landlords and Managing Agents – Tenants with Pets.

Potential role in future cat management

Significant progress has been made in reducing cat surrender through initiatives from animal welfare organisations to address situations that lead to surrender; these are of great benefit and need to continue. Cat abandonment is illegal under animal welfare legislation in all states/territories in Australia and in order to reduce its occurrence the existing legislation would need to be more consistently and stringently enforced. In addition, including an offence under cat management legislation would authorise animal management officers, rather than only inspectors gazetted under animal welfare legislation, to intervene in situations were owned cats have been abandoned. With regard to rental accommodation, targeted education and changes in legislation could increase the number of cat-friendly homes for tenants.

12 Rental access

Significant progress has been made in reducing cat surrender through initiatives from animal welfare organisations.

An important factor in surrender and abandonment of cats is the limited availability of cat-friendly rental accommodation. Changes to tenancy laws and promoting the advantages of renting to pet owners may help to improve this.

Cat abandonment continues despite being illegal under animal welfare legislation in all states/territories in Australia.

RECOMMENDATION 12

Cat surrender and abandonment could be reduced through increasing the availability of cat-friendly rental accommodation and promoting the value of the human-cat bond.

4.3.2 Responsible cat ownership

The key elements of responsible cat ownership are:

- containment (also termed confinement)
- identification
- desexing
- registration (where required).

Containment

Containment of cats does not yet seem to be regarded by owners as an important component of responsible cat ownership in Australia. However, preventing cats from roaming has the potential not only to prevent reproduction (especially of young cats that are sexually mature but not yet desexed) but also to prevent wildlife predation, minimise community nuisance, reduce toxoplasmosis transmission, reduce the risk of the cats contracting diseases and becoming injured or killed from traffic, fighting, dogs and human cruelty (Loyd and Hernandez 2012; Toukhsati et al. 2012a). For example, a recent study conducted in SA fitted suburban owned cats with individual cameras and found a high frequency of potentially life threatening hazards to these cats (for example, road crossings, encounters with other cats, consumption of potentially toxic substances, and exploration of storm drain systems and crawlspaces of houses) (Loyd et al. 2013). Domestic cats have been found to have larger home ranges at night than during the day (Metsers et al. 2010), thus potentially exposing them to more risk during the night if allowed to roam.

The keeping of purely indoor cats (with or without a fully contained outdoor enclosure) is common in the USA and is increasingly recommended in Australia, However, rather than being a requirement, this is often a choice made by cat owners in the interests of keeping their cats safe and secure and/or to prevent wildlife predation.

Community acceptance for cat containment varies; negative views of containing cats have been reported (McLeod et al. 2015) but other studies show broad support (Loyd and Hernandez 2012; Toukhsati et al. 2012a; Walker et al. 2017). A recent New Zealand study reported that 41% of people interviewed supported containment of companion cats to the owner's property at certain times; night time containment was the most commonly supported approach (Walker et al. 2017).

Some research suggests that campaigns to reduce roaming through containment will be more successful if they concentrate on the welfare benefits to cats rather than wildlife protection (Toukhsati et al. 2012a; Hall et al. 2016). In addition, people who perceive higher risks associated with cats being outside have more negative attitudes toward cats being allowed outside (Gramza et al. 2016). Restrictions on roaming will serve the dual purpose of protecting wildlife and cats. Collaborative education programs involving councils, veterinarians, animal welfare groups and other stakeholders are essential to increasing acceptance and implementation of cat containment. Recent evidence suggests that locally relevant and targeted information that can increase the perception of risk associated with cats being outside may prove useful in conservation efforts aimed at promoting adoption of risk-mitigation actions such as cat containment (Gramza et al. 2016).

Despite containment having many benefits for cats, there are also health risks to some cats who are confined indoors including obesity, immobility, lower urinary tract disease and behaviour problems (Zoran and Buffington 2011). A study of cat owners showed that indoor and indoor/garden contained cats showed more behavioural problems compared to free-roaming owned cats, particularly house soiling, boredom and damage to furniture (Sandoe et al. 2017). Other research indicates that behavioural problems are due to increased stress, insufficient mental stimulation and lack of physical activity (Bain & Stelow 2014). However, these problems were reduced when owners were provided with appropriate education by veterinary behaviourists (Gazzano et al. 2015). Indoor containment and physical inactivity are also risk factors in the development of feline type 2 diabetes mellitus (Slingerland et al. 2009). Further research is required to determine the true nature and prevalence of diseases and other conditions associated with containment as these impacts can lead to some cats being surrendered where owners are unable or unwilling to resolve these problems.

There are a few areas where cat owners are required to fully confine their cats 24 hours/day (sometimes referred to as a 24-hour cat curfew). In these areas, if allowed outside, cats must be on a leash or in an enclosure. Limited information is available about the implementation of 24-hour containment regulations and their outcomes. Anecdotally, no cat attacks on wildlife have been reported to the RSPCA in areas in the ACT where containment regulations have been put in place. However, this does not account for wildlife killed, or injured animals or birds taken to other facilities. There are no other reports of success, or failure, of 24-hour containment regulations and no reports of formal monitoring.

In addition to 24-hour containment there are other, less strict, limited cat containment regulations implemented by some local governments. These vary significantly in the different locations in which they are introduced, in terms of the times at which cats must be contained and also the extent to which cats must be contained. In some areas, cats may only go outside on a lead or contained within an enclosure but in other areas it is only required that the cat must be contained to the owner's property. Local councils in Australia that have introduced cat containment regulations have slightly different requirements. Overall, councils with cat containment regulations have not been able to demonstrate any measurable reduction in cat complaints or cats wandering at large following the introduction of the regulations. However, in the few existing reports, the assessment of the success or failure of limited cat containment is based on no, minimal or questionable data. Rates or compliance with such regulations is unknown, and in any case, cats may kill wildlife and mate during the day within the confines of their owner's property. Consequently, there are limits to the effectiveness of cat containment regulations unless cats are required to be confined 24 hours/day within an enclosure or on a lead when outside, and such regulations are effectively enforced.

There are also a number of issues associated with cat containment regulations including:

- The potential negative impact of containment on the health and behaviour of cats
- Inadvertent trapping of owned cats that are not contained (or have escaped)
- Increased owned cat surrender or abandonment due to the imposition of an added responsibility to cat ownership.

Enforcement of containment regulations can prove difficult for various reasons including:

- difficulty of capturing cats in breach of containment regulations
- unrealistic community expectations in regard to enforcement and management
- the majority of trapped and impounded cats are not owned or traceable to an owner so there is no possibility of taking any enforcement action
- the expense of proper monitoring and enforcement may be prohibitive and is likely to far exceed the benefit gained from limited cat containment regulations.

Anecdotal information from councils that have introduced cat containment regulations shows that there have been limited numbers of enforcement actions by animal management officers following their introduction. Instead, the public are reportedly taking action by trapping cats through council cat trap programs and trap loan schemes. As a result, cat trap services have expanded, with the purchase of additional traps and allocation of additional staff resources to manage the delivery and collection of traps and impounding of cats, all at significant cost. There are also major concerns regarding trapping by untrained members of the public and the impact of this on cat welfare.

Where owners are unable to contain their cats, promotion of effective methods to reduce predation is of benefit. Bells on collars have been shown to be relatively ineffective in preventing overall predation (Calver and Thomas 2011). However, other research has shown that a specially designed 'cat bib' does reduce predation, with cats easily tolerating this device (Calver et al. 2007). In addition, a study evaluating the impact of a colourful 'scrunchie' worn around the neck, also showed reduced predation (Hall et al. 2015).

Where cat containment regulations are proposed, the cat-owning public need to be informed about the benefits of containment and how to provide a suitable and enriched environment for their cats (Loyd and Hernandez 2012; Toukhsati et al. 2012a). Community education programs promoting the benefits and practical aspects of welfare friendly cat containment involving councils, animal welfare organisations, veterinarians and pet supply businesses would be beneficial. In addition, evaluation of the scheme through a monitoring system with baseline statistics and ongoing measurement of outcomes should be established before implementation. Publishing the results would be very useful as there is currently no information on this reported in the literature.

However, education alone may not be sufficient to achieve the behaviour change required for owners to regard containment as 'normal' practice. One Tasmanian study indicated that cat-owners' decisions to contain their cats or to allow them to roam were guided by a range of factors including owners' beliefs about their ability to implement an effective containment strategy and their views about the physical and psychological needs of their cats (McLeod et al. 2015). Identifying the drivers and barriers to change is crucial to be able to select appropriate behavioural change tools, targeted engagement strategies and messaging. Research evaluating the response of cat owners to different persuasive messages found that messages which focused on either 'wildlife protection' or 'cat benefit' in relation to containment increased owners' motivation to contain their cat and their belief that they could effectively contain their cat (McLeod et al. 2017a).

The Cat Tracker Project conducted in SA, which involved tracking the movement of 428 radio-collared pet cats and surveying their owners, revealed some interesting findings. The results showed that 40% of cats considered to be inside at night by their owners were in fact roaming over a one hectare area. Seventy percent of owners thought it was important to contain cats at night but only 19% thought daytime cat containment was important (Roetman et al. 2017).

Potential role in future cat management

There is a lack of clear and measurable objectives for the implementation of cat containment regulations. There is also a lack of monitoring or data that can be used to adequately evaluate success.

From the available information it seems that regulations that mandate 24-hour containment of cats (i.e. where cats must be indoors, in an enclosure or on a leash), are more likely to achieve the assumed goals of significantly reducing wildlife predation, breeding of unwanted cats and cat nuisance, than limited containment regulations. However, at present, 24-hour containment appears to have less support from cat owners than night-time containment.

In order to have the most benefit for cat management, containment needs to be combined with mandatory identification (so that cats found outdoors can be identified as owned) and strategies to manage unowned cats.

After a containment regulation is introduced, there may be an increase in admissions, adoptions and euthanasia as cats are trapped if found wandering in breach of the containment regulations, even if they are owned. Strict containment laws may also deter people from owning cats and this could lead to an increase in shelter intake rates. These problems may be mitigated if regulation is preceded by owner education and facilitating behaviour change towards more responsible cat ownership.

13 Cat containment

Cat containment regulations need to mandate 24 hours/day containment, rather than night-time curfews, if they are to significantly reduce wildlife predation, breeding of unwanted cats and cat nuisance.

Enforcement of cat containment regulations can prove difficult.

Implementation of cat containment should be preceded by programs to educate owners about the benefits of containment and how to ensure the welfare of contained cats.

More data is needed on the impact of cat containment on prevention of wildlife predation, health and welfare of confined pet cats and risks associated with cat trapping.

The greatest benefit from cat containment would come from combining these regulations with mandatory desexing and identification (so that cats found outdoors can be identified as owned), and strategies to manage unowned cats.

RECOMMENDATION 13

Education programs are needed to increase the acceptance and uptake of 24-hour cat containment, with subsequent regulation in areas of high conservation value.

Mandatory identification

In general, mandatory identification refers to a requirement to have cats microchipped from a specific age or if the cat is being transferred from one owner to another. Identification of a cat is generally considered as a mark of ownership and is an indication that the 'owner' cares enough about the cat to claim it as theirs. Identification is a fundamental tool of animal management at a community level with microchipping being the preferred method because microchips are the only permanent and unalterable form of identification currently available for cats.

The presence of a microchip helps welfare agencies, pounds, veterinarians and concerned community members to make appropriate decisions about the future of a cat that is found. There are many benefits of microchipping including the following:

- if a cat is lost, the owner can be identified and contacted so the cat can be reclaimed
- if an owned cat is injured the owner can be contacted so that prompt and appropriate decisions can be made about their treatment
- if a cat is straying and causing a nuisance the owner can be identified and educated about their responsibilities, warned or penalised (depending on the local legislation and policies)
- if a cat does not have a microchip the cat may be assumed to be unowned: this means that appropriate decisions can be made according to the relevant legislation if the cat is lost, injured, or straying.

Microchipping is a reliable means of lifetime identification, but it is not visible, requires access to a 'reader' and relies on the information linked with the microchip being accurate. Solely relying on microchipping as the only form of identification may limit the capacity to locate owners efficiently. It is common for the microchip data for owned cats entering shelters to be inaccurate, making reuniting cats with their owners difficult (Alberthsen et al. 2013; Alberthsen 2014). A study showed that 37% of stray but microchipped cats entering RSPCA Qld had inaccurate data (Lancaster et al. 2015). Nearly half were registered to a previous owner and nearly one third had either incorrect or disconnected contact phone details.

Providing cats with collars and a visible identification tag has been successful in reuniting cats with their owners although there can be issues with collars becoming caught or lost (Lord et al. 2007; Lord et al. 2010). Over a 6-month study period, most (73%) cats successfully wore a collar (including some owners replacing collars), with 56% of owners claiming their cat tolerated the collar better than expected (Lord et al. 2010). However, 3% of all cats had a minor incident that involved either getting their forelimb caught in their collar, the collar caught on an object, or the collar caught in their mouth. Only elastic collars became caught on an object (6.6% of cats with elastic collars) and incidents were more often associated with collars that became loose. Collars came off in 14% of cats with a buckle collar, 49% with a break-away collar and 53% with an elastic collar (Lord et al. 2010).

Another study of 107 veterinarians indicated that injuries or death caused by wearing a collar are very rare (Calver et al. 2013). In one practice, cat collar injuries accounted for 0.33% cases being admitted over a three-year period. Of 63 cat owners surveyed, only one reported a cat collar injury, but 22% reported cats needed treatment following a road accident, 52% reported cats needing treatment due to cat fighting and 62% had owned cats killed on the road. The authors concluded that road accidents and fighting pose greater hazards to roaming cats than collars, which offer benefits such as allowing identification and anti-predation devices to be attached.

Positive documented outcomes of mandatory identification include:

- Mandatory cat identification, in combination with registration, and annual licensing, has been associated with an increase in the reclaim rates of cats (Lord et al. 2007). Theoretically, mandatory identification alone (either microchip &/or collar and identification tag) should also increase reclaim rates.
- Providing cats with collars and a visible identification tag has been successful in reuniting cats with their owner (Lord et al. 2007).
- After mandatory identification of cats was introduced in the ACT, the number of cats returned to their owners after they entered the RSPCA ACT shelter increased (Source: RSPCA ACT).

Where mandatory identification has been introduced there is some variability in the age at which cats are required to be microchipped and whether a previously un-microchipped adult cat is required to be microchipped. In addition, some localities also require external identification (usually a council registration tag if cats must also be registered in that locality).

There are issues that need careful consideration when contemplating the introduction of mandatory identification including:

- The (usually unintended) effect of an increase in impoundment and euthanasia of semi-owned cats, unowned cats and cats who have owners who do not want to comply with the law.
- The tendency for these laws to be worded in a way which makes it illegal for someone to care for an unowned cat without taking full ownership (for example, by registering and microchipping the cat). This discourages people from caring for homeless cats where, if they believe that the cat is likely to be killed if taken to a shelter, they opt instead to do nothing (Zito 2015).
- Collars should be checked regularly to ensure a snug fit to prevent injuries as a result of getting a forelimb or mouth caught in the collar or caught on an object.

Potential role in future cat management

Mandatory identification has the potential to be a very useful tool to help humanely manage cat populations, especially to increase reclaiming rates. However, the legislation needs to be enacted and implemented in a way that minimises the potential negative aspects.

The best way to analyse the success of mandatory identification laws would be to monitor the percentages of cats reunited with their owners after being lost but comprehensive data would be very hard to obtain. The most reliable data available are from the reclaim rate of cats from shelters and pounds which could be compared pre- and post-the introduction of mandatory identification.

14 Identification

Microchipping is an extremely valuable tool for cat identification and data collection.

Microchipping has some limitations in terms of accuracy of owner details and requires a scanner to identify cats, which can delay cats being reunited with their owner.

There are benefits for cats to also wear a collar and identification tag.

RECOMMENDATION 14

Cat management plans should aim to increase the number of cats who are identified through mandatory microchipping.

Mandatory desexing

Reports of the impact of mandatory desexing legislation come predominantly from the USA and Australia. Mandatory desexing is intended to reduce the number of unwanted cats in the community and promote responsible ownership of cats. In Australia, three states and the ACT have mandated desexing and some local government authorities have also introduced desexing requirements in their local laws. Some localities require that all domestic cats over a certain age be desexed (this ranges from 3-6 months). However, there is usually no enforcement of mandatory desexing requirements as enforcement is difficult and expensive. There is also mixed support for mandatory desexing from stakeholder groups, with some rescue groups advocating for resources to be used instead for education and subsidised desexing programs, whilst the Australian Veterinary Association (AVA) believes that the strategy is ineffective.

Some localities in the USA require that any rehoming agency (e.g. pound, shelter) desex cats and kittens prior to release to their new home, and this may be in addition to mandatory desexing for owned cats or a stand-alone requirement.

A review of the available information reveals that only occasionally are mandatory desexing requirements monitored. Most frequently this involves comparing data pre- and post-mandatory desexing introduction in the following areas:

- shelter/pound cat admissions
- shelter/pound cat euthanasia
- cat adoptions
- cat registrations (where this is mandatory)
- cat return to their owners from shelters
- animal management costs.

A preliminary assessment of the impact of mandatory desexing legislation in the ACT found no obvious improvement in RSPCA shelter admissions, adoptions or euthanasia rates in the five years following its introduction in 2001 (AVA 2007). A lack of enforcement of the legislation and poor levels of awareness in the local veterinary and broader community are considered to be the major factors contributing to the apparent ineffectiveness of this legislation (Orr and Jones 2018).

Where mandatory desexing has been introduced with community support and paired with requirements for breeder permits and pre-pubertal desexing there is evidence of success in reducing shelter intakes. The City of Gold Coast developed and introduced model breeder permit legislation, including desexing of all kittens prior to sale or transfer, in 2010. This was achieved after a two-year consultation with all relevant stakeholders coordinated by Animal Welfare League Queensland and the introduction of a cooperative subsidised (low-cost) desexing program funded by the local council. While it is difficult to disentangle the impacts of mandatory desexing from the range of strategies implemented in the City of Gold Coast since 2002, nevertheless the annual intake of 'stray' kittens has reduced from 656 to 372 in the seven years since the introduction of the legislation. Total incoming

kitten and cat numbers, including surrenders, have declined substantially since 2001/2002 despite a growing human population. The introduction of mandatory desexing prior to sale of transfer of kittens added incentive to desex to avoid a breeder permit fee or possible fine, and enabled any breeders advertising kittens for sale or give away to be contacted to inform them of their requirements to desex and to offer low-cost desexing support if accidental breeding had occurred.

One key approach to significantly decrease intake and euthanasia rates for cats in shelters/pounds in most areas is to manage the unowned and semi-owned cat populations. While mandating owners to desex their cats will not impact directly on these cat populations, it can help prevent them from becoming established. A 2014 report for the SA Dog and Cat Management Board showed that 46% of owned cats were not contained to their property at all times and only 47% of owned cats were desexed at 3-6 months, thus many wandering owned cats can breed and contribute to the unowned cat population without the owner's knowledge (Kapulski 2014). This study also showed that 22% of owned cats had a litter prior to being desexed. Requiring desexing of kittens prior to sale or transfer may help to prevent this.

In those areas where a high number of cats entering shelters/pounds are unwanted kittens from owned cats, or owned adult cats surrendered as a result of unwanted breeding, then mandatory desexing legislation should be of significant use, however this is not borne out by existing data. There appear to be two main reasons for this: first, responsible cat owners who can afford desexing already desex their cats (although this may only occur after the cat has already had a litter of kittens); and second, those owners who cannot afford to desex, or are not motivated to desex, do not comply because the legislation is not enforced. The resources and commitment to actively enforce mandatory desexing legislation are generally lacking and so implementation is ineffective.

One way to address this is to require desexing and identification of cats at point of sale or transfer of ownership or release from impoundment. This strategy has the potential to increase compliance by making monitoring easier, more achievable and more cost-effective than attempting to monitor the desexed status of all owned cats. An option gaining increasing support is to regulate pet shops and online sale of cats to ensure that only desexed and microchipped shelter/rescue animals are sold. In 2017, California announced that it will be the first US state to require pet shops to sell only shelter or rescue animals who are desexed and microchipped.

Well-promoted and well-designed targeted low-cost desexing programs will help with compliance of mandatory desexing legislation.

In areas where the cat population dynamics are appropriate for this strategy, mandatory desexing legislation would be most effective if:

- the legislation is well-promoted so people breeding, selling, buying and impounding cats know it is a requirement that all cats/kittens are desexed (unless being transferred to another permitted breeder)
- cats are desexed prior to sale or transfer and before the onset of sexual maturity. Prior consultation with local veterinary practitioners is essential as without their support and capacity to conduct pre-pubertal desexing, owners will be unable to comply
- low-cost desexing programs are available to assist cat owners who cannot afford general desexing costs to comply
- mandatory identification requirements are also introduced
- the legislation is adequately enforced.

It is likely that not all people selling cats would comply with such legislation and certain groups would be easier to monitor than others. However, even an imperfect uptake would still be a considerable step forward in ensuring that many more cats were desexed. Although, mandatory desexing prior to sale/transfer would likely increase the cost to obtain a cat, promotion of the benefits of cats being desexed at acquisition (saving the owner the time and expense of organising desexing, or coping with unwanted litters, and reducing euthanasia rates in the community) will ensure greater awareness of and commitment to responsible ownership. Also shelters and rescue groups can continue to provide reasonably-priced desexed cats for owners of limited means.

It should be noted that under Queensland legislation, it is a mandatory requirement for veterinarians to tattoo all cats that have been desexed. This is of great benefit, especially for females, where rapid assessment of desexing status, especially for cats entering a shelter, can avoid the need for surgical intervention.

Potential role in future cat management

Mandatory desexing of cats (prior to reaching sexual maturity) has the potential to reduce the number of first litters born to owned cats, and reduce the number of unowned cats that originate as unwanted kittens of owned cats. From the available data it seems that in order for mandatory desexing to succeed in these aims, it must be well-promoted within the community, supported by veterinary practitioners, targeted at pre-pubertal desexing prior to sale or transfer, supported through targeted low-cost desexing programs and adequately enforced.

15 Mandatory desexing

There is mixed evidence on whether mandatory desexing legislation has contributed to reducing shelter and pound intake and euthanasia rates in Australia.

Where mandatory desexing has not achieved these aims, evidence indicates this is due to a lack of active enforcement of legislation and low public awareness of its requirements.

A number of factors have been identified which, if implemented in parallel with mandatory desexing, are likely to increase the success of this strategy.

RECOMMENDATION 15

Mandatory desexing has the potential to be successful in reducing shelter and pound intake and euthanasia rates where it is well-promoted within the community, supported by veterinary practitioners, targeted at pre-pubertal desexing prior to sale or transfer, supported through targeted low-cost desexing programs and adequately enforced.

Targeted low-cost desexing

An alternative or supplementary strategy to mandatory desexing is the provision and promotion of affordable desexing services (which may be free or low-cost) for those who need it. This includes not just cat owners but also semi-owners or cat colony carers. This strategy represents a paradigm shift from punishment of non-compliant owners and censure of non-owner cat carers, to incentives to encourage responsible cat caretaking for both groups, and is becoming increasingly common overseas.

One of the main contributing factors to the continued high cat intakes into shelters is likely to be the failure to increase the desexing rate of pets living in low-income households (Marsh 2010) and semi-owned and unowned cats (Toukhsati et al. 2007; Zito 2015, Zito et al. 2015a). A 2007 study in the USA found that only 51.4% of cats living in low income households were desexed compared to more than 90% of cats living in households with higher incomes (Marsh 2012). This situation is likely to be similar in Australia as cat surrender is associated with a lower socio-economic status (Zito et al. 2016a) and a number of Australian studies have identified lower desexing rates among owner-surrendered cats of 12% (Marston and Bennett 2009) and 47% (Alberthsen et al. 2013) compared to over 90% of owned cats in Australia (Toukhsati et al. 2007). These high reported rates of desexing of owned cats are likely to only be representative of responsible cat owners who have adequate resources to pay for desexing.

There are few published journal articles evaluating these programs and it is difficult to separate out the effectiveness of targeted low-cost desexing programs from the many strategies that effect change. However, shelter statistics do tend to show a decline in kitten intake when sustained desexing programs are part of the range of strategies used. Box 3 presents a number of case-studies of successful targeted low-cost desexing programs.

BOX 3

Examples of successful targeted low-cost desexing programs.

AWLQ National Desexing Network (NDN) and NDN Cooperative Desexing Program

In 2004, the Animal Welfare League Queensland established the NDN which now consists of a nationwide network of more than 160 participating veterinary clinics that has helped to desex around 200,000 cats and dogs across Australia. The NDN website provides easy access to contact details of the closest veterinarian(s) in all capital cities and some regional centres. Costs are 40-60% lower than standard desexing rates, depending on individual veterinary charges. In addition, AWL promotes a national desexing month every July to help increase the number of cats desexed prior to the spring breeding season. This provides for an extra emphasis on the need to desex cats, especially by four months of age.

The NDN Cooperative Desexing Program commenced in 2010 and requires a contribution from all stakeholders: the owner, the council, animal welfare group and veterinary practitioner (who agrees to desex at a set price). Calculations on the costs to manage stray and surrendered cats by local councils demonstrate that investing in subsidised desexing programs can reduce impounding costs substantially. For example, in the City of Gold Coast in 2017 this involved owners paying $35 to desex a male cat and $55 to desex a female cat, with additional female cats $35. For male/female cat desexing, the council contributes $55/$85 and veterinarians receive $90/$120, and the NDN provides the staff and resources to organise and manage the program free of charge. Residents who have a concession card, can demonstrate financial hardship, have adopted strays or too many cats to afford to desex them are eligible.

As of 2018, five Councils are contributing annually to these programs. All Council funds go directly to desexing subsidies to help their residents in need.

RSPCA Queensland Operation Wanted

The 'Operation Wanted' campaign, which is coordinated by RSPCA Qld commenced in 2015 and runs annually from June to August with incentives in the form of prizes offered to pet owners for participation. An estimated 10,000 'extra animals' were desexed in 2015. A total of 1186 veterinarians were involved in 2016, reducing their desexing fees for dogs and cats by 20%. In the same year 26 council areas contributed to the campaign's promotion with individual veterinary practitioners also doing their own local promotions.

Lost Dogs Home Mobile Animal Desexing Unit

In March 2016, the Lost Dogs Home commenced a Mobile Animal Desexing Unit (MADI) which currently works with eight Victorian councils to deliver low-cost desexing for cats and dogs. Clinics run for 2-3 days every fortnight in a specific location with up to 24 cats being desexed daily. To date, 1450 cats have been desexed through the program. Owners pay $50 with the council matching this and covering any shortfall. Most owners have reported that they had delayed desexing due to the cost, with most cats/kittens having never seen a veterinarian. The MADI staff offer healthcare advice and refer clients to local veterinary practices thereby helping to create a new client base for local businesses. Two local rescue groups (Maneki Neko and Second Chance Cat Rescue) also support the program by coordinating owners when the unit is scheduled in specific areas. All parties sign an agreement which outlines pricing, logistics and operations. Evidence is emerging of the positive effect of the initiative: for example, Wyndam City Council has reported a significant increase in cat registration each year since the introduction of MADI (pers. comm Elaine Bugeja, Wyndham City Council)

Characteristics common to successful desexing initiatives are:

- Programs help only those owners/carers who genuinely need help to get their pets desexed. Several criteria to help decide eligibility for low-cost or free desexing programs include: income targeting, geographic targeting, and programs for senior citizens (Marsh 2010; Scarlett and Johnston 2012). Income targeting has proven to be the most cost-effective approach and eligibility for a public-assistance program can be used as the basis for this. Programs are affordable for owners/carers with poverty-level incomes. The affordable price would need to be determined based on the relevant statistics for Australia.
- Programs are accessible to indigent carers. These people usually also need help to transport their pets to the place where the surgery is performed and back home again. Options to address this issue include: providing services through a network of private veterinary clinics, providing a mobile surgical unit, or organising to transport pets to a fixed-site clinic. Ancillary services such as transportation for pets to and from surgery appointments are crucial in assisting low-income pet owners (Target Zero, 2016).
- Programs have enough funding to desex large numbers of animals from indigent households every year for several years. It has been reported that desexing five pets from indigent households every year for every 1,000 residents will significantly reduce local shelter intake and euthanasia rates. However, if the program cannot sustain that volume over the long term, the progress it has made can quickly be reversed (Marsh 2012).
- Time-limited desexing programs that are available to all cat owners, broad scale high profile promotion and incentives are likely to increase uptake (pers comm Mandy Paterson).

Potential role in future cat management

Targeted and low cost desexing programs have been shown to have significant potential to reduce animal shelter/pound cat admissions and euthanasia and also generally receive strong community support. Therefore, these programs are a fundamental component of any effort to reduce the number of unwanted cats in a community. Desexing programs may be combined with mandatory desexing legislation but are also very successful without any supporting legislation.

16 Targeted low-cost desexing of owned cats

Targeted low-cost desexing programs for owned cats have significant potential to reduce cat overpopulation and also generally receive strong community support.

Income and geographic targeting can be successfully used to determine eligibility for these programs.

RECOMMENDATION 16

Increasing access to targeted low-cost desexing initiatives, especially areas of low socio-economic status or those overrepresented in shelter and pound intakes, should be considered a key strategy for domestic cat management.

Pre-pubertal desexing

It has been reported that at least 30% of owned cats in the Australian community are not desexed before six months of age, allowing for unplanned litters from young, sexually mature queens prior to desexing (Toukhsati 2005). A high number of well-socialised kittens from owned litters are surrendered to shelters (New et al. 2000; Marston et al. 2009; Animal Welfare League Queensland 2010) and although many are likely to be from semi-owned cats, a proportion are likely to be from owned cats producing kittens before they are desexed (Marston and Bennett 2009). In an Australian study of 191,000 cats entering RSPCA shelters nationally between 2006 and 2010, just over half were kittens (53%), and of kittens from the general public and other sources, 32% were from owned queens and 68% from strays (Alberthsen 2014).

The 'traditional' age of desexing is six months of age; this unfortunately allows cats to reach reproductive maturity before they are desexed (Joyce and Yates 2011; Clark et al. 2012; Zanowski 2012); cats may reach reproductive maturity as early as 3.5 months of age (Little 2001; Farnworth et al. 2013). Delayed desexing of owned cats is reported to often result in the production of unwanted litters of kittens (Alberthsen et al. 2013), but can be addressed through the introduction of pre-pubertal or 'early-age' desexing (Manning and Rowan 1992; Fournier 2004; Alberthsen et al. 2013; Johnson and Cicirelli 2014). Therefore, it would be of great benefit to revise current recommendations so that owned cats are desexed before four months. In addition, any initiatives to desex semi-owned and unowned cats should also aim to desex these cats before four months of age to prevent reproduction prior to desexing.

It is a routine procedure for animal shelters to desex kittens at approximately eight weeks of age (and/or 1kg or more in body weight), and multiple benefits from pre-pubertal desexing have been demonstrated for the individual cat as well as benefits in terms of cat population control (Spain et al. 2004; Joyce and Yates 2011; Farnworth et al. 2013; Yates et al. 2013; Porters et al. 2014). However, this procedure is not yet universally accepted among the veterinary community, as there are divided opinions on pre-pubertal desexing (Farnworth et al. 2013; Yates et al. 2013) and a lack of veterinarians who have relevant training and are willing to offer this service to the community. Reluctance to perform pre-pubertal desexing relates to concerns over risks associated with the procedure as well as longer term health problems. However, a study of nearly 450 kittens concluded that desexing at 8-12 weeks was as safe as at 6-8 months but the former had the benefit of being significantly shorter to perform (Porters et al. 2014). A further study of 800 kittens concluded that there are no health-related contraindications (including lower urinary tract disease, urethral obstruction, lameness, fracture or hypersensitivity disorders) to desexing at 8-12 weeks versus 6-8 months in a shelter environment (Porters et al. 2015).

Veterinarians are a vital link in communicating with cat owners and ensuring that owned kittens are desexed before reproductive maturity (New et al. 2000; Fournier 2004; Stavisky 2014; Welsh et al. 2014). Therefore, encouragement of veterinarians to accept this procedure and training to ensure that they can deliver this service is crucial (Farnworth et al. 2013; Yates et al. 2013).

In 2013, seven UK-based animal welfare organisations, including the RSPCA and the British Veterinary Association, joined together to form The Cat Group to help reduce reproduction rates in owned cats. A website was established dedicated to promoting pre-pubertal desexing, providing a resource to veterinarians and the community. Information includes a register of veterinary schools that teach pre-pubertal desexing, a register of veterinary practitioners who offer pre-pubertal desexing, as well as training videos for veterinarians. A report produced by RSPCA UK concluded that '*The promotion and practice of pre-pubertal neutering (at four months) by vets – as the norm for owned cats – is vital to tackling the cat population crisis.*' (RSPCA UK 2014b). There is also widespread support for prepubertal desexing from Australian animal welfare organisations, cat protection groups and the Australian Veterinary Association, with many shelters using this as standard practice, however, its uptake in private veterinary practice remains relatively low (Leung et al. 2016; Orr and Jones 2018). The Cat Protection Society NSW has produced a website with videos and information to enable veterinarians to upgrade their knowledge and skills in pre-pubertal desexing and gain points toward their required ongoing professional development.

Potential role in future cat management

The implementation of large scale pre-pubertal desexing is very likely to have a positive impact on cat management in terms of reducing unwanted cat numbers and will assist owners to comply with mandatory requirements for desexing prior to sale or transfer. This should result in a decrease in cat predation on wildlife and also a decrease in animal shelter/control cat intake and euthanasia. However, there are no reports in the literature or media about the impact of such a scheme as it has never been introduced or reported on a large scale. If such a program is implemented then formal assessment would be a very beneficial addition to the literature in the field of cat management.

17 Pre-pubertal desexing

Cats need to be desexed prior to four months of age to prevent first litters. Pre-pubertal desexing has benefits for the welfare of individual cats as well as assisting cat management in terms of reducing unwanted cat numbers.

RECOMMENDATION 17

The promotion of pre-pubertal desexing as normal practice is key to reducing the number of unwanted kittens born. Engagement with cat owners and the veterinary community is vital to increase acceptance and uptake of pre-pubertal desexing by veterinary practitioners.

Mandatory registration

Registration establishes ownership of a cat and allows the local government to monitor and enforce other animal specific laws such as limits on cat numbers, breeding regulation, mandatory identification and desexing. It also provides a source of funding to help resource cat management activities, particularly education programs and subsidised desexing programs. Annual registration can assist owners to ensure that microchip details are also current.

Mandatory registration of cats is uncommon worldwide but is required in some parts of Australia, Canada and the USA. It is more common in the areas that have laws to try and control rabies; registration (licensing) is often driven by the rabies control laws in these areas.

Mandatory cat registration is a requirement in several Australian states:

- In Victoria, registration fees are used to fund animal management staff attendance to nuisance complaints, collect and return stray animals to owners, coordinate events such as pet expos and discount microchipping days and to develop and distribute responsible pet ownership publications, as well as maintenance of websites, and online courses.
- In Queensland, state-wide mandatory registration legislation was repealed two years after its introduction. Councils were granted authority to retain cat registration programs if desired but according to the Queensland Department of Agriculture and Fisheries, many local governments now oppose statewide mandatory cat registration. Compliance with registration legislation was low, even among more responsible cat owners. For example, it has been reported that over 90% of owned cats are desexed but during the mandatory registration period less than 30% of cats were registered. However, there seems to have been no efforts to engage the community prior to introduction of registration.
- In SA, the Mitcham City Council in Adelaide requires cat registration; to encourage registration the cost for cats is lower than for dogs ($30 or if discounted $10-15 for cats versus $80 for dogs). Compliance is reasonable with 3,000 currently registered cats but a recent survey prompted an additional 400 owners to register their cat (pers comm Roger Brown).

Although some councils have introduced mandatory registration, there are no reports of its successful implementation, but the objectives are not clearly apparent which makes assessment of the outcomes difficult.

Cat owners generally do not see the benefits of registration and view it as an extra cost and layer of bureaucracy. Also, some councils do not see benefit in imposing mandatory registration with mandatory identification being implemented.

Where councils allocate funds from registration to support community initiatives such as desexing and microchipping, then these parameters would be useful measures to assess the impact of registration.

There is a lack of uniformity regarding mandatory registration at the state and local government level with some jurisdictions removing this provision as it has not been widely supported. However, the NSW Pest Animal Review supports mandatory registration and the ACT is considering introducing registration.

Potential role in future cat management

Mandatory registration is unlikely to have any significant impact on the cat overpopulation problem. Its implementation and administration is expensive and the cost of enforcement and monitoring is likely to be prohibitive. However, some councils have used the funds raised to help employ a cat management officer or to subsidise desexing costs for low-income families.

Limiting the numbers of cats allowed to be owned

Limiting the number of cats that can be kept by an individual owner attempts to reconcile the sometimes conflicting interests of pet owners with property owners and cat nuisance issues and is sometimes also discussed as a measure to manage overall cat numbers. An increasing number of jurisdictions are enacting regulations on the number and type of animals a person can keep on their property. Restricting cat numbers is likely to benefit cat welfare provided that cats are still able to benefit from living with conspecifics, and may act as an incentive for desexing. Most councils impose a standard maximum limit of two cats per household but also allow for additional cats upon request and under permit. There are a number of households who successfully care for up to five or six cats and if councils increased the standard limit from two cats to four cats (under specific conditions – for example where the cats are desexed, microchipped, contained and well cared for) this may improve prospects for more cats to be adopted.

Restrictions on the number of cats allowed per household may also assist in resolving cases of animal hoarding and help prevent the establishment of kitten farms. When implemented alongside ownership regulations, breeding regulations can also limit the number of breeding cats owned and require breeders to meet minimum standards of care and containment (see below). Where there are no strict cat containment regulations, having fewer cats should also result in lower predation.

There are no reports of assessment of specific outcomes for the restriction on the number of cats that can be kept.

Potential role in future cat management

Limiting the number of cats that can be kept is suited to managing the sometimes conflicting interests of cat owners and property owners, helping to prevent kitten farms and may assist in addressing cases of animal hoarding. This may also help to reduce wildlife predation or nuisance cats but this will partly depend on the level of cat containment. It may assist with reducing overall cat numbers when used in combination with other responsible pet ownership strategies.

18 Cats per household

Limiting the number of cats that can be kept may assist in reducing public nuisance from cats, preventing kitten farms and resolving cases of animal hoarding.

Most councils have a standard maximum limit of two cats per household, however, many households successfully care for more than two cats and increasing this limit may help increase cat adoptions.

RECOMMENDATION 18

Council limits on the number of cats that can be kept per household without a permit should be set at four cats rather than two, on the condition that all cats are desexed, microchipped, contained and well cared for.

Breeding regulation

Cat breeding regulation allows for the mandatory registration of breeders and the need for breeders to comply with a breeder welfare code. Regulations of this type are recent developments and have been introduced to address the problem of kitten farming and other poor practices that compromise cat welfare and health, rather than as a cat management tool relating to responsible ownership, cat overpopulation and cat predation on wildlife but it may have indirect benefits. Where breeding regulation is effectively enforced and includes breeder traceability and requirements for microchipping and desexing of kittens prior to sale or transfer, these benefits may be significant.

There are no clearly defined goals relating to breeding regulation and no reports yet of assessment of specific outcomes of the breeding regulation schemes that have been put in place.

Potential role in future cat management

Breeding regulation is likely to be of use in trying to combat kitten farms and other poor practices that compromise cat welfare and health, but many of these regulations are new and further evaluation is required to understand the overall impact on cat management.

4.3.3 Cat owner education

Responsible cat ownership comprises two different elements – firstly and preferably, owners voluntarily doing the right thing and, secondly, mandating requirements through legislation. If cat owners understood responsible cat ownership requirements, were committed and had appropriate resources to be responsible, there would be very little need for legislative requirements. Awareness, education and opportunity are fundamental to widespread commitment of responsible cat ownership in which the responsible cat owner ensures their cat is safe, happy and healthy, does not disturb the environment or neighbours and does not contribute to feral cat populations (through production of unwanted kittens or straying). All messaging needs to be clear, concise, consistent and accessible.

Increasing public understanding of the importance and benefits of responsible cat ownership will involve consistent public messages from government and animal welfare organisations, education programs in schools and social marketing campaigns. These kinds of initiatives have been widely used to improve public understanding of human public health and welfare issues such as drink driving, cigarette smoking, skin cancer, obesity and many others. In recent years these types of campaigns have focused on identifying the drivers and barriers to changing existing behaviours.

Broadly, behaviour change towards more responsible cat ownership is facilitated by changing community attitudes and beliefs relating to cats. The Theory of Planned Behaviour (Ajzen 1985; Ajzen 1991) has been shown to predict a number of volitional human behaviours, including behaviours towards animals (Coleman et al. 1998; Rohlf et al. 2012; Toukhsati et al. 2012b). Modification of elements of the Theory of Planned Behaviour relates to behaviours of interest (for example, attitudes, social norms, and beliefs) that might be expected to have the potential to alter the behaviours of interest (Coleman et al. 1998; Hsu et al. 2003). A 2012 study about community attitudes towards cat containment and cat impacts on wildlife found agreement of only approximately 63% (owners and non-owners) that wandering cats endanger or kill native wildlife (Toukhsati et al. 2012a). It was found that 80% of cat owners contained their cat to a property at night but only 41.2% contained their cat to a property during the day. This study is a good example of the relationship between beliefs and related behaviour as people who believed that cat containment was important (to protect their cats and wildlife) were most likely to contain their own cats.

Traditional methods used by government to change community behaviours are legislation, regulation, penalties, taxes and subsidies, but these may not be as successful as other methods that improve cooperative community behaviour change (Head 2008), such as education and community awareness programs (Toukhsati et al. 2012b). This approach is a paradigm shift from the more punitive and negative measures to change behaviour to a more collaborative and encouraging approach to engage stakeholders. A recent study which reviewed online cat management interventions in terms of identified best-practice principles of behaviour change and persuasive communication provides suggestions on improving the design of cat management strategies (McLeod et al. 2017b).

There are a number of areas related to cat management in which there is a great need for change in community attitudes and beliefs and subsequently behaviour modification. These include:

- increasing the value placed on cats
- the impact of cats and cat caretaking practices on wildlife
- acceptance of certain responsible ownership and care measures such as:
  - cat containment
  - pre-pubertal desexing
  - desexing of cats being cared for by a non-owner (semi-owned cats or unowned cats)
  - cat identification
- awareness of the benefits to cats of the responsible ownership and care measures outlined above and other behaviours with positive impacts on cat welfare such as enrichment for cats, especially confined cats (Loyd and Hernandez 2012; Toukhsati et al. 2012a)
- acceptance and implementation of pre-pubertal desexing by veterinarians on a large scale.

Potential role in future cat management

The coordination of ongoing, consistent public messages delivered by government and animal welfare organisations, education programs in schools and social marketing campaigns is essential in maintaining progress for effective cat management.

Regulation is an important tool as it clearly defines what is acceptable regarding legal requirements. However, legislation alone is not an effective instrument for addressing cat population, nuisance and predatory issues. Much more emphasis needs to be placed on education and community support programs to encourage responsible cat ownership. The use of best-practice principles of behaviour change and persuasive communication to improve the design of education programs should be encouraged.

Given that domestic and feral cat issues are universal across Australia, it is time to consider national leadership to achieve greater consistency and collaboration with problem definition, solution development, resource sharing and impact evaluation to encompass all cat metapopulations.

19 Cat owner education

A combination of consistent public messages from government and animal welfare organisations, education programs in schools and social marketing campaigns can result in positive progress for cat management.

Legislation alone is not an effective instrument for addressing cat population, nuisance and predatory issues.

The use of best-practice principles of behaviour change and persuasive communication to improve the design of education programs should be encouraged.

RECOMMENDATION 19

Changing community attitudes, beliefs and behaviours should be a key component of every strategy to manage cat populations. Education programs should focus on increasing cat owner understanding of the benefits of cat management, such as containment, identification and desexing of their cat, and for decreasing euthanasia of kittens and cats in shelters and pounds.

4.4 Designing effective cat management strategies

This report has reviewed the existing literature on current and potential strategies to domestic cat management. Table 4 provides a summary of these strategies in terms of their potential for evaluation and effectiveness at reducing cat overpopulation.

TABLE 4: COMPARISON OF POTENTIAL STRATEGIES FOR DOMESTIC CAT MANAGEMENT

STRATEGY	MEASURABLE?	EFFECTIVE AT REDUCING CAT OVERPOPULATION?*
UNOWNED AND SEMI-OWNED CATS		
Adoption	Yes	Yes – but only in combination with other approaches
Trap and kill	Yes	Potentially – if consistently high removal rates are achieved for long periods. However, this is unlikely
Trap, neuter and return	Yes	Potentially – if strict conditions were applied
Targeted low-cost desexing	Yes	Potentially – for semi-owned cats
Educational strategies	Difficult	Potentially – if targeted at semi-owners
OWNED CATS		
Increasing access to cat friendly rental accommodation	Yes	Yes – with collaboration with real estate organisations
Containment	Yes	Potentially – if 24-hour containment in combination with mandatory identification and strategies to control unowned cats
Mandatory identification	Yes	Yes – especially if used with collar and tag requirements
Mandatory desexing	Yes	Potentially – if aimed at pre-pubertal desexing prior to sale/ transfer/return, adequately enforced and supported through low-cost targeted desexing programs
Targeted low-cost desexing	Yes	Yes
Pre-pubertal desexing	Yes	Potentially – requires the full support of veterinary practitioners and education of cat owners
Registration	Yes	No – but may assist indirectly where funds are directed to cat management activities
Limiting cat ownership	Yes	No – but may assist in reducing public nuisance, kitten farms and resolving animal hoarding cases
Breeding regulation	Difficult	Potentially – where mandatory desexing is implemented and to reduce kitten farms
Educational strategies	Difficult	Yes – if applied to specific areas of need
Facilitation of behaviour change	Difficult	Yes - if encouraged and resourced appropriately

**NOTE: all these strategies require further research to obtain more data*

In terms of the management of unowned and semi-owned cats, two key points emerge. Firstly, the evidence indicates that current low-level trap and kill programs aimed at controlling unowned cats are ineffective at achieving the main objectives of cat management. Given the lack of public appetite for lethal control programs in an urban or peri-urban context, resources may be better spent on more effective alternative strategies. These include education and community engagement campaigns to encourage desexing of semi-owned cats, combined with subsidised and facilitated desexing programs.

Secondly, in order to address the contributions of semi-owned cats to the unwanted cat problem and the associated wildlife predation, it is likely that new strategies will be needed to engage semi-owners in solutions that allow them to continue to care for their cats. This will necessitate a change in the way that the community, animal welfare groups and policy makers approach cat caretakers or semi-owners. Currently, in many localities, cat carers will not engage with animal welfare organisations and authorities for fear that their cats will be euthanased. A consistent classification system that allows for the targeting of semi-owners as a distinct group needing specific approaches is required. Distinguishing between cats that are directly or indirectly dependent on humans and those that are not dependent on humans (feral cats) has been proposed in New Zealand (Farnworth et al. 2010a). A legislative climate that allows cat carers to continue caring for their cats if those cats are desexed would be the starting point (Zito 2015).

In terms of the management of owned cats, many existing strategies have the potential to be effective in achieving the objective of cat management, if an integrated, consistent approach is taken. Methods that appear to have potential to effect change are: making affordable desexing initiatives widely available and accessible, increasing the uptake of pre-pubertal desexing, and encouraging the containment of owned cats, alongside public education programs and social marketing campaigns to increase community acceptance of the need for cat management.

Rather than relying upon legislation, regulation and enforcement through penalties, especially in an environment where government resources are limited, more emphasis needs to be placed on methods to improve cooperative behaviour change, such as education and community support programs. Changing community attitudes and beliefs relating to cats is an important first step in increasing positive associated behaviours and moving towards a consistent, effective approach to cat management in Australia.

4.4.1 Evaluation and assessment

The body of evidence related to cat management is increasing but more information is still needed to evaluate management activities and inform best practice. Many of the strategies that are theorised to be effective in controlling cat populations have not been fully implemented or formally assessed. These data are vital in order to be able to measure the success of any cat management strategy. Agreement on parameters and study design are needed to enable valid comparisons of strategies under different circumstances and locations.

There are currently few, if any, formal assessments of the impact of specific cat management strategies on wildlife predation by cats, unwanted cat numbers, shelter intakes, shelter euthanasia numbers, and nuisance complaints. The few existing assessments relate to the impact of desexing initiatives (and TNR programs in overseas countries) on animal shelter cat intake and euthanasia numbers and the increase in reclaim rates associated with identification of cats. In the limited reports in the literature and media the assessment of the success or failure of cat containment is seemingly based on no, minimal or questionable data. This highlights the need for setting clear and measureable objectives for initiatives and formal assessment based on the objectives.

Table 5 sets out a series of measures that could be used to evaluate the success of cat management strategies, as well as measures specific to individual strategies. Evaluation of the success of cat management programs requires pre- and post-implementation monitoring using these measures. Many of these measures would already be recorded. For example, admissions of cats into shelters and pounds, numbers of cats killed, costs of local government animal management officers, but are not publicly available or compiled at a level which makes evaluation feasible. There is an urgent need for standardisation and reporting of these data at the local government, state and national levels if they are to be accessible for evaluation purposes. Agreement on the definition of feral and domestic cats, and the subcategories of owned, semi-owned and unowned cats is crucial to this process. Information on the age, microchip and desexed status of individual cats should also be recorded. It is noted that reporting of shelter and pound outcomes in a robust and standardised manner is also a key action of the *Australian Cat Action Plan*.

TABLE 5: POTENTIAL EVALUATION MEASURES FOR STRATEGIES TO MANAGE DOMESTIC CATS

GENERAL MEASURES	
Reduced:	Shelter/pound admissions of owned, unowned and semi-owned cats Shelter/pound euthanasia of owned, unowned and semi-owned cats Overall numbers of unowned and semi-owned cats Size of individual cat colonies Nuisance complaints about cats Documented wildlife injuries, deaths and impact on populations Animal management costs
Increased:	Retention of owned cats Proportion of owned and semi-owned cats desexed Adoptions of semi-owned and unowned cats Community satisfaction and support for cat management Wildlife prey abundance
SPECIFIC MEASURES	
Trap, neuter and return	Reduced size of discrete unowned cat population Increased number and proportion of desexed unowned cats
Education of semi-owners	Increased number of semi-owned cats desexed Increased number of semi-owned cats adopted
Abandonment and surrender	Decreased number of owned cats surrendered to animal shelters Increased number of cat abandonment complaints received by RSPCA inspectorate
Containment	Increased uptake of cat containment Increased use of outdoor cat enclosures Increased use of environmental enrichment for contained cats
Identification	Increased reclaim rates recorded by shelters, pounds and veterinarians
Registration	Increased reclaim rates recorded by shelters and veterinarians Cat registration numbers Council income from cat registration (and application towards cat management initiatives)
Desexing	Increased number of owned cats desexed prior to sexual maturity Reduction in shelter/pound admissions of kittens Reduction in shelter/pound euthanasias of kittens
Targeted low-cost desexing	Increased number of desexed cats from low income areas
Pre-pubertal desexing	Increased number of cats desexed prior to sexual maturity Increased retention of adult cats desexed prior to sexual maturity Age of mother cat when kittens surrendered to shelters and pounds Increased number of veterinarians undertaking pre-pubertal desexing
Limit of cats per household	Reduction in number of hoarding complaints received by RSPCA inspectorate
Breeder regulation	Reduction in number of breeding complaints received by RSPCA inspectorate
Education and behaviour change	Increased support for cat management strategies

20 Reporting and evaluation

Evaluation of cat management strategies is essential in order to determine their effectiveness. Key evaluation measures and processes for data collection need to be agreed by all stakeholders and applied to all new and existing initiatives.

There is an urgent need for standardisation and reporting of shelter/pound admission and outcomes data if they are to be accessible for evaluation purposes.

Evaluation of different management strategies and programs is either not undertaken, reported or not easily accessible.

RECOMMENDATION 20

Key stakeholders should agree on measures to be used to enable comparative evaluation of cat management strategies and programs. Evaluation outcomes should be reported and incorporated into the development of cat management plans at the national, state and local level.

4.4.2 Further research

Research related to cat management in Australia is generally undertaken in an ad hoc manner, usually focusing on a specific area rather than as part of a coordinated research program. There is also no obvious source of funding for domestic cat management research. However, there is a strong case to be made for funding research in this area, given the significance of the problem and the potential benefits and cost-savings to be made by improving our understanding of the effectiveness of different management approaches.

Two different strategies, TDARS and targeted desexing of semi-owned cats, have already been recommended as requiring evaluation under Australian conditions in non-ecologically sensitive urban and peri-urban environments. In addition, the following areas have been identified for further investigation:

- The impact of TDARS and targeted desexing on the number of: roaming unwanted cats, cat submissions to shelters/pounds, and cat euthanasias (including identification of key aspects for effective management of unowned cats).
- The effect that desexing has on cat behaviour and how this might influence cat population dynamics including analysis of typical dispersal rates, dispersal rates under different conditions, and the survival rates of dispersing cats (Miller et al. 2014b).
- Quantifying typical abandonment rates under different conditions and the socio-economic and attitudinal factors that contribute to higher abandonment rates and prevention of abandonment (Miller et al. 2014b).
- Determining if intensely managing cats within a small part of the metapopulation, or to managing a larger part of the metapopulation at lower intensity, is more effective at controlling the cat population (Miller et al. 2014b).
- Identifying the barriers to desexing semi-owned cats.
- Establishing a centralised database of key information including shelter and pound admissions, trapping statistics, desexing initiatives, and other measureables (see Table 5).
- The impact of domestic cats (owned and unowned) on the abundance and diversity of wildlife in peri-urban areas.
- The role of utilising behaviour change principles to improve responsible cat ownership, such as through citizen science projects.
- Candidates for non-surgical permanent sterilisation of cats.

21 Research

Research related to cat management is generally undertaken in an ad hoc manner focusing on a specific area rather than as part of an integrated and coordinated approach.

Several areas for further investigation have already been identified but there is a lack of adequate research funding for this.

RECOMMENDATION 21

Further research is required to inform future cat management strategies and ensure that limited resources are effectively targeted. This will require allocation of resources, coordination and priority setting at a national level.

5 AN OVERALL PLAN TO MANAGE DOMESTIC CATS

It is clear from the preceding chapters that managing owned, semi-owned and unowned cats domestic cats, in a way which adequately considers the associated animal welfare issues, social issues and their impact on wildlife, is a complex, difficult and ongoing task. Just as cats themselves vary in their temperament and behaviour, so too will the strategies that need to be used to effectively manage them; there is no one-size-fits-all solution. However, through this examination of existing legislation, strategies and approaches to domestic cat management, a number of key factors have emerged which appear to increase the likelihood of a successful and effective outcome.

The importance of appropriate and consistent terminology in legislation and regulations, especially the definition of feral cats versus domestic cats, cannot be overstated (**Recommendation 1**). Ensuring that any cat receiving direct or indirect support from humans is treated as a domestic cat across all types of legislation is vital in designing an effective and humane management plan that has broad community support.

It is also crucial to identify and work with all relevant stakeholders involved or affected by cat management to identify solutions that are acceptable to the community and have a realistic prospect of reducing cat numbers, their euthanasia in shelters and pounds and the negative impacts of roaming cats (**Recommendation 5**). Cat management is a polarising issue for many people, a fact underscored in the *Response to Public Consultation on the Discussion Paper*, so it is crucial to the success of any strategy that all those with an interest in cat management are involved in its development.

Variations in legislative provisions and requirements for feral and domestic cat management between states and territories make a consistent, best practice approach to cat management extremely challenging. Existing legislation is at different stages of review and there are significant inconsistencies at the state and local government level in the approach and level of commitment to cat management. There is huge potential to improve animal welfare and increase the success and cost-effectiveness of cat management by tackling these inconsistencies and improving coordination between state and local government (**Recommendation 2**). Notwithstanding this, there is also a need to ensure that management strategies are context-appropriate: different approaches are required towards managing domestic cats in urban and suburban areas, rural communities, remote indigenous communities, ecologically sensitive locations, or on islands.

Feedback from the public during the development of this report has revealed serious problems in the treatment of domestic cats caught up in the overlap between legislation aimed at protecting biosecurity or native wildlife and domestic cat management legislation. A coordinated approach to the management of feral and domestic cats is vital to ensure that laws and strategies aimed at feral cats and domestic cats are complementary, not opposing, and that no vital aspects in terms of definitions, responsibilities and initiatives are misunderstood or overlooked (**Recommendation 6**).

State governments play an important role in guiding approaches to cat management at the local level to reflect best practice and community expectations to achieve consistent and effective change. The establishment of a cat management advisory group with terms of reference designed to support this role has been successful in several states and should be more widely adopted (**Recommendation 3**). Such a group can also provide specific guidance in the form of COPs, templates and model bylaws to support local councils in developing and implementing a cat management plan (**Recommendation 4**).

Given the role that local government plays in the on-ground enforcement of domestic cat legislation and bylaws, local councils have a pivotal role to play in working with key stakeholders including cat owners, breeders, sellers, animal welfare organisations, veterinarians and conservation groups. Councils can help facilitate and coordinate community-based activities involving these stakeholders, including subsidised desexing schemes, promotion of responsible cat ownership, encouraging pet friendly rental accommodation and supporting cat adoption drives. There is huge potential and increasing interest in councils either working collaboratively with local rescue groups or establishing best practice shelters with the aim of preventing the euthanasia of healthy, treatable animals.

Evidence and scientific rigour are needed to define the problems and impacts, determine causes and then identify solutions before designing an action plan. Evaluation of cat management programs is essential in order to determine their effectiveness but, to date, few have included an evaluation element. There is also an urgent need for standardisation and reporting of data if they are to be accessible for evaluation purposes (**Recommendation 20**).

In this report we have reviewed the available literature and evidence for the full range of approaches used to manage unowned, semi-owned and owned domestic cats in Australia, and considered each approach in terms of its potential role in future cat management. A series of recommendations has emerged, ranging from identifying ideas for research studies and educational or behaviour change programs, improvements to current practices and increasing access to successful initiatives such as targeted and low cost desexing (**Recommendations 8-18**). It is clear that some current programs are not currently achieving the main objectives of cat management, and that new strategies are needed to engage cat owners and semi-owners in order to be successful in reducing shelter and pound intakes and euthanasia rates. Several areas have been identified where further research is needed but these will of course require allocation of new resources (**Recommendations 8, 9 and 21**).

An understanding of the distinction between owned cats, semi-owned cats and unowned cats is also key as different strategies are required for each population and their owners or carers if we are to reduce the number of cats admitted to shelters (**Recommendations 1 and 8**). Legislation requiring desexing, identification, and cat containment will impact on the owned cat population but will also help to prevent owned cats contributing to semi-owned and unowned populations. Strategies such as trap and kill programs may be ineffective for semi-owned and unowned cats as the success of these programs is dependent on community support and cat semi-owners are likely to be opposed to such programs. However, they may be responsive to education, social marketing messages, or other programs aimed at reducing semi-owned and unowned cat numbers through non-lethal means.

Public responses to cat management methods will be influenced by their understanding of the impacts of cats on wildlife, their views on the value of domestic cats, and their acceptance of the need to manage cats in all populations and settings. Thus public education, community engagement and the application of behaviour change principles are as important to achieving best practice cat management as is the management of cats themselves (**Recommendation 19**).

Legal requirements of state-based cat management legislation cover a range of issues, from identification, desexing, cat registration, breeder registration, cat containment and the capture of roaming cats. Many of these requirements have benefits for the ongoing welfare of cats, but they also have the potential for adverse outcomes, so it is crucial that provisions to encourage a humane best practice approach are linked to any increase in control activities (**Recommendation 7**).

While acknowledging the serious adverse impacts that feral cats have on wildlife, it is also important that legislation for feral cat management recognises that all cats are sentient, intelligent animals capable of experiencing pain, suffering and distress, whatever label is applied to them (**Recommendation 6**). Unfortunately many of the techniques used to trap and kill feral cats cause significant suffering, yet there is no legal imperative for practitioners to use the most humane control methods or to accelerate the development or adoption of more humane alternatives.

Through the efforts of the Threatened Species Commissioner, the Australian Government has taken significant steps to coordinate the management of feral cats at a national level. It is now timely to develop a similar approach for domestic cat management. We hope that this report provides the basis for state governments, local councils and key stakeholders to discuss common challenges, encourage greater integration and collaboration, and apply solutions to effectively and humanely manage domestic cats.

References

AAFP (2013). Position Statement on Free-Roaming Cats. American Association of Feline Practitioners. Available from: https://www.catvets.com/public/PDFs/PositionStatements/FreeRoaming.pdf. Accessed 17 Oct 2017.

Afonso E, Thulliez P, Gilot-Fromont E (2006). Transmission of Toxoplamsa gondii in an urban population of domestic cats (*Felis catus*). International Journal of Parasitology, 36, 1373-1382.

Aguilar GD and Farnworth MJ (2012). Stray cats in Auckland, New Zealand: Discovering geographic information for exploratory spatial analysis. Applied Geography, 34, 230-238.

Aguilar GD and Farnworth MJ (2013). Distribution characteristics of unmanaged cat colonies over a 20 year period in Auckland, New Zealand. Applied Geography, 37, 160-167.

Aguilar GD, Farnworth MJ, Winder L (2015). Mapping the stray domestic cat (*Felis catus*) population in New Zealand: Species distribution modelling with a climate change scenario and implications for protected areas. Applied Geography, 63, 146–154.

Ajzen I (1985). From intentions to actions: A Theory of Planned Behavior In: Action-control: From cognition to behavior. Springer, Heidelberg, Germany, 11-39.

Ajzen I (1991). The Theory of Planned Behavior. Organizational Behavior and Human Decision Processes, 50, 179-211.

Akucewich LH, Philman K, Clark A, Gillespie J, Kunkle G, Nicklin CF, Greiner EC (2002). Prevalence of ectoparasites in a population of feral cats from north central Florida during the summer. Veterinary Parasitology, 109, 129-139.

Alberthsen C (2014). The Australian Excess Cat Population: An Exploration of Cat Admissions and Outcomes to RSPCA Shelters. Thesis: Doctor of Philosophy, University of Queensland.

Alberthsen C, Rand JS, Bennett PC, Paterson M, Lawrie M, Morton JM (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.

Anderson TC, Foster GW, Forrester DJ (2003). Hookworms of feral cats in Florida. Veterinary Parasitology, 115,19–24.

Andersen MC, Martin BJ, Roemer GW (2004). Use of matrix population models to estimate the efficacy of euthanasia versus trap-neuter-return for management of free-roaming cats. Journal of the American Veterinary Medical Association, 225, 1871–1876.

Angold PG, Sadler JP, Hill MO, Pullin A, Rushton S, Austin K, Small E, Wood B, Wadsworth R, Sanderson R, Thompson K (2006). Biodiversity in urban habitat patches. Science of the Total Environment, 360, 196–204.

Animal Welfare League Queensland (2010). AWLQ Statistics 2009-10. Available from: http://www.awlqld.com.au/wp-content/uploads/2011/07/Statistics200910.pdf. Accessed 13 July 2016.

Ash SJ (2001). Ecological and sociological considerations of using the TTVAR (trap, test, vaccinate, alter, return) method to control free-ranging domestic cat, *Felis catus*, populations. PhD Thesis, Texas A&M University, ProQuest Dissertations Publishing.

Ash SJ and Adams CE (2003). Public preferences for free-ranging domestic cat management options. Wildlife Society Bulletin, 31, 334–339.

ASPCA (2017). Position Statement on Community Cats and Community Cat Programs. American Society for the Prevention of Cruelty to Animals. Available from: http://www.aspca.org/about-us/aspca-policy-and-position-statements/position-statement-community-cats-and-community-cat. Accessed 23 Jan 2017.

Association of Shelter Veterinarians' Veterinary Task Force to Advance Spay-Neuter (2016). The Association of Shelter Veterinarians' 2016 Veterinary Medical Care Guidelines for Spay-Neuter Programs. Journal of the American Veterinary Medical Association, 249, 165-188.

Australian Government (1992). *Endangered Species Protection Act 1992*. Available from: https://www.legislation.gov.au/Details/C2004A04485. Accessed 7 June 2016.

Australian Government (1999). *Environment Protection and Biodiversity Conservation Act 1999*. Available from: https://www.legislation.gov.au/Series/C2004A00485. Accessed 7 June 2016.

Australian Government, Department of the Environment and Energy (2014). Feral Cat Threat Abatement Plan. Available from: https://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats. Accessed 8 June 2016.

Australian Government, Department of Environment (2015). National declaration: Feral cats as pests. Available from: http://www.environment.gov.au/system/files/pages/907fcf93-baf3-4a8f-bfdb-70bdf55aa90e/files/national-declaration-feral-cats-pests.pdf%20Accessed%208th%20June%202016. Accessed 8 June 2016.

Australian Veterinary Association (2007). Mandatory Desexing in the ACT – has it worked? Centre for Companion Animals in the Community. Available from: https://gungahlinvet.com.au/petcare-info/publications/mandatory-desexing-of-cats-in-the-act-has-it-been-successful-aiam-2007.pdf. Accessed 22 March 2018.

Bain M and Stelow E (2014). Feline aggression toward family members: a guide for practitioners. Veterinary Clinics of North America: Small Animal Practice, 44, 581-597.

Baker PJ, Moloney SE, Stone E, Cuthill IC, Harris S (2008). Cats about town: is predation by free-ranging pet cats *Felis catus* likely to effect urban bird populations? Ibis, 150(s1), 86-99.

Baran BE, Allen JA, Rogelberg SG, Spitzmüller C, DiGiacomo NA, Webb JB, Carter NT, Clark OL, Teeter LA, Walker AG (2009). Euthanasia-related strain and coping strategies in animal shelter employees. Journal of American Veterinary Medical Association, 235, 83–88.

Barratt DG (1997). Predation by house cats *Felis catus (L.),* in Canberra. I Prey composition and preference. Wildlife Research, 24, 263-277.

BCSPCA (2017). Position statement: Cat welfare. British Columbia Socieity for the Prevention of Cruelty to Animals. Available from: http://www.spca.bc.ca/assets/documents/welfare/position-statements/position-statement-cat-welfare.pdf. Accessed 23 Jan 2017.

Biosecurity Tasmania, Department of Primary Industries, Water and Environment (2016). Draft Tasmanian Cat Management Plan - Background Document. Available from: http://dpipwe.tas.gov.au/Documents/Tasmanian Cat Management Plan-Draft for Public Comment_Background Report-20-4-16_FINAL.pdf. Accessed 30 May 2016.

Biosecurity Tasmania, Department of Primary Industries, Water and Environment (2017). Tasmanian Cat Management Plan 2017-2022. Available from: http://dpipwe.tas.gov.au/Documents/TASMANIAN%20CAT%20MANAGEMENT%20PLAN%20FINAL.pdf. Accessed 30 September 2017.

Bi-state Pet Food Pantry (2014). Bi-state Pet Food Pantry. Available from: http://bistatepetfoodpantry.org/. Accessed 2 June 2016.

Boone JD (2015). Better trap–neuter–return for free-roaming cats: Using models and monitoring to improve population management. Journal of Feline Medicine and Surgery, 17, 800-807.

Budke CM and Slater MR (2009). Utilization of matrix population models to assess a 3-year single treatment nonsurgical contraception program versus surgical sterilization in feral cat populations. Journal of Applied Animal Welfare Science, 12, 277–292.

Calver MC and Thomas SR (2011). Effectiveness of the Liberator(TM) in reducing predation on wildlife by domestic cats. Pacific Conservation Biology, 16, 242-250.

Calver M, Thomas S, Bradley S, McCutcheon H (2007). Reducing the rate of predation on wildlife by pet cats: The efficacy and practicability of collar-mounted pounce protectors. Biological Conservation, 137(3), 341-348.

Calver MC, Adams G, Clark W, Pollock KH (2013). Assessing the safety of collars used to attach predation deterrent devices and ID tags to pet cats. Animal Welfare, 22, 95-105.

Carlisle-Frank P, Frank JM, Nielsen L (2015). Companion animal renters and pet friendly housing in the US. Anthrozoös, 18(1), 59-77.

Casey RA, Bradshaw JWS, Roberts MA, Vandenbussche S (2009). Reasons for relinquishment and return of domestic cats (*Felis Silvestris Catus*) to rescue shelters in the UK. Anthrozoös, 22, 347-358.

Castillo D and Clarke A (2003). Trap/neuter/release methods ineffective in controlling domestic cat "colonies" on public lands. Natural Areas Journal, 23, 247-253.

Centonze LA and Levy JK (2002). Characteristics of free-roaming cats and their caretakers. Journal of the American Veterinary Medical Association, 220, 1627-1633.

Chaseling S (2001). Pet populations in Australia. Dogs increasing and cats decreasing - why is it so? In: Urban Animal Management: Proceedings of the National Conference Melbourne, Australia.

Chomel BB, Kasten RW, Floyd-Hawkins K, Chi B, Yamamoto K, Roberts-Wilson J, Gurfield AN, Abbott RC, Pedersen NC, Koehler JE (1996). Experimental transmission of *Bartonella henselae* by the cat flea. Journal of Clinical Microbiology, 34, 1952–1956.

Clark CC, Gruffydd-Jones T, Murray JK (2012). Number of cats and dogs in UK welfare organisations. Veterinary Record, 170, 493-499.

Cogger H, Dickman C, Ford H, Johnson C, Taylor MFJ (2017). Australian animals lost to bulldozers in Queensland 2013-15. WWF-Australia technical report. Available from: http://www.wwf.org.au/knowledge-centre/resource-library?RefineModule=670&retain=true&StartTax=220,42,252,&StartDate=&RefineParent=23,40,48&Keywords=gs.=i_2UQ0. Accessed 6 Dec 2017.

Coleman GJ, Hemsworth PH, Hay M (1998). Predicting stockperson behaviour towards pigs from attitudinal and job-related variables and empathy. Journal of Applied Animal Behaviour Science, 58, 63-75.

Commonwealth of Australia, Department of the Environment and Energy (2015a). Background document for the Threat Abatement Plan for Predation by Feral Cats. Available from: http://www.environment.gov.au/system/files/resources/78f3dea5-c278-4273-8923-fa0de27aacfb/files/tap-predation-feral-cats-2015-background.pdf. Accessed 30 May 2016.

Commonwealth of Australia, Department of the Environment and Energy (2015b). Threat Abatement Plan for Predation by Feral Cats. Available from: http://www.environment.gov.au/system/files/resources/78f3dea5-c278-4273-8923-fa0de27aacfb/files/tap-predation-feral-cats-2015.pdf. Accessed 30 May 2016.

Dale A (2015). The comparative welfare status of owned, managed stray and unmanaged stray cats, In: Proceedings of the 6th National G2Z Summit and Workshops, Gold Coast, Australia. https://www.g2z.org.au/pdf/6th%20National%20G2Z%20Summit%20speaker%20profile%20and%20abstract%20-%20Arnja%20Dale.pdf. Accessed 20 March 2018.

Dauphine N and Cooper RJ (2009). Impacts of free-ranging domestic cats (*Felis catus*) on birds in the United States: A review of recent research with conservation and management recommendations. Proceedings of the Fourth International Partners Flight Conference Tundra to Tropics, 205–219. Available from: http://www.birdsphotography.com/conservation/cats/by_dauphine_cooper.pdf. Accessed 6 March 2017.

Dayer A and Manfredo M (2004). Concepts for exploring the social aspects of human-wildlife conflict in a global context. Human Dimensions of Wildlife, 9, 1-20.

Denny E and Dickman C (2010). Review of cat ecology and management strategies in Australia. In: Invasive Animals Cooperative Research Centre, Institute of Wildlife Research, School of Biological Sciences, University of Sydney, Sydney. Available from: https://www.researchgate.net/profile/Christopher_Dickman/publication/305409721_Review_of_Cat_Ecology_and_Management_Strategies_in_Australia/links/578e21bd08ae81b4466eb7a9.pdf. Accessed 6 March 2017.

Department of Sustainability and Environment, Tasmanian Government (1999). Cats and wildlife - how you can protect both. Available from: http://dpipwe.tas.gov.au/Documents/CATS%20and%20WILDLIFE%20Booklet%20(A5%2012%20pp)_2015.pdf. Accessed 6 July 2016.

DiGiacomo N, Arluke A, Petronek G (1998). Surrendering pets to shelters: The relinquisher's perspective. Anthrozoös, 11(1), 41-51.

Dubey, JP (1973). Feline toxoplasmosis and coccidiosis: a survey of domiciled and stray cats. Journal of the American Veterinary Medical Association, 162, 873–877.

Dubn´a S, Langrov´a I, Jankovsk´a I, Vadlejch J, Pek´ar S, N´apravn´ık J, Fechtner J (2007). Contamination of soil with Toxocara eggs in urban (Prague) and rural areas in the Czech Republic. Veterinary Parasitology, 144, 81–86.

Eyles K and Mulvaney M (2014). Background paper; Options to improve cat management in the ACT. Available from: http://conservationcouncil.org.au/wp-content/uploads/2012/11/Eyles-Mulvaney-Background-Paper-Responsible-Pet-Ownership-and-the-Protection-of-Wildlife-2014.pdf. Accessed 4 June 2016.

Farnworth MJ, Campbell J, Adams NJ (2001). What's in a name? Perceptions of stray and feral cat welfare and control in Aotearoa, New Zealand. Journal of Applied Animal Welfare Science, 14, 59-74.

Farnworth M, Dye N, Keown N (2010a). The legal status of cats in New Zealand: A perspective on the welfare of companion, stray, and feral domestic cats (*Felis catus*). Journal of Applied Animal Welfare Science, 13, 180-188.

Farnworth MJ, Campbell J, Adams NJ (2010b). Public awareness in New Zealand of animal welfare legislation relating to cats. New Zealand Veterinary Journal, 58, 213-217.

Farnworth MJ, Adams NJ, Seksel K, Waran NK, Beausoleil NJ, Stafford KJ (2013). Veterinary attitudes towards pre-pubertal gonadectomy of cats: a comparison of samples from New Zealand, Australia and the United Kingdom. New Zealand Veterinary Journal, 61(4), 226-233.

Farnworth MJ, Watson H, Adams NJ (2014). Understanding control of non-native wild and feral mammals: Similarities and differences in the opinions of the general public, animal protectionists and conservationists in New Zealand (Aotearoa). Journal of Applied Animal Welfare Science, 17, 1-17.

Finkler H and Terkel J (2010). Cortisol levels and aggression in neutered and intact free-roaming female cats living in urban social groups. Physiology & Behavior, 99, 343-347.

Finkler H and Terkel J (2011). Dichotomy in the emotional approaches of caretakers of free-roaming cats in urban feeding groups: Findings from in-depth interviews. Anthrozoös, 24, 203-218.

Finkler H and Terkel J (2012). The contribution of cat owners' attitudes and behaviours to the free-roaming cat overpopulation in Tel Aviv, Israel. Preventive Veterinary Medicine, 104, 125-135.

Finkler H, Hatna E, Terkel J (2011a). The impact of anthropogenic factors on the behavior, reproduction, management and welfare of urban, free-roaming cat populations. Anthrozoös, 24, 31-49.

Finkler HAC, Hatna EB, Terkel JA (2011b). The influence of neighbourhood socio-demographic factors on densities of free-roaming cat populations in an urban ecosystem in Israel. Wildlife Research, 38, 235-243.

Finn HC and Stephens NS (2017). The invisible harm: land clearing is an issue of animal welfare. Wildlife Research, Available from: http://dx.doi.org/10.1071/WR17018. Accessed 6 Dec 2017.

Fishbein M and Ajzen I (2010). Predicting and changing behavior: the reasoned action approach. Taylor and Francis, New York.

Foley P, Foley JE, Levy JK, Paik T (2005). Analysis of the impact of trap-neuter-return program on populations of feral cats. Journal of the American Veterinary Medical Association, 227, 1775-1781.

Fournier AKGS (2004). Behaviour analysis of companion-animal overpopulation: A conceptualization of the problem and suggestions for intervention. Behavior and Social Issues, 13, 51-68.

Gazzano A, Bianchi L, Campa S, Mariti C (2015). The prevention of undesirable behaviors in cats: Effectiveness of veterinary behaviorists' advice given to kitten owners. Journal of Veterinary Behavior: Clinical Applications and Research, 10, 535-542.

Gramza A, Teel T, Vandewoude S, Crooks K (2016). Understanding public perceptions of risk regarding outdoor pet cats to inform conservation action. Conservation Biology, 30, 276-286.

Grayson J, Calver M, Lymbery A (2007). Species richness and community composition of passerine birds in suburban Perth: is predation by pet cats the most important factor? In: Lunney D, Eby P, Hutchings P, Burgin S, editors. Pest or Guest: The Zoology of Overabundance. Royal Zoological Society of New South Wales, Mosman, NSW, Australia, 195-207.

Gunther I, Finkler H, Terkel J (2011). Demographic differences between urban feeding groups of neutered and sexually intact free-roaming cats following trap-neuter-return procedure. Journal of the American Veterinary Medical Association, 238, 1134-1140.

Gunther I, Raz T, Berke O, Klement E (2015). Nuisances and welfare of free-roaming cats in urban settings and their association with cat reproduction. Preventive Veterinary Medicine, 119, 203-210.

Gunther I, Raz T, Zor YE, Bachowski Y, Klement E (2016). Feeders of free-roaming cats: Personal characteristics, feeding practices, and data on cat health and welfare in an urban setting of Israel. Frontiers in Veterinary Science. Available from: https://doi.org/10.3389/fvets.2016.00021. Accessed 2 Jan 2017.

Gunther I and Terkel J (2002). Regulation of free-roaming cat *(Felis silvestris catus)* populations: A survey of the literature and its application to Israel. Animal Welfare, 11, 171-188.

Guttilla DA and Stapp P (2010). Effects of sterilization on movements of feral cats at a wildland-urban interface. Journal of Mammalogy, 91, 482-489.

Hall CM, Adams NA, Bradley JS, Bryant KA, Davis AA, Dickman CR, Fujita T, Kobayashi S, Lepczyk CA, McBride EA, Pollock KH, Styles IM, van Heezik Y, Wang F, Calver MC (2016). Community attitudes and practices of urban residents regarding predation by pet cats on wildlife: An international comparison. PLoS ONE, 11. Available from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0151962. Accessed 10 August 2016.

Hall CM, Fontaine JB, Bryant KA, Calver MC (2015). Assessing the effectiveness of the Birdsbesafe® anti-predation collar cover in reducing predation on wildlife by pet cats in Western Australia. Applied Animal Behaviour Science, 173, 40-51.

Haspel C and Calhoon RE (1990). The interdependence of humans and free-ranging cats in Brooklyn, New York. Anthrozoös, 3, 155-161.

Hatley PJ (2003). Feral cat colonies in Florida: The fur and feathers are flying. Journal of Land Use and Environmental Law, 18, 441-465.

Head BW (2008). Wicked problems in public policy. Public Policy, 3, 101-118.

Hervías S, Silva C, Pipa T, Oliveira N, Henriques A, Geraldes PL, Mealha S, Diaz E, Bravo I, Oppel S, Medina FM (2012). Invasive mammal species on Corvo Island: Is their eradication technically feasible? Airo, 22, 12–28.

Hsu Y, Severinghaus LL, Serpell JA (2003). Dog keeping in Taiwan: its contribution to the problem of free-roaming dogs. Journal of Applied Animal Welfare Science, 6, 1-23.

Hughes KL and Slater MR (2002). Implementation of a feral cat management program on a university campus. Journal of Applied Animal Welfare Science, 5, 15-28.

Hurley K (2013). Making the Case for a Paradigm Shift in Community Cat Management, Parts one and two. Available from: http://www.maddiesfund.org/making-the-case-for-community-cats-part-one.htm?p=topic35, http://www.maddiesfund.org/making-the-case-for-community-cats-part-two.htm?p=topic35. Accessed 12 June 2016.

Hutchins M (2013). Impact of free-ranging domestic cats on wildlife. Journal of the American Veterinary Medical Association, 242, 1339-1340.

ICAM (International Companion Animal Management Coalition) (2007). Humane cat population management guidance. Available from: http://www.icam-coalition.org/downloads/ICAM-Humane%20cat%20population.pdf. Accessed 17 Oct 2017.

Izawa M and Ono Y (1986). Mother-offspring relationship in the feral cat population. The Mammal Society of Japan, 11, 27–34.

Jacobson SK (2009). Communication skills for conservation professionals. 2nd edition. Island Press, Washington, DC.

Jarman P and van der Lee G (1993). Cats (domestic, stray and feral) and endangered Australian wildlife: A factual review. A report to The Petcare Information and Advisory Service, Melbourne, Australia. University of New England, Armidale.

Jessup DA (2004). The welfare of feral cats and wildlife. Journal of the American Veterinary Medical Association, 1225(9), 1377-1383.

Johnson J and Calver MC (2014). Prevalence of desexed cats in relation to age in a convenience sample of Western Australian cats. Australian Veterinary Journal, 92(6), 226-227.

Johnson KL and Cicirelli J (2014). Study of the effect on shelter intakes and euthanasia from a shelter neuter return project of 10,080 cats from March 2010 to June 2014. PeerJ 2:e646; DOI 10.7717/peerj.646.

Johnston SD and Rhodes L (2015). No surgery required: the future of feline sterilization. An overview of the Michelson Prize and Grants in Reproductive Biology. Journal of Feline Medicine and Surgery, 17, 777-782.

Jones AL and Downs CT (2011). Managing feral cats on a university's campuses: how many are there and is sterilization having an effect? Journal of Applied Animal Welfare Science, 14, 304-320.

Jongman E (2007). Adaptation of cats to confinement. Journal of Veterinary Behaviour: Clinical Applications and Research, 2, 193-196.

Joyce A and Yates D (2011). Help stop teenage pregnancy. Journal of Feline Medicine and Surgery, 13, 3-10.

Kapulski N (2014). Cat Owners Survey Adelaide, Australia. Dog and Cat Management Board, SA Government Department of Environment & Heritage.

Karsten CL, Wagner DC, Kass PH, Hurley KF (2017). An observational study of the relationship between Capacity for Care as an animal shelter management model and cat health, adoption and death in three animal shelters. The Veterinary Journal, 227, 15-22.

Kass PH (2005). Cat overpopulation in the United States. In: The welfare of cats. Springer, Dordtrecht, The Netherlands, 119-140.

Kays RW and DeWan AA (2004). Ecological impact of inside/outside house cats around a suburban nature preserve. Animal Conservation, 7, 273-283.

Kilgour RJ, Magle SB, Slater M, Christian A, Weiss E, DiTullio M (2017). Estimating free-roaming cat populations and the effects of one year Trap-Neuter-Return management effort in a highly urban area. Urban Ecosystems, 20(1), 207–216.

Kitts-Morgan SE (2015). Companion Animals Symposium. Sustainable ecosystems: Domestic cats and their effect on wildlife populations. Journal of Animal Science, 93, 848-859.

Lancaster ER, J, Collecott S, Paterson M (2015). Problems associated with the microchip data of stray dogs and cats entering RSPCA Queensland shelters. Animals, 5, 332-348.

Lazenby BT, Mooney NJ, Dickman CR (2015). Effects of low-level culling of feral cats in open populations: a case study from the forests of southern Tasmania. Wildlife Research, 41, 407-420.

Lee IT, Levy JK, Gorman SP, Cynda Crawford P, Slater MR (2002), Prevalance of feline leukemia virus infection and serum antibodies against feline immunodeficiency virus in unowned free-roaming cats. Journal of American Veterinary Medical Association, 220(5), 620-622.

Legge S, Murphy BP, McGregor H, Woinarski JC, Augusteyn J, Ballard G, Baseler M, Buckmaster T, Dickman CR, Doherty T, Edwards G (2017). Enumerating a continental-scale threat: How many feral cats are in Australia? Biological Conservation, 206, 293-303.

Lepczyk CA, Dauphiné N, Bird DM, Conant S, Cooper RJ, Duffy DC, Hatley PM, Marra PP, Stone E, Temple SA (2010). What conservation biologists can do to counter trap-neuter-return: Response to Longcore et al., Conservation Biology, 24, 627–629.

Leung OYV, Kelman M, Hayward M, Ward MP (2016). Survey of recommendations given by Australian veterinarians on the age of desexing of dogs and cats. Australian Veterinary Practitioner, 46(3), 72-82.

Levy J (2012). Shelter crowd control: Keeping community cats out of shelters. Available from: http://www.maddiesfund.org/shelter-crowd-control-keeping-community-cats-out-of-shelters-presentation.htm. Accessed 15 June 2016.

Levy J and Hurley K (2013). Feline Shelter Intake Reduction Program FAQs. Available from: http://www.maddiesfund.org/feline-shelter-intake-reduction-program-faqs.htm. Accessed 12 June 2016.

Levy JK and Crawford PC (2004). Humane strategies for controlling feral cat populations. Journal of the American Veterinary Medical Association, 225, 1354-1360.

Levy JK, Gale DW, Gale LA (2003a). Evaluation of the effect of a long-term trap-neuter-return and adoption program on a free-roaming cat population. Journal of the American Veterinary Medical Association, 222, 42-46.

Levy JK, Isaza NM, Scott KC (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.

Levy JK, Woods JE, Turick SL, Etheridge DL (2003b). Number of unowned free-roaming cats in a college community in the southern United States and characteristics of community residents who feed them. Journal of the American Veterinary Medical Association, 223, 202-205.

Lilith M, Calver M, Styles I, Garkaklis M (2006). Protecting wildlife from predation by owned domestic cats: Application of a precautionary approach to the acceptability of proposed cat regulations. Australian Ecology, 31, 176-189.

Lilith M, Calver MC, 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.

Liordos V, Kontsiotis VJ, Georgari M, Baltzi K, Baltzi I (2017). Public acceptance of management methods under different human-wildlife conflict scenarios. Science of the Total Environment, 579, 685-693.

Little SE (2001). Female Reproduction. In: The Cat: Clinical Medicine and Management, 1st ed. Elsevier Saunders., St. Louis MO, USA.

Lohr CA and Lepczyk CA (2014). Desires and management preferences of stakeholders regarding feral cats in the Hawaiian Islands. Conservation Biology, 28, 392-403.

Longcore T, Rich C, Sullivan LM (2009). Critical assessment of claims regarding management of feral cats by trap–neuter–return. Conservation Biology, 23, 887-894.

Lord E, Widmar NO, Litster A (2014). Economic impacts of adoption and fundraising strategies in animal shelters. Preventive Veterinary Medicine, 113, 423-429.

Lord LK, Griffin B, Slater MR, Levy JK (2010). Evaluation of collars and microchips for visual and permanent identification of pet cats. Journal of the American Veterinary Medical Association, 237, 387-394.

Lord LK, Wittum TE, Scarlett JM (2007). Use of group-randomized trials in pet population research. Preventive Veterinary Medicine, 82, 167-175.

Lort Smith (2014). About Lort Smith. Available from: http://www.lortsmith.com/what-we- do/about-us/. Accessed 2 June 2016.

Loss SR, Will T, Marra PP (2013). The impact of free-ranging domestic cats on wildlife of the United States. Nature Communications, 4. DOI: 10.1038/ncomms2380.

Loyd KAT and DeVore JL (2010). An evaluation of feral cat management options using a decision analysis network. Ecology and Society, 15(4), 10. Available from: http://www.ecologyandsociety.org/vol15/iss4/art10. Accessed 20 Jan 2017.

Loyd K and Hernandez S (2012). Public perceptions of domestic cats and preferences for feral cat management in the southeastern United States. Anthrozoös, 25, 337-351.

Loyd KAT and Miller CA (2010). Factors related to preferences for trap-neuter-release management of feral cats among Illinois homeowners. Journal of Wildlife Management, 74, 160-165.

Loyd KAT, Hernandez SM, Carroll JP, Abernathy KJ, Marshall GJ (2013). Quantifying free-roaming domestic cat predation using animal-borne video cameras. Biological Conservation, 160, 183-189.

Luria BJ, Levy JK, Lappin MR (2004). Prevalence of infectious diseases in feral cats in Northern Florida. Journal of Feline Medicine and Surgery, 6(5), 287-296.

MacDonald E, Milfont T, Gavin M (2015). What drives cat-owner behaviour? First steps towards limiting domestic-cat impacts on native wildlife. Wildlife Research, 42, 257-265.

Manning A and Rowan A (1992). Companion animal demographics and sterilization status: results from a survey in four Massachusetts towns. Anthrozoös, 5, 192-201.

Marsh P (2010). Replacing myth with math: Using evidence-based programs to eradicate shelter overpopulation. Available from: http://www.shelteroverpopulation.org/Books/Replacing_Myth_with_Math.pdf. Accessed 30 May 2016.

Marsh P (2012). Getting to zero: A roadmap to ending animal shelter overpopulation in the United States. Available from: http://www.shelteroverpopulation.org/Books/Getting_to_Zero.pdf. Accessed 9 June 2016.

Marston L, Bennett P, Rohlf V, Mornement K (2008). Review of strategies for effectively managing unwanted dogs and cats in Queensland. A Report to the Department of Primary Industries and Fisheries, Queensland, from the Animal Welfare Science Centre, School of Psychology, Psychiatry & Psychological Medicine, Monash University.

Marston LC (2009). An analysis of feline admission data from the Royal Society for the Prevention of Cruelty (RSPCA) and Animal Welfare League (AWL) of South Australia for July 2007 to June 2009. A report for the Dog and Cat Management Board of South Australia, 1-46.

Marston LC and Bennett PC (2009). Admissions of cats to animal welfare shelters in Melbourne, Australia. Journal of Applied Animal Welfare Science, 12, 189-213.

Mascia MB, Brosius JP, Dobson TA, Forbes BC, Horowitz L, McKean MA, Turner NJ (2003). Conservation and the social sciences. Conservation Biology, 17, 649-650.

Matthews A, Dickman CR, Major RE (1999). The influence of fragment size and edge on nest predation in urban bushland. ECOGRAPHV Copenhagen, 22, 349-356.

McCarthy RJ, Levine SH, Reed JM (2013). Estimation of effectiveness of three methods of feral cat population control by use of a simulation model. Journal of the American Veterinary Medical Association, 243, 502-511.

McGregor HW, Legge S, Jones ME, Johson CN (2014). Landscape management of fire and grazing regimes alters the fine-scale habitat utilisation by feral cats. PLoS One, 9(10). Available from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0109097. Accessed 14 Sept 2017.

McLeod LJ, Hine DW, Bengsen AJ (2015). Born to roam? Surveying cat owners in Tasmania, Australia, to identify the drivers and barriers to cat containment. Preventive Veterinary Medicine, 122, 339-344.

McLeod LJ, Hine DW, Bengsen AJ, Driver AB (2017a). Assessing the impact of different persuasive messages on the intentions and behaviour of cat owners. Preventive Veterinary Medicine, 146, 136-142.

McLeod LJ, Driver AB, Bengsen AJ, Hine DW (2017b). Refining online communication strategies for domestic cat management. Anthrozoös, 30(4), 635-649.

McManus CM, Levy JK, Andersen LA, McGorray SP, Leutenegger CM, Gray LK, Hilligas J, Tucker SJ (2014). Prevalence of upper respiratory pathogens in four management models for unowned cats in the southeast United States. The Veterinary Journal, 201, 196-201.

Medina FM and Nogales M (2009). A review of the impacts of feral cats (*Felis silvestris catus*) in the Canary Islands: Implications for the conservation of its endangered fauna. Biodiversity and Conservation, 18, 829-846.

Medina FM, Nogales M, Farnworth MJ, Bonnaud E (2016). Human-cat relationship in an oceanic biosphere reserve: the case of La Palma Island, Canary Archipelago. Journal for Nature Conservation, 34, 8-14.

Meek PD (1998). Food items brought home by domestic cats *Felis catus (L)* living in Booderee National Park, Jervis Bay. Proceedings of the Linnean Society of New South Wales, 120, 43-47.

Mendes-de-Almeida F, Ferreira Faria MC, Aline SB, Serrão ML (2004). Sanitary conditions of a colony of urban feral cats (*Felis catus Linnaeus, 1758*) in a zoological garden of Rio De Janeiro, Brazil. Revista do Instituto de Medicina Tropical de São Paulo, 46, 269-274.

Metsers EM, Seddon PJ, van Heezik YM (2010). Cat-exclusion zones in rural and urban-fringe landscapes: How large would they have to be? Wildlife Research, 37, 47–56.

Miller DD, Staats SR, Partlo C, Rada K (1996). Factors associated with the decision to surrender a pet to an animal shelter. Journal of the American Veterinary Medical Association, 209, 738-742.

Miller PS, Boone JD, Briggs JR, Lawler DF, Levy JK, Nutter FB, Slater M, Zawistowski S (2014a). Companion piece to the publication "Simulating free-roaming cat population management options in open demographic environments". PLoS ONE, 9. Available from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0113553. Accessed 30 May 2016.

Miller PS, Boone JD, Briggs JR, Lawler DF, Levy JK, Nutter FB, Slater M, Zawistowski S (2014b). Simulating free-roaming cat population management options in open demographic environments. PLoS ONE, 9. Available from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0113553. Accessed 30 May 2016.

Mirmovitch V (1995). Spatial organisation of urban feral cats (*Felis catus*) in Jerusalem. Wildlife Research, 22, 299-310.

Moodie E (1995). The potential for biological control of feral cats in Australia. Australian Nature Conservation Agency, New South Wales National Parks and Wildlife Service. Available from: http://www.pestsmart.org.au/wp-content/uploads/2014/12/Moodie1995_cat_biocontrol_review.pdf. Accessed 4 May 2016.

Moller AP and Erritzoe J (2000). Predation against birds with low immunocompetence. Oecologia, 122, 500-504.

Moore S (2008). Humane cage trapping of domestic, unowned and wild cats. Biosecurity Victoria, Bureau of Animal Welfare. Available from: http://agriculture.vic.gov.au/agriculture/animal-health-and-welfare/animal-welfare/humane-vertebrate-pest-control/humane-cage-trapping-of-domestic-unowned-and-wild-cats. Accessed 19 April 2017.

Murray JK, Skillings E, Gruffydd-Jones TJ (2008). A study of risk factors for cat mortality in adoption centres of a UK cat charity. Journal of Feline Medicine and Surgery, 10, 338-345.

Natoli E, Maragliano L, Cariola G, Faini A, Bonanni R, Cafazzo S, Fantini C (2006). Management of feral domestic cats in the urban environment of Rome (Italy). Preventive Veterinary Medicine, 77, 180-185.

Natural Resources Kangaroo Island (2015). Kangaroo Island feral cat eradication program 2015-2030 prospectus. Available from: http://www.naturalresources.sa.gov.au/kangarooisland/plants-and-animals/pest-animals/Kangaroo-Island-feral-cat-eradication-initiative. Accessed 5 May 2016.

New JC, Salman MD, King M, Scarlett JM, Kass PH, Hutchison JM (2000). Characteristics of shelter-relinquished animals and their owners compared with animals and their owners in U.S. pet-owning households. Journal of Applied Animal Behaviour Science, 3, 179-201.

New Zealand Government, Ministry for Primary Industry (2007). Animal Welfare (Companion Cats) Code of Welfare 2007. Available from: https://www.mpi.govt.nz/document-vault/1413. Accessed 20 May 2016.

Nogales M, Martìn A, Tershy BR, Donlan CJ, Veitch D, Puerta N, Wood B, Alonso J (2004). A review of feral cat eradication on islands. Conservation Biology, 18, 310-319.

Norris JM, Bell ET, Hales L, Toribio JA, White JD, Wigney DI, Baral RM, Malik R (2007). Prevalence of feline immunodeficiency virus infection in domesticated and feral cats in eastern Australia. Journal of Feline Medicine and Surgery, 9, 300-308.

NSW Department of Primary Industries (2017). NSW Government Response: State-wide review of pest animal management, Natural Resources Commission. Available from http://www.nrc.nsw.gov.au/reports/Government-response/pest-animal-report-gov-response. Accessed 20 Jan 2017.

NSW Natural Resources Commission (2016). Shared Problem, Shared Solutions – Pest Animal Management Review. Available from: http://www.nrc.nsw.gov.au/pest-animal-management. Accessed 9 June 2016.

Nutter FB (2005). Evaluation of a trap-neuter-return management program for feral cat colonies: Population dynamics, home ranges, and potentially zoonotic diseases. PhD thesis, North Carolina State University, ProQuest Dissertations Publishing.

Oppel S, Beaven BM, Bolton M, Vickery J, Bodey TW (2011). Eradication of invasive mammals on islands inhabited by humans and domestic animals. Conservation Biology, 25, 232-240.

Orr B and Jones B (2018). Prepuberal desexing in the ACT. In Proceedings of the Australian Veterinary Association Ltd Annual Conference, 14-18 May 2018, Brisbane. The Australian Veterinary Association, St. Leonards, New South Wales.

Palmer C (2014). Value conflicts in feral cat management: Trap-neuter-return or trap-euthanize? In: Dilemmas in Animal Welfare. CABI, Wallingford, Oxfordshire.

Parkes J, Fisher P, Robinson S, Aguirre-Muñoz A (2014). Eradication of feral cats from large islands: An assessment of the effort required for success. New Zealand Journal of Ecology, 38, 307-314.

Paterson M (2014). TNR (Trap-Neuter-Return): Is it a solution for the management of feral cats in Australia? In: Engaging with animals: interpretations of a shared existence. Sydney University Press, Sydney.

Patronek G (1998). Surrendering pets to shelters: The relinquisher's perspective. Anthrozoös, 11, 41-51.

Pennington DN, Hansel J, Blair RB (2008). The conservation value of urban riparian areas for landbirds during spring migration: land cover, scale, and vegetation effects. Biological Conservation, 141, 1235-1248.

Pet Rescue Ltd. (2016). Do you have a secret cat? Available from: http://www.communitycats.com.au/ Accessed 7 May 2016.

Porters N, Polis I, Moons C, Duchateau L, Goethals K, Huyghe S, De Rooster H (2014). Prepubertal gonadectomy in cats: different surgical techniques and comparison with gonadectomy at traditional age. Veterinary Record, 175, 223. DOI: 10.1136/vr.102337.

Porters N, Polis I, Moons C, Van de Maele I, Ducatelle R, Goethals K, Duchateau L, de Rooster H (2015). Relationship between age at gonadectomy and health problems in kittens adopted from shelters. Veterinary Record, 176(22). Available from: http://veterinaryrecord.bmj.com/content/176/22/572. Accessed 18 Aug 2017.

Project Maddie (2014). Project Maddie: a pet food bank. Available from: http://www.projectmaddie.com/. Accessed 2 June 2016.

Proulx G (1988). Control of urban wildlife predation by cats through public education. Environmental Conservation, 15, 358–359.

Reading AS, Scarlett JM, Berliner EA (2014). A novel approach to identify and map kitten clusters using Geographic Information Systems (GIS): A case study from Tompkins County, NY. Journal of Applied Animal Welfare Science 17, 295-307.

Rinzin K, Stevenson MA, Probert DW, Bird RG, Jackson R, French NP, Weir JA (2008). Free-roaming and surrendered dogs and cats submitted to a humane shelter in Wellington, New Zealand, 1999-2006. New Zealand Veterinary Journal, 56(6), 297-303.

Robertson SA (2007). A review of feral cat control. Journal of Feline Medicine and Surgery, 10, 366-375.

Roetman P, Tindle H, Litchfield C, Chiera B, Quinton G, Kikillus H, Bruce D, Kays R (2017). Cat Tracker South Australia – Understanding pet cats through citizen science. Discovery Circle initiative, University of South Australia, Adelaide. Available from: http://dx.doi.org/10.4226/78/5892ce70b245a. Accessed 20 Jan 2017.

Rohlf V and Bennett P (2005). Perpetration-induced traumatic stress in persons who euthanize nonhuman animals in surgeries, animal shelters, and laboratories. Society of Animals, 13, 201-219.

Rohlf VI, Bennett PC, Toukhsati S, Coleman G (2012). Beliefs underlying dog owners' health care behaviors: results from a large, self-selected internet sample. Anthrozoös, 25, 171-185.

RSPCA Australia (2016). RSPCA Australia Knowledge Base: How many pets are there in Australia? Available from: http://kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html. Accessed 21 Jan 2017.

RSPCA Australia (2018). Response to Public Consultation on the Discussion Paper – Identifying Best Practice Domestic Cat Management in Australia. Available from http://kb.rspca.org.au/file/167/?f=1

RSPCA UK (2014a). RSPCA Policies on Animal Welfare . Available from: https://www.rspca.org.uk. Accessed 23 Jan 2017.

RSPCA UK (2014b). Tackling the cat crisis. Available from: https://www.rspca.org.uk/ImageLocator/LocateAsset?asset=document&assetId=1232734779317&mode=prd. Accessed 18 Dec 2016.

Sacramento Pet Food Bank (2011). Titanic's Pantry. The Sacramento Pet Food Bank. Available from: http://www.sacpetfoodbank.org/. Accessed 2 June 2016.

Salman MD, New, JG Jr, Scarlett, JM, Kass PH, Ruch-Gallie R, Hetts S (1998). Human and animal factors related to relinquishment of dogs and cats in 12 selected animal shelters in the United States. Journal of Applied Animal Welfare Science, 1, 207-226.

Sandoe P, Norspang AP, Forkman B, Bjornvad CR, Kondrup SV, Lund TB (2017). The burden of domestication - A representative study of welfare in privately owned cats in Denmark. Animal Welfare, 26, 1-10.

Scarlett J and Johnston N (2012). Impact of a subsidized spay neuter clinic on impoundments and euthanasia in a community shelter and on service and complaint calls to animal control. Journal of Applied Animal Welfare Science, 15, 53-69.

Schmidt PM, Swannack TM, Lopez RR, Slater MR (2009). Evaluation of euthanasia and trap-neuter-return (TNR) programs in managing free-roaming cat populations. Wildlife Research, 36, 117-125.

Sealy D (1996). Removal of a colony of free-ranging domestic cats from an area administered by the National Park Service: a case history. In Proceedings: 1995 International Wildlife Rehabilitation Council Annual Conference, 75-77.

Seewagen CL and Slayton EJ (2008). Mass changes of migratory landbirds during stopovers in a New York City park. Wilson Journal of Ornithology, 120, 296-303.

Sharp A and Hartnett N (2009). Semi-owned cat attitudes and behaviours in South Australia. University of South Australia and Ehrenberg-Bass Institute for Marketing Science. Prepared for South Australian Dog and Cat Management Board. Available from: http://www.dogandcatboard.com.au/media/W1siZiIsIjIwMTMvMTEvMTEvMjJfMjVfMDJfMjU3X1NlbWlfb3duZWRfY2F0X2F0dGl0dWRlc19hbmRfYmVoYXZpb3Vyc19pbl9TQS5wZGYiXV0/Semi-owned%20cat%20attitudes%20and%20behaviours%20in%20SA.pdf. Accessed 10 October 2017.

Sharp T and Saunders G (2012). Model code of practice for the humane control of feral cats. Available from: http://www.pestsmart.org.au/wp-content/uploads/2012/09/catCOP2012.pdf. Accessed 30 May 2016.

Shaw SE, Birtles RJ, Day MJ (2001). Arthropod-transmitted infectious diseases of cats. Journal of Feline Medicine and Surgery, 3, 193–209.

Shore ER, Petersen CL, Douglas DK (2003). Moving as a reason for pet relinquishment: a closer look. Journal of Applied Animal Welfare Science, 6, 39-52.

Slater MR (2001). The role of veterinary epidemiology in the study of free-roaming dogs and cats. Preventive Veterinary Medicine, 48, 273-286.

Slingerland L, Fazilova V, Plantinga E, Kooistra H, Beynen A (2009). Indoor confinement and physical inactivity rather than the proportion of dry food are risk factors in the development of feline type 2 diabetes mellitus. The Veterinary Journal, 179, 247-253.

Spain CV, Scarlett JM, Houpt KA (2004). Long-term risks and benefits of early-age gonadectomy in cats. Journal of the American Veterinary Medical Association, 224, 372-379.

Spehar DD and Wolf PJ (2017). An examination of an iconic Trap-Neuter-Return Program: The Newburyport, Massachusetts Case Study. Animals, 7(11), 81. DOI: 10.3390/ani7110081.

Stavisky J (2014). Too many cats: how owner beliefs contribute to overpopulation. Veterinary Record, 174, 116-117.

Stoskopf MK and Nutter FB (2004). Analyzing approaches to feral cat management - one size does not fit all. Journal of the American Veterinary Medical Association, 225, 1361-1364.

Tan K, Rand J, Morton J (2017). Trap-Neuter-Return activities in urban stray cat colonies in Australia. Animals 7(46), DOI: 10.3390/ani7060046

Target Zero (2016). Targeted spay/neuter. Targeting help where it's needed most. Available from: http://www.target-zero.org/subsidized-income-targeted-spay-neuter-surgeries. Accessed 9 June 2016.

The Humane Society of the United States (2014). Are you having trouble affording your pet? Available from: http://www.humanesociety.org/animals/resources/tips/trouble_affording_pet.html?credit=we b_id91754962. Accessed 2 June 2016.

The Tasmanian Government (2009). Cat Management Act 2009. Available from: http://www.austlii.edu.au/au/legis/tas/num_act/cma200989o2009171/. Accessed 8 June 2016.

Toukhsati S, Coleman GJ, Bennett PC (2005). Community attitudes and behaviours towards cats. A report to the Bureau of Animal Welfare DPI, Victoria. Melbourne, Australia. Animal Welfare Science Centre, Monash University, Melbourne.

Toukhsati SR, Bennett PC, Coleman GJ (2007). Behaviors and attitudes towards semi-owned cats. Anthrozoös, 20, 131-142.

Toukhsati SR, Young E, Bennett PC, Coleman GJ (2012a). Wandering cats: Attitudes and behaviors towards cat containment in Australia. Anthrozoös, 25, 61-74.

Toukhsati S, Phillips C, Podberscek A, Coleman G (2012b). Semi-ownership and sterilisation of cats and dogs in Thailand. Animals, 2, 611-627.

Tratalos J, Fuller RA, Warren PH, Davies RG, Gaston KJ (2007). Urban form, biodiversity potential and ecosystem services. Landscape and Urban Planning, 83, 308-317.

Tschanz B, Hegglin D, Gloor S, Bontadina F (2010). Hunters and non-hunters: skewed predation rate by domestic cats in a rural village. European Journal of Wildlife Research, 57, 597-602.

Uga S, Minami T, Nagata K (1996). Defecation habits of cats and dogs and contamination by Toxocara eggs in public park sand pits. American Journal of Tropical Medicine, 54, 122-126.

van Heezik Y (2010). Pussyfooting around the issue of cat predation in urban areas. Oryx, 44, 153-154.

Veitch CR, Clout MN, Towns DR (Eds.) (2011). Island invasives: eradication and management. Proceedings of the International Conference on Island Invasives, IUCN Gland, Switzerland and Auckland, New Zealand, 37-46.

Victorian Department of Primary Industries (2009). "Who's for cats?" Campaign Evaluation.

Victorian Department of Primary Industries (2012). Humane cage trapping of domestic, unowned and wild cats. Available from: http://agriculture.vic.gov.au/agriculture/animal-health-and-welfare/animal-welfare/humane-vertebrate-pest-control/humane-cage-trapping-of-domestic-unowned-and-wild-cats. Accessed 4 August 2016.

Walker JK, Bruce SJ, Dale AR (2017). Survey of public opinion on cat (*Felis catus*) predation and the future direction of cat management in New Zealand. Animals, 7(7), 49, DOI: 10.3390/ani7070049.

Wallace JL and Levy JK (2006). Population characteristics of feral cats admitted to seven trap-neuter-return programs in the United States. Journal of Feline Medicine and Surgery, 8, 279-284.

Webb C (2008). Australia asks "Who's for Cats?" In: AAWS International Animal Welfare Conference Proceedings, Gold Coast, Australia.

Weiss E, Patronek G, Slater M, Garrison L, Medicus K (2013). Community partnering as a tool for improving live release rate in animal shelters in the United States. Journal of Applied Animal Welfare Science, 16(3), 221-238.

Welsh CP, Gruffydd-Jones TJ, Roberts MA, Murray JK (2014). Poor owner knowledge of feline reproduction contributes to the high proportion of accidental litters born to UK pet cats. Veterinary Record, 174(5), DOI: 10.1136/vr.101909.

Wilken RLM (2012). Feral cat management: Perceptions and preferences (A case study). Thesis, ProQuest, UMI Dissertations Publishing. Available from: http://scholarworks.sjsu.edu/cgi/viewcontent.cgi?article=7714&context=etd_theses. Accessed 6 April 2017.

Winter L (2004). Trap-neuter-release programs: the reality and the impacts. Journal of the American Veterinary Medical Association, 225, 1369-1376.

Woinarski JCZ, Burbidge AA, Harrison PL (2015a). Ongoing unraveling of a continental fauna: decline and extinction of Australian mammals since European settlement. Proceedings of the National Academy of Sciences of the United States of America, 112, 4531-4540.

Woinarski JCZ, Morris K, Ritchie EG (2015b). Draft national targets for feral cat management: Towards the effective control of feral cats in Australia – targets with teeth. National Feral Cat Management Workshop Proceedings, Invasive Animals CRC.

Woinarski JCZ, Murphy BP, Legge SM, Garnett ST, Lawes MJ, Comer S, Dickman CR, Doherty TS, Edwards G, Nankivell A, Paton D, Palmer R, Woolley LA (2017a). How many birds are killed by cats in Australia? Biological Conservation, 214, 76-87.

Woinarski JCZ, Woolley LA, Garnett ST, Legge SM, Murphy BP, Lawes MJ, Comer S, Dickman CR, Doherty TS, Edwards G, Nankivill A, Palmer R, Paton D (2017b). Compilation and traits of Australian bird species killed by cats. Biological Conservation, 216, 1-9.

Woods M, McDonald RA, Harris S (2003). Predation of wildlife by domestic cats *Felis catus* in Great Britain. Mammal Review, 33, 174-188.

Yates D, Yeates J, Roberts M (2013). Optimum age for neutering cats. Veterinary Record, 172, 53-54.

Zanowski GN (2012). A fresh look at spay/neuter legislation: The journey to a middle ground. Journal of Public Health Management and Practice, 18(3), E24-E33.

Zasloff LR and Hart LA (1998). Attitudes and care practices of cat caretakers in Hawaii. Anthrozoös, 11, 242-248.

Zaunbrecher KI and Smith RE (1993). Neutering of feral cats as an alternative to eradication programs. Journal of the American Veterinary Medical Association, 203, 449-452.

Zito S (2015). Understanding human factors involved in the unwanted cat problem. Thesis: Doctor of Philosophy, University of Queensland. Available from: https://espace.library.uq.edu.au/view/UQ:367304. Accessed 24 May 2016.

Zito S, Vankan D, Bennett P, Paterson M, Phillips CJC (2015a). Cat ownership perception and caretaking explored in an internet survey of people associated with cats. PLoS ONE, 10. Available from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0133293. Accessed 24 May 2016.

Zito S, Paterson M, Vankan D, Morton J, Bennett P, Phillips C (2015b). Determinants of cat choice and outcomes for adult cats and kittens adopted from an Australian animal shelter. Animals, 5, 276-314.

Zito S, Morton J, Paterson M, Vankan D, Bennett PC, Rand J, Phillips CJC (2016a). Cross-sectional study of characteristics of owners and non-owners surrendering cats to four Australian animal shelters. Journal of Applied Animal Welfare Science, 19, 126-143.

Zito S, Vankan D, Morton J, Paterson M, Bennett P, Rand J, Phillips C (2016b). Reasons that people surrender cats to Australian animal shelters and barriers to assuming ownership of these cats. Journal of Applied Animal Welfare Science, 19, 303-319.

Zoran DL and Buffington CA (2011). Effects of nutrition choices and lifestyle changes on the well-being of cats, a carnivore that has moved indoors. Journal of the American Veterinary Medical Association, 239, 596-606.

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