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The environmental needs of many Australian pet cats are not being met

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Abstract

Objectives The aim of this study was to investigate whether Australian cat owners are effectively meeting their cats' environmental needs and to identify areas of deficiency that may have an impact on the cats' health and welfare.

Methods An online survey investigating lifestyle factors and provision of environmental resources was distributed to Australian cat owners.

Results In total, 12,010 respondents, representing cat-owning households, completed the survey. Altogether, 45.5% were single-cat households and 54.5% were multi-cat households, with a mean number of two cats per household. In total, 46.3% of households contained indoor cats, 51.8% contained indoor–outdoor cats and 1.8% had mostly outdoor cats. Dry food was the predominant food type in 59% of households and few respondents fed their cats in a manner that stimulates natural predatory behaviours. Altogether, 17.1% of households reported cats with urinary problems such as haematuria or urethral obstruction, and 19.8% reported inappropriate urination outside of the litter tray. The incidence of urinary problems was found to be significantly increased in multi-cat households, those with a low number of litter trays, less frequent cleaning of the trays of faeces and the use of crystal type litter. The veterinary clinic was the most common place to obtain advice about feeding and toileting management.

Conclusions and relevance An increased number of Australian households now contain multiple cats that live restricted or indoor lifestyles. Despite the majority of respondents claiming to have a lot of knowledge about cats and obtaining veterinary advice, deficiencies were identified in toileting facilities and feeding practices, which raises significant welfare concerns. Urinary tract disorders are an important cause of morbidity, mortality and relinquishment and its presence was associated with inadequate toileting facilities. Ongoing education of cat owners and an increased effort by veterinarians to include basic husbandry in preventative care consultations is critical to improving the welfare of pet cats.

Keywords: Animal welfare; environmental enrichment; resources; urinary problems; lifestyle; survey; Australia

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Introduction

Australia has one of the highest companion animal ownership rates in the world, with an estimated 29% of households owning a cat and a total pet cat population of 3.9 million.[1] Domestic cats have frequently been studied in the shelter environment, research facility and veterinary hospital, but limited research has been performed to evaluate the ways in which owners meet the needs of pet cats in the home environment.[2]

Addressing feline-specific environmental needs is essential for meeting their unique physical, social and behavioural requirements.[3] An appropriate feline environment includes the provision of three-dimensional space, opportunities for foraging and predatory behaviours, separate areas for key resources such as litter trays and

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food, appropriate substrates for scratching, and environmental complexity and diversity.[2–6]

Owner management practices and environmental factors significantly influence the welfare of pet cats.[3,7] Cats confined indoors may be subjected to a spatially limited and monotonous environment, which can result in boredom, inactivity and chronic stress, with an increased risk of obesity, illness, anxiety and behavioural issues.[3,8–11] Stress-related diseases such as feline idiopathic cystitis (FIC) may be more prevalent in multi-cat households, particularly in those where cats are housed in groups that are not socially affiliated, and where competition and conflict exists over shared resources.[12,13] Susceptibility to FIC is thought to be influenced by a combination of genetic predisposition, early life experiences and environmental stressors.[8,12,14] Inappropriate elimination is one of the most commonly reported feline behavioural problems and reason for relinquishment to shelters.[14–16] Potential causes include medical disorders such as FIC, social and environmental stress, and factors related to toileting facilities such as litter tray location and size, litter preferences and frequency of cleaning.[12,14]

The aim of this study was to conduct a survey of the cat-owning population in Australia to investigate the provision of environmental resources in the home environment, and identify factors that may compromise the welfare of pet cats.

Materials and methods

Survey design

An online survey was created using the web-based Bristol Online Survey (ethics approval University of Edinburgh, Human Ethical Review Committee_55_16) and was designed to assess the quality of the environment of domestic pet cats in Australia (see supplementary material). Survey questions were formulated based on information gained from a literature review, and input from feline specialists and a behaviourist. Emphasis was placed on questions relating to the management of toileting facilities as lower urinary tract disease has been identified as a significant health and welfare issue for companion cats globally, and inappropriate urination is the most commonly reported behavioural problem.[12,17–19] The survey was divided into five short sections containing 25 questions (Table 1). Rather than asking about individual cats, respondents were requested to select answers to the questions that best fit the majority of the cats in the household and that only one survey per household was completed. The survey was open for an 8-week period (January–February 2017).

Survey distribution

The survey was advertised to Australian cat owners through social media and professional networks. Participation in the survey was voluntary and no

Table 1 Survey questionnaire outline

Section	Description	Questions
1	Introduction	Number of cats owned by the household*
		Where the respondent heard about the survey*
2	Lifestyle and home environment	Main lifestyle*
		Type of outdoor access and home environment
		Provision of indoor furniture and scratching posts
		Frequency of inappropriate scratching behaviours
3	Toileting	Number and location of litter trays provided
		Size of litter trays
		Frequency of cleaning of litter trays
		Type of litter provided
		Depth of litter provided
		Frequency of inappropriate urination (outside of the litter tray)
		Presence of urinary problems (eg, straining to urinate, blood in urine, urethral obstruction)
		Where advice is sought about litter tray management
4	Feeding	Main type of food offered
		Additional types of food offered
		Method of feeding
		Where advice is sought about feeding
5	Respondent demographics	State and postcode of respondent
		Level of knowledge and experience with cats

*Mandatory question

incentives were offered. Survey responses were anonymous and no respondent demographic information was collected other than respondent postcodes (as per Human Ethical Review Committee approval conditions).

Data analysis

Data was exported into a Microsoft Excel spreadsheet and initially analysed using pivot tables. Minitab statistical software package version 16 was used to perform descriptive statistics. The count and percentage of respondents that answered individual questions was calculated, and categorical and quantitative variables described. A forward stepwise Poisson distribution generalised linear mixed-model analysis of variables was performed using GenStat statistical software version 16 to predict relationships between the presence of urinary problems, and lifestyle and environmental variables. A binomial distribution generalised linear mixed-model analysis was performed to predict relationships between the presence of inappropriate urination outside of the litter tray, and the same lifestyle and environmental variables. In this model the number of litter trays provided was treated as a variate and not a factor owing to negative interactions with other factors within the model causing errors. Non-parametric data distribution was assumed and for all tests Wald statistics were calculated. P values of <0.05 were considered significant.

Results

Demographics

A total of 12,010 survey responses were received, representing cat-owning households in Australia. Responses were obtained from every state and territory (Figure 1). Altogether, 45.5% (n = 5459) were single-cat households and 54.5% (n = 6551) were multi-cat households. There were 23,920 cats across these households, with a mean of two cats per household.

Lifestyle

In total, 46.3% (n = 5562) of respondents had indoor-only cats, which were either 100% indoors, indoors with supervised outdoor access on a harness or had access to an outdoor cat enclosure. Altogether, 51.8% (n = 6227) had cats with a mixed indoor–outdoor lifestyle where access to the outdoors was not strictly enclosed or supervised, and 1.8% (n = 221) had cats that were predominantly outdoors with no supervision.

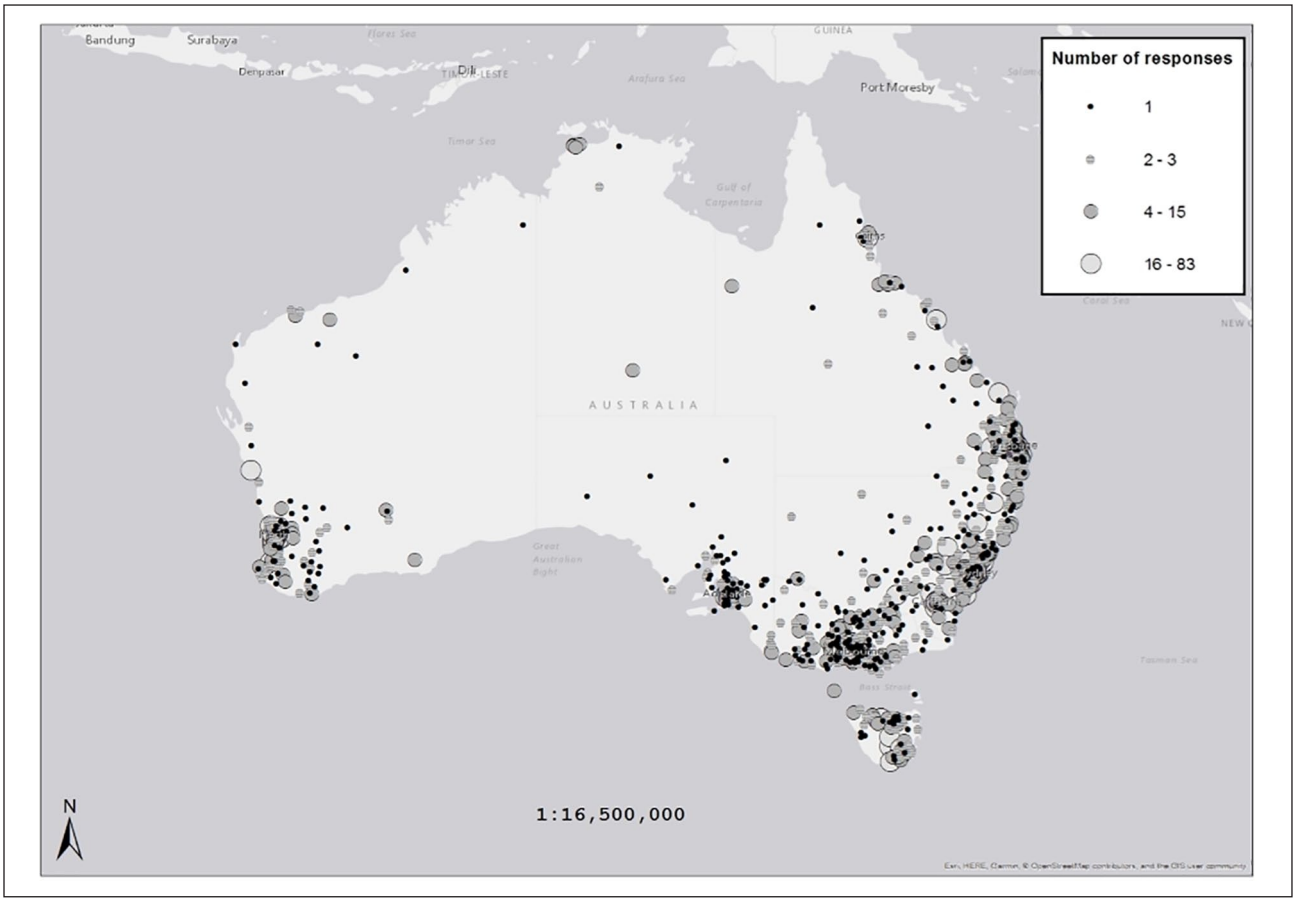

Figure 1 Map showing the geographical distribution of survey respondents

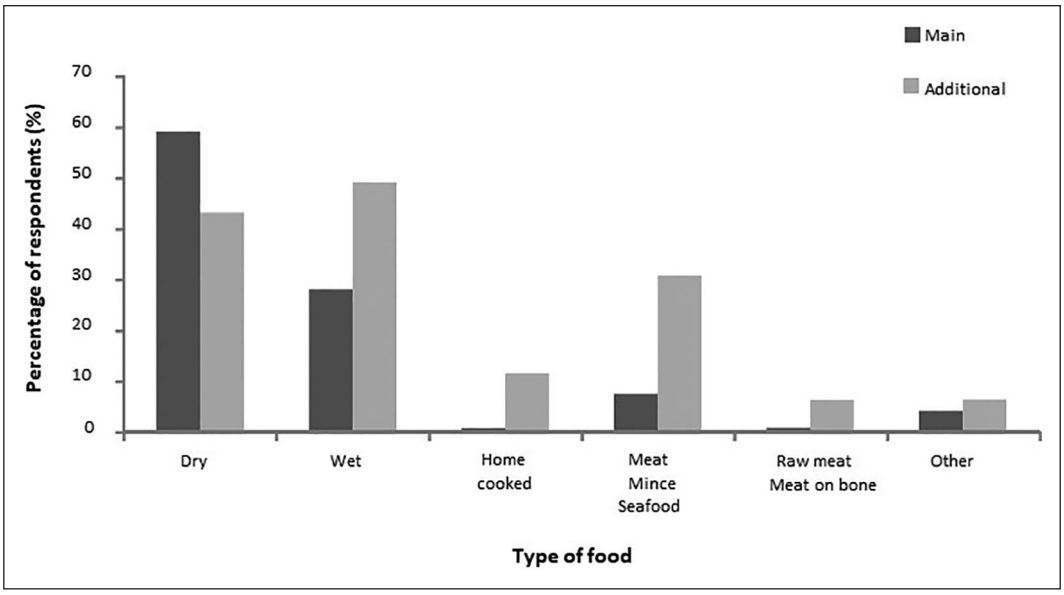

Figure 2 Type of foods fed

Home environment

The majority of cats (98.7%; n = 11,857) had access to low furniture in the house, such as a couch, chair or bed. In total, 81.2% (n = 9754) had access to high furniture, such as a wardrobe or shelf, 85.3% (n = 10,245) a window sill, 64.2% (n = 7710) to a cat tower or tree and 17.6% (n = 2119) had access to other furniture specifically designed for cats, such as platforms or ramps.

Scratching behaviours

In total, 92.4% (n = 5140/5562) of indoor cat households provided scratching posts and 71.2% (n = 4435/6227) of those with indoor–outdoor cats provided scratching posts. Inappropriate scratching was reported to be common in both single-cat and multi-cat households, with less than a quarter of respondents (21.8%; n = 2620/12,002) reporting no inappropriate scratching behaviours. Altogether, 72.8% (n = 1726/2372) of respondents that did not provide scratching posts reported that their cats exhibited inappropriate scratching behaviours; however, 79.5% (n = 7656/9630) of respondents that did provide scratching posts indicated that their cats still exhibited some inappropriate scratching.

Feeding

The majority of cat owners (59.0%; n = 7082/12,002) fed dry food as the main diet, while 28.0% (n = 3366/12,002) fed wet food as the main diet. Of those respondents that fed dry food as the main diet, 70.4% (n = 4988) also fed wet food as an additional dietary component. Home-cooked diets, mince, raw meat or other diets (a combination of different foods with no one predominant type of food) were less commonly fed (Figure 2). In total, 85.3% (n = 10,240/12,010) of respondents fed their cats using a plate or a bowl, with 7.3% (n = 876/12,010) using interactive puzzles or food-dispensing toys, while 5.5% (662/12,010) used other methods such as hand feeding, automated feeders and microchip feeders.

Toileting

A total of 10,305 households provided litter trays. Of those classified as indoor cat households, 80.1% (n = 1713/2139) of single-cat households provided one litter tray, 17.7% (n = 378/2139) two trays and 2.2% (n = 48/2139) three or more litter trays. Of the two-cat households, 36.5% (n = 709/1940) provided one tray, 44.7% (n = 867/1940) two trays and 18.8% (n = 364/1940) three or more litter trays. Of the three-cat households, 16.7% (n = 104/622) provided one litter tray, 32.0% (n = 199/622) two trays and 51.3% (n = 319/622) three or more trays.

Overall, 71.3% (n = 6733/9446) of households either provided a single litter tray or provided several trays in the same location. The majority of survey respondents indicated that common locations of litter trays were the laundry room, bathroom, hallways and spare bedrooms. The most common types of litter used were recycled paper pellets (36.1%; n = 3719/10,305), crystal litter (29.8%; n = 3075/10,305) and clumping clay (28.6%; n = 2949/10,305).

Sixty-one percent provided a tray greater than the size of the length of the largest cat in the house. Removing wet litter was performed daily in 35.6% of households, several times weekly in 30.9%, weekly in 25.7% and less than once a week in 7.8%. Removing faeces from the tray occurred after one faecal deposit in 63.7% of households, after several faecal deposits in 29.3%, weekly in 5.8% and less than once a week in 1.2% (Table 2).

Table 2 Summary of litter tray management practices for households that provided litter trays

Question	Variable		Number of responses	Percentage of responses
Location of litter trays	Single tray or multiple together	Overall	6733/9446	71.3
		Single-cat households	3333/3919	85.1
		Multi-cat households	3400/5527	61.5
	Not together	Overall	2713/9446	28.7
		Single-cat households	586/3919	15.0
		Multi-cat households	2127/5527	38.5
Size of litter tray	Less than the length of largest cat		425/10,375	4.1
	Approximately the length of largest cat		3672/10,375	35.4
	Greater than the length of largest cat		6278/10,375	60.5
Depth of litter	<1 cm		324/10,382	3.1
	Approximately 1–3 cm		5032/10,382	48.5
	>3 cm		5026/10,382	48.4
Frequency of cleaning of litter tray of faeces	Remove after one faecal deposit		6563/10,295	63.7
	Remove after several faecal deposits		3011/10,295	29.3
	Remove faeces weekly		597/10,295	5.8
	Remove faeces less than weekly		124/10,295	1.2
Frequency of cleaning of litter tray of urine	Remove wet litter daily		3650/10,257	35.6
	Remove wet litter a few times per week		3171/10,257	30.9
	Remove wet litter weekly		2639/10,257	25.7
	Remove wet litter less than once weekly		797/10,257	7.8

Overall, inappropriate urination was reported by 19.8% (n = 2371/11,955) of respondents. This was reported to occur weekly in 6.1% (n= 729/11,955), monthly in 3.6% (n= 427/11,955) and less than monthly in 10.2% (n=1215/11, 955) of households. In total, 9.2% (n = 218/2371) of households reporting inappropriate urination did not provide any litter trays indoors.

Urinary problems such as straining to urinate, vocalising when urinating, blood in the urine or urethral obstruction were reported by 17.1% (n = 2049/11,981) of respondents. Altogether, 15.8% (n = 1888/11,981) of households reported urinary problems in one cat, and 1.3% (n = 161/11,981) in more than one cat in the same household. Urinary problems were reported in 11.9% (n = 646/5446) of single-cat households and 21.5% (n = 1403/6535) of multi-cat households, 19.0% (n = 1053/5548) of indoor cat households and 15.8% (n = 979/6213) of indoor–outdoor cat households. In total, 17.6% (n = 1739/9894) of households that did not have cats with urinary problems reported varying frequencies of inappropriate urination, with 4.9% (n = 487/9894) urinating inappropriately on an approximately weekly basis.

The incidence of urinary problems was found to be significantly increased in multi-cat households ($P<0.001$), households with a low number of litter trays ($P<0.001$), those that used crystal-type litter ($P<0.001$) and those that less frequently cleaned faeces from the litter tray ($P<0.006$). No significant relationship was found between the presence of urinary problems and whether the cat was housed indoor, indoor–outdoor or outdoor ($P = 0.306$). The main type of food was also not significantly associated with the presence of urinary problems ($P = 0.254$).

The incidence of inappropriate urination outside of the litter tray was found to be significantly increased in multi-cat households ($P<0.001$), those with a low number of litter trays ($P<0.001$), less frequent cleaning of the litter trays of both urine ($P<0.001$) and faeces ($P<0.001$), litter trays located in the same area ($P<0.001$) and the use of recycled paper litter type ($P<0.001$).

Owner's cat experience and sources of husbandry advice

With regard to knowledge and experience with cats, 58.3% (n = 6975/11,968) of respondents stated they had a lot, 38.9% (n = 4653/11,968) had some and 2.8% (n = 340/11,968) had little knowledge or experience with cats. Respondents were more likely to obtain advice about feeding than toileting management. Veterinarians were the most common source of advice about both feeding (61.1%; n = 7333/12,010) and toileting (23.5%; n = 2823/12,010), but 52.2% (n = 6266/12,010) of respondents had not been provided with any advice about toileting management (Figure 3).

In total, 34.5% (n = 706/2049) of respondents owning cats with urinary problems (defined as straining to urinate, vocalising when urinating, blood in the urine or urethral obstruction) had not been provided with advice about litter tray management, even when they owned more than one cat with urinary tract problems (21.1%; n = 34/161). A further 39.3% (n = 932/2371) of respondents owning cats that inappropriately urinated outside

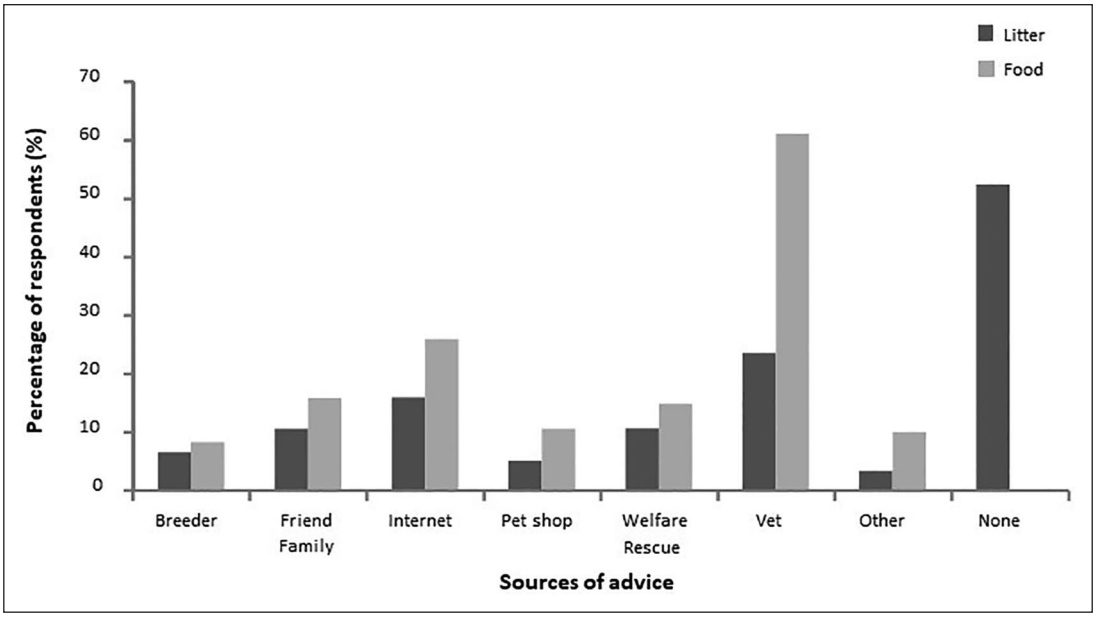

Figure 3 Sources of advice regarding feeding and litter tray management

of the litter tray had also not been provided with advice about litter tray management.

Discussion

A study of this magnitude has not previously been performed and is unique in respect to the high number of responses obtained from a broad geographical range of cat-owning households in Australia.[1,20–22] Insightful information on the husbandry of pet cats has been gained from 12,010 owners, representing 23,920 cats throughout Australia and 0.6% of the owned domestic cat population. The survey identified some serious deficiencies in provisions for pet cats in Australian households, which are likely to be contributing to a range of health and welfare problems. The most striking deficiencies identified were with regard to litter tray provisions and management, the way that cats are fed and the predominant type of food provided. This may appear surprising given that the majority of cat owners in this survey considered themselves to be knowledgeable and experienced with cats, and veterinarians were the most common source of advice for these areas. Given this respondent bias, it suggests that the problems identified may be even worse in the general cat-owning population than the findings reported in this study.

Multi-cat households and indoor-only cats were more common than reported in previous surveys.[20–22] The increase in indoor-only cats is unsurprising given the ongoing encouragement for pet cats in Australia to be kept confined indoors.[20–23] Environmental resources and owner management practices become even more important in these situations if optimal welfare of pet cats is to be achieved. Our survey results suggest that further education of cat owners is required and that veterinary professionals need to take a more active role in providing optimal advice regarding basic cat husbandry practices. In particular, the lack of litter tray management advice from veterinarians, even when cats have presented with lower urinary tract problems, suggests that further education of veterinarians on optimal cat husbandry may also be required.

Although the majority of owners in the study reported that their cats had access to both low and high furniture, almost 20% were not provided with opportunities to access vertical space in the home environment. Three-dimensional space is of key importance for cats, as it allows for options to retreat from actual or perceived threats in the environment such as children, aversive noises or other animals.[3,24,25] Additionally, these structures provide opportunities for active behaviour, environmental complexity and a place to rest.[24]

Inappropriate scratching was commonly reported in this survey, despite the majority of owners providing scratching posts. This may suggest that owners are unaware of what constitutes appropriate scratching provisions, and are perhaps not considering the scratching substrate, location, variety, type (horizontal or vertical) and height. Cats prefer a variety of scratching surfaces, and while most cats prefer posts with rope substrate, older cats prefer softer carpet.[26] Inappropriate scratching is a key behavioural reason for the breakdown of the human–cat bond and can result in potential adverse outcomes such as punishment or relinquishment.[26,27] The survey did not explore this area in detail and

further study is warranted to determine optimal management of scratching provisions for cats in the home environment.

It is increasingly recommended that feeding cats should not only meet their unique nutritional requirements, but also encourage natural predatory behaviours in order to provide both physical and mental stimulation.[3,6,25] This can be achieved through the use of interactive food toys or puzzles, hiding or scattering food, or feeding chunks of meat or meat on the bone.[6,28] The latter also stimulates locomotor and masticatory behaviours.[28] Of concern is that very few respondents in this study were using any of these methods of feeding, with the majority providing dry food in a bowl or plate.

Dry food is not recommended as the main dietary component in cats, as it has been associated with an increased risk of disorders such as FIC, obesity and obesity-related disorders such as diabetes mellitus.[12,29] Furthermore, for some health disorders such as chronic kidney disease, diabetes mellitus and FIC, the increased water intake associated with wet food is beneficial.[29] The majority of respondents reported obtaining feeding advice from veterinarians, suggesting that either many veterinarians may not be up to date with current recommendations on feeding cats or owners are not following their veterinarian's advice.

Urinary tract disorders such as FIC, urethral obstruction and inappropriate urination are all common disorders and can result in morbidity (eg, FIC), mortality (eg, urethral obstruction) and relinquishment (eg, inappropriate urination).[14,16] In this survey, urinary tract disorders were common, with 17.1% of respondents reporting urinary tract problems, such as straining to urinate, vocalising when urinating, blood in the urine or urethral obstruction in one or more of their cats. Assuming that the respondents were largely representative of Australian cat owners, this may equate to more than half a million pet cats in Australia suffering from urinary tract disease. Nearly one-fifth of respondents (19.8%) reported inappropriate urination (outside of the litter tray), and nearly 10% of these households did not provide any litter trays for their cats. The exact location of the inappropriate urination was not defined and more acceptable locations such as the shower or bath may be a common reason for lack of provision of a litter tray.

Elimination in the feline species involves a sequence of behaviours that includes digging, posturing and covering of elimination products.[30] Factors that may contribute to inappropriate urination include litter tray location, litter aversion, substrate preference, size of litter tray, frequency of cleaning, anxiety and sharing of litter trays.[14,17] Previous studies have shown a preference towards a litter substrate that is unscented and finely particulate in size such as a clumping clay-based litter, a depth of at least 3 cm of litter and unused litter trays (ie, no urine/wet litter or faeces in the tray).[7,31,32] The presence of urinary problems in this study was also found to be significantly associated with the use of crystal-type litter compared with other litter types. This may be related to an aversion to the substrate due to the texture and sensation of crystal-type litter or it may also be that owners are less likely to remove wet litter daily.

Lifestyle aspects such as indoor or limited outdoor access, a sedentary lifestyle, feeding a predominantly dry food diet and stress, such as living in a multi-cat household where conflict exists, have previously been identified as risk factors for FIC.[12,13,19,33] Litter tray location may have also had an impact on the likelihood of urinary tract problems, but this was not explored in enough detail in the current survey to draw any conclusions.

In this survey, factors associated with both inappropriate urination and other urinary tract problems included multi-cat households, provision of fewer litter trays than number of cats in the household and infrequent cleaning of the litter trays of faeces. These findings suggest that agonistic interactions in multi-cat households and competition for resources can result in an increased likelihood of toileting in areas of the house outside of the litter tray. An inability of cats to perform normal elimination behavioural sequences owing to dirty litter trays can also lead to aversion to the trays and seeking alternative locations for toileting.

Of concern is that the majority of respondents reported not receiving advice regarding toileting management from any source, and in some cases even when their cat exhibited urinary tract problems. Given that previous Australian studies have also shown inadequate litter tray provision with sharing of litter trays in multi-cat households, there does not appear to have been an increase in awareness or addressing of this issue.[9,34] Inappropriate elimination has been identified as the most common behavioural reason for relinquishment of cats to the Royal Society for the Prevention of Cruelty to Animals shelters in Australia and therefore poses a significant risk to the breakdown of the human–cat relationship.[16] This highlights a huge opportunity for veterinarians to have a positive impact on the welfare of pet cats by providing detailed toileting management advice as part of routine preventative health care.

A major strength of the study was the succinct format of the survey questionnaire and the resulting high response rate achieved. However, this does bring limitations, with a lack of comprehensive data collected across some areas. For example, data such as age, sex, neutering status and health problems that may affect the cats' lifestyles were not collected with regard to individual cats. Furthermore, more detailed information on aspects of feeding, water provision, locations of resources, social groupings and interactions within multi-cat households would add further valuable information. This survey

has, however, highlighted important areas that would be worthy of more in-depth research.

Conclusions

Provision of resources for domestic cats in the home environment was examined by conducting an online survey of cat owners in Australia. The results demonstrate a change in the structure of cat-owning households in recent decades, with an increase in the number of multi-cat, indoor-only households.[1,22,35] Feeding practices and litter tray management were identified to be the most important areas of deficiencies.

This may have serious health and welfare consequences, as exemplified by nearly one-fifth of households reporting owning cats with urinary tract problems. Poor management of toileting facilities, including a low number of litter trays, shared toileting facilities, infrequent cleaning of trays and litter type, were found to be associated with an increased risk of urinary problems. Although a large percentage of cat owners were provided with dietary advice from veterinarians, the study found that very few cats were fed in a manner that promotes expression of active predatory behaviours, or provides physical or mental stimulation.

Opportunities exist for veterinarians to pre-emptively commence discussions about these basic areas of husbandry during routine health examinations. This is particularly pertinent for cats living in multi-cat households, and those leading contained lifestyles where toileting options are limited and controlled by the human caregiver. Improvement in the provision and management of feline toileting facilities alone has the potential to have an enormous benefit on the health and welfare of millions of pet cats.

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Cats of Australia Survey.

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