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Cat Tracker South Australia

UNDERSTANDING PET CATS THROUGH CITIZEN SCIENCE

Philip Roetman, Hayley Tindle, Carla Litchfield, Belinda Chiera,
Gillian Quinton, Heidi Kikillus, David Bruce & Roland Kays





**Cat
tracker**

Domestic cats are one of the most popular pets worldwide and they play an important and much-cherished role in the lives of many South Australians. The **Cat Tracker** project was designed to help cat owners make informed decisions about the care and management of their pet cats. **Cat Tracker** was launched in South Australia in February 2015. The project focussed on the movement and management of pet cats in South Australia, as well as exploring cat personality and the attachment people have with pet cats.

Thank you to all of the people and cats who have contributed to the project!



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- **Dog and Cat Management Board**
- **City of Marion**
- **City of Salisbury**
- **City of Mitcham**
- **Adelaide and Mount Lofty Ranges Natural Resources Management Board**
- **Department of Environment, Water and Natural Resources**
- **University of South Australia**

University of South Australia project team

- **Dr Philip Roetman** is the research leader of the [Discovery Circle](http://www.discoverycircle.org.au) initiative. As a researcher, he is particularly interested in citizen science – actively involving the wider community in research projects. Philip led the *Cat Tracker* project in South Australia and contributed to all aspects of the project: research design, developing project resources, data collection, data analysis and report writing.
- **Dr Hayley Tindle** is the [Discovery Circle](http://www.discoverycircle.org.au) project officer. Her research interests are conservation psychology and encouraging sustainable behaviours. Hayley contributed to project design, developing project resources, data analysis and report writing. Hayley also managed the cat tracking.
- **Dr Carla Litchfield** is a Lecturer in Psychology. Her research interests are animal behaviour and conservation psychology. Carla contributed to the overall project design and led the cat personality research.
- **Dr Belinda Chiera** is a Senior Lecturer in Statistics with research interests ranging from environmental projects to social network analysis. Belinda contributed to the cat personality research and advised on statistical analysis.
- **Gillian Quinton** was an Honours student in 2015. Gillian contributed to the analysis of cat personality.
- **Associate Professor David Bruce** is an adjunct researcher in the geospatial sciences. David contributed to the analysis of cat road crossings.
- **Additional contributors:** Associate Professor Kathy Paige, Dr David Lloyd, and Dr Yvonne Zeegers all contributed to the development of project resources for teachers; David Chan 3D printed custom cases for the GPS units; Dr Sandra Taylor is working on an analysis of stories about cats; Julia Roetman provided research advice; and the UniSA Communications and Marketing Unit assisted with promotion of the project. Particular thanks to Victoria Fielding and her family (including their cats).

International partners

- **North Carolina State University and North Carolina Museum of Natural Sciences**
Associate Professor Roland Kays, Troi Perkins, Dr Holly Menninger, Professor Rob Dunn and Sarah Davidson all contribute to the *Cat Tracker* project in the USA, where the GPS tracking of cats began:
<http://cats.yourwildlife.org/>
- **Victoria University of Wellington**
Dr Heidy Kikillus contributed to the project design in Australia, ran *Cat Tracker* in Wellington, New Zealand, and collected cat personality data for cats in New Zealand: <http://cattracker.nz/>

Research Approvals: in South Australia, *Cat Tracker* was approved by the University of South Australia's Animal Ethics Committee (project U33-14) and Human Research Ethics Committee (project 33220).



Introduction

Domestic cats are one of the most popular pets worldwide and they play an important and much-cherished role in the lives of many South Australians. Cats provide great enjoyment, companionship and a connection to the natural world. The **Cat Tracker** project has explored the movement and management of domestic cats in South Australia. It has been run as a **citizen science** project, where members of the public have been directly involved in scientific work – in this case, the tracking of cats.

The *Cat Tracker* questionnaire

The project has had two main phases, a questionnaire (survey) and cat tracking activity. The questionnaire asked pet owners about their cats and how they manage their cat's indoor-outdoor movement. People who did not own cats could also contribute information about cat management, particularly focussed on issues associated with cat movement, including roaming cats and semi-owned cats. The survey also included questions about **attachment** to pet cats and a **cat personality** test, where cat owners answered a series of questions about their cats in order to generate a personality profile of their cats.

Key research questions related to the questionnaire:

1. In what ways are people attached to their pet cats?
2. What are the personality characteristics of pet cats?
3. How do people manage their pet cats?
4. What are community attitudes towards roaming cats and semi-owned cats?

Cat tracking

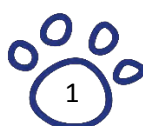
Cat owners who completed the questionnaire were able to nominate themselves (and their cats) to participate in the second phase of the project, the cat tracking. During the cat tracking phase, cat owners used GPS tracking devices supplied by the research team to track their own cats. These tracks are available for public review through the [Discovery Circle](http://www.discoverycircle.org.au/projects/cat-tracker/tracks/) website at: www.discoverycircle.org.au/projects/cat-tracker/tracks/

Key research questions related to the cat tracking:

5. How large (or small) are the home-ranges of pet cats?
6. Are there differences between the day and night home-ranges of pet cats?
7. How are cat home-ranges related to cat characteristics and cat management?

This report

For analysis we had a total of **3,192 surveys**, including data about **4,314 cats** (there are more cats than people because some people owned more than one cat). At the completion of cat tracking we had tracked **443 cats** in South Australia. In this report we present an overview of the results and some analysis of our survey and cat tracking data. We start with some background 'cat facts' about the taxonomy, biology, history and ownership of cats. We hope that this report will inform cat owners and help them to make decisions about the care, welfare and management of their cats.



Notes

Sample sizes: each chart in this report includes a sample size, denoted by 'n'. For example, '(n = 3192)' indicates that the responses from 3,192 people are presented in the chart.

Averages: the term 'average' is used in this report as it is in general usage – to describe the result obtained by adding together several values and then dividing this total by the number of values. A statistician would typically call this value the 'mean' or perhaps the 'arithmetic mean' but in general usage the terms are typically interchangeable.

Quotes and photographs: throughout this report we have presented photographs of cats we have tracked and quotes from survey respondents. The photographs and quotes are not linked in any way (i.e. the quotes were not submitted by the owners of the cats pictured beside them). Further, where suitable quotes were available we have tried to illustrate different opinions, but they are not a representative sample or the result of a formal analysis. The quotes may be lightly edited for readability (e.g. amended spelling).

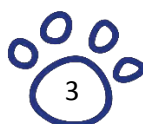


Background cat facts

Cat facts 1: The taxonomy of cats

Scientists classify animals to study them and to understand how they are related to each other. This classification is called taxonomy. Taxonomy is based on a hierarchy, and each level is given a different name, like 'order' or 'family'. There is an example of this hierarchy below, with cats classified at each level. At the top of the hierarchy, cats are related to all other animals. As you move down the hierarchy, the groups become more specific and the animals mentioned are more closely related.

Levels of the taxonomic hierarchy	How domestic cats are classified at each level	Description
Kingdom	Animalia (animals)	All animals are part of a kingdom called ' Animalia '. Animals are multi-celled organisms that have nervous systems.
Phylum	Chordata (chordates)	The kingdom Animalia is divided into numerous phyla (the singular of phyla is phylum). Different groups of animals are in different phyla, with phyla for sponges, crustaceans and chordates (and more). Chordates are animals with notochords . Our backbones are a type of notochord. In fact, all animals with backbones (sometimes called vertebrates) are chordates. But other animals have notochords, so they are chordates, even sea squirts.
Class	Mammalia (mammals)	Chordates are divided into several classes . Sea squirts are in one class, and there are other classes for things like bony fish, amphibians, reptiles, birds and mammals (and more). Mammals are warm blooded, feed their young with milk, and most have hair. The class for mammals is called ' Mammalia '.
Order	Carnivora (carnivores)	There are different kinds of mammals and they are classified in different orders , including orders for rodents, bats, elephants, primates and carnivores . The word carnivore comes from a Latin word meaning "to devour flesh." Indeed, carnivores have teeth, claws, and binocular vision that are all well developed for catching and eating other animals. However, while most carnivores eat mostly meat, some are omnivorous (eating both meat and plants), and the giant panda is almost exclusively herbivorous (eating mostly plant material).
Family	Felidae (felids)	The carnivore order is divided into a number of families . There are families for bears, dogs, foxes, hyenas and cats (and more). The cat family is called Felidae . It includes the 'big cats' such as lions, tigers, cougars and cheetahs. It also includes smaller cats like lynx, servals and wildcats. Cats are carnivorous, needing meat and high proportions of protein to survive. They typically have flexible bodies with muscular limbs, a tail, soft toe pads and protractible claws.
Genus	Felis (felines)	The Felidae family is split into several genera (the singular of genera is genus). The big cats are in different genera to smaller wildcats and domestic cats. The Felis genus includes small felines who generally feed on rodents, birds, and other small animals.
Species	Felis catus	A species is a group of animals within a genus that can interbreed and produce viable (fertile) offspring. When scientists write a species name, they include the genus name as well. The genus name is capitalised and both names are written in italics. Thus, a domestic cat is <i>Felis catus</i> .





Cat facts 2: Cat biology

Although domestic cats often seem lethargic, sleeping for around 14 hours a day, their bodies are designed for speed and agility, helping them to be excellent hunters. Below are some of the key adaptations of domestic cats for speed, agility, hunting and survival.

- **Backbone** – A flexible backbone is one of the secrets to cats’ speed. Cats have more vertebrae than humans and these are attached to powerful muscles allowing the backbone to flex, extend or twist by as much as 180 degrees, helping them land on their feet.
- **Shoulder blades** – Unlike humans, cats’ shoulder blades run down the side of their chest and pivot halfway, allowing their shoulders to travel in a wider arc and lengthening their gait.
- **Legs** – Cats’ front legs move slightly inward as they walk so that both the left and right paws land on almost the same line, helping them to walk on narrow platforms such as fence rails.
- **Feet** – Cats walk on their toes, with their ‘foot’ making up the lower part of their leg. This minimises surface area on the ground, reducing friction and resistance on the ground, increasing speed. Their paw pads are designed for silent hunting - supple so they don’t displace objects on the ground, with tufts of fur between the paw pads to muffle sound.
- **Claws** – Cats’ front claws are retracted until they are needed, and they are sharpened through scratching. Their back claws wear away when they walk as they are not protected.
- **Eyes** – Cats’ eyes are well developed for hunting during either the day or the night. Their pupils rapidly constrict and dilate in response to light. Cats’ eyes shine at night due to the reflection from a ‘mirror’ in the cat’s retina that allows them to utilise all available light in their surroundings.
- **Ears** – Cats’ ears have over 20 muscles and can rotate 180 degrees.
- **Skin** – Cats’ skin is very sensitive to touch and is ‘loose’, especially around the neck, where it is also thicker. This loose skin may help the cat to survive if caught, by giving it a chance to slip out of its capturer’s grasp.

The lifecycle of a cat

Cats can reach sexual maturity and breed as early as four months of age. Their average gestation period is between 64 and 67 days and they typically produce three to five kittens. Female cats can have two to three litters per year. Over ten years, a single female cat could have as many as 150 offspring.

Pet cats usually live for around 10 to 15 years. However, there is great variation in how long cats live. One pet cat has been recorded to live for 38 years! That cat, called “Creme Puff”, was the oldest cat ever recorded, according to the Guinness World Records (2010 edition).

Un-owned and semi-owned cats do not live as long as owned cats (see **Factsheet 4** for definitions of owned, semi-owned and un-owned cats). There is great variation in how long un-owned cats live. Some research suggests that they might only survive for two to three years (on average) as they are more susceptible to disease, injury, predators, and starvation. The lifespan of semi-owned cats is likely to be somewhere in-between the lifespans of owned and un-owned cats.





Cat facts 3: A short history of domestic cats

Domestic animals are bred by people to increase how useful they are for work, food, or as pets. It is thought that most domestic animals, like horses, cattle and dogs, were specifically selected for domestication, but cats became domesticated by coincidence as they lived in increasing proximity to people. It is likely that wildcats (*Felis silvestris*) started interacting with humans as we developed agriculture around 10,000 years ago – they were attracted to being near humans and their grain – that was where the mice were! As wildcats have become domesticated they have become smaller and domestic cats are now usually considered to be a separate species (*Felis catus*). However, there is some contention as domestic cats can still interbreed with wildcats and produce fertile offspring. Therefore, some scientists classify them as a sub-species of the wildcat (i.e. *Felis silvestris catus*). Some key dates in the history of pet cats are listed below.

4000 BC – There are records of wildcats in Egyptian towns.

2000 BC – Egyptians welcomed cats into their homes as they kept snakes away. Egyptians began to worship cats as sacred animals, and banned people from taking them to other countries. The Egyptian Goddess of joy, fertility, and motherhood – Bastet – was often portrayed as a cat. Egyptian families would mourn the death of their cats, with wealthy people providing elaborate funerals and mummifying cats.

1000-500 BC – Domesticated cats were secretly transported across south-east Asia and India.

500 AD – Cats were introduced to the whole of Europe, including Britain, as the Roman Empire grew.

950 AD – In Wales, the value of a cat was legally defined and depended on its age. If someone was convicted of killing someone else's cat, the offender had to give the cat's owner either a sheep with a lamb, or the amount of corn that would cover the cat when its corpse was suspended by the tail (nose touching the ground). In 12th Century Saxony this calculation was not necessary – cats were valued at sixty bushels of corn!

1400s – After being worshiped by Egyptians for thousands of years, the 1400s saw cats associated with evil and witchcraft. Witch hunters in the Middle Ages believed that cats were agents of the Devil and that the shine in cats' eyes was from the fires of hell. Cats were treated badly and killed during this time.

1600s – It is likely that some cats were introduced to Australia around this time. They may have been introduced by Indonesian fishermen or when Dutch traders became shipwrecked off Western Australia.

1700s – American settlers took large numbers of cats from Europe to control rat plagues.

1788 – Arrival of cats in Australia as pets of European settlers.

1850 – As cats eyes respond to light, some have believed that their eyes could serve as clocks. A French missionary priest in China in the 19th century reported that when he asked some village children for the time, they pried open cats' eyelids and replied that it was not yet noon!

1900s – As cities grew with new warehouses, railway depots, and post offices, so did the number of rats and mice. Managers of such premises would acquire cats to live and work on the premises. The British Post Office Cats were one such example, a respected group of cats who received a weekly payment for their care.

1914-1918 – Cats served in World War One, being used in submarines to detect foul air, in the trenches to sniff out poisonous gas, and on war ships to control rats. Cats have sensitive hearing and can differentiate between very similar sounds. Ship cats would roam on land when their ships were in port, and could recognise their ship's boarding whistle, returning to the ship when it was time to leave port. However, during World War One, ship whistles were silenced, so cats had no way of knowing when their ship was leaving, resulting in cats being marooned in many ports. There is a story of a cat stranded in Panama for months, refusing to board a ship until her vessel returned.





Cat facts 4: Owned, semi-owned and un-owned cats

Ownership status

The cats that we keep as pets are known as “domestic” cats because the species (*Felis catus*) has been domesticated. If they are un-owned (stray or feral) they are still called domestic cats, even though they are not living in a domestic situation. Below we list three categories of ownership status for domestic cats.

- **Owned** – they are owned and cared for by someone (i.e. they are pets). Domestic cats are one of most popular pets worldwide and they can play an important and much-cherished role in the lives of their owners. Cats provide great enjoyment, companionship and a connection to the natural world.
- **Semi-owned** – cats that are intentionally provided with food, medical treatment or shelter, but are not considered to be owned by anyone. People sometimes enjoy having a semi-owned cat visiting them regularly. However, semi-owned cats can lead to increases in the un-owned cat population. Semi-owned cats are sometimes called **stray** cats (as are un-owned cats).
- **Un-owned** – cats that no one owns or provides care for. Un-owned cats are also called **feral** or **stray** cats. In Australia there are no native cats, so cats that live without human care are all un-owned cats.

While well-managed cats provide many benefits, some owned cats are not well managed. These cats can be a nuisance to neighbours and may have a negative impact on native wildlife. Owned cats that are not well managed, semi-owned cats and un-owned cats are all at risk of starvation, disease, injury or abuse.

Cats in Australia

Cats can cause problems in Australia. As there are no native cats here, native Australian animals have few strategies to avoid predation by cats. Therefore, the arrival of cats has contributed to some serious declines in the populations of small native mammals and birds. The impact of cats on native wildlife is considered to be one of the most significant conservation issues in Australia. Cats may also cause a public nuisance as they fight, yowl, spray urine or defecate in people’s gardens. However, while any cat can cause these issues, cats that are well cared-for and do not roam are unlikely to cause problems. Owners of well cared-for pets can enjoy the beauty of their cats and the companionship they provide.

What about the wildcats?

In parts of the world where **wildcats** are present (e.g. *Felis silvestris* in Europe, Africa and Asia), free-ranging domestic cats can be a problem. There, the domestic cats can inter-breed with the wildcats. This inter-breeding is a problem because it changes the wildcat population. If it happens too much, there will be no true wildcats left – they will become extinct. Similar issues exist for other wild animals. Australian examples are the inter-breeding between dingoes and domestic dogs, and the inter-breeding between introduced Mallard ducks and native Pacific-black ducks.





Meet the cats

The cats of *Cat Tracker*

In this section we provide information from the survey, about 4,314 South Australian cats. Note that not all participants provided a response to every question, and in these cases the number of responses will be less than 4,314.

Popular cat names

Respondents were asked the names of their cats. There was great diversity in cat names, with 1,294 unique names for male cats and 1,183 unique names for female cats. The most common names are presented below.

Top 25 male cat names	
Cat name	Frequency (number of cats)
1. Charlie	31
2. Max	29
3. Harry	24
4. Oscar	23
5. Toby	21
6. Jasper	20
7. Milo	20
8. Leo	17
9. Tiger	17
10. Basil	15
11. George	15
12. Simba	14
13. Oliver	13
14. Archie	12
15. Felix	11
16. Henry	11
17. Ollie	11
18. Jack	10
19. Sylvester	10
20. Tigger	10
21. Tom	10
22. Billy	9
23. Merlin	9
24. Alfie	8
25. Cooper	8

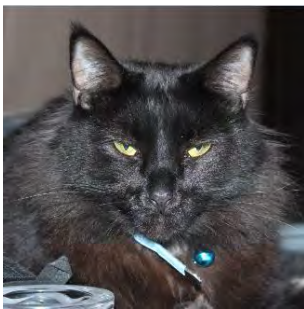
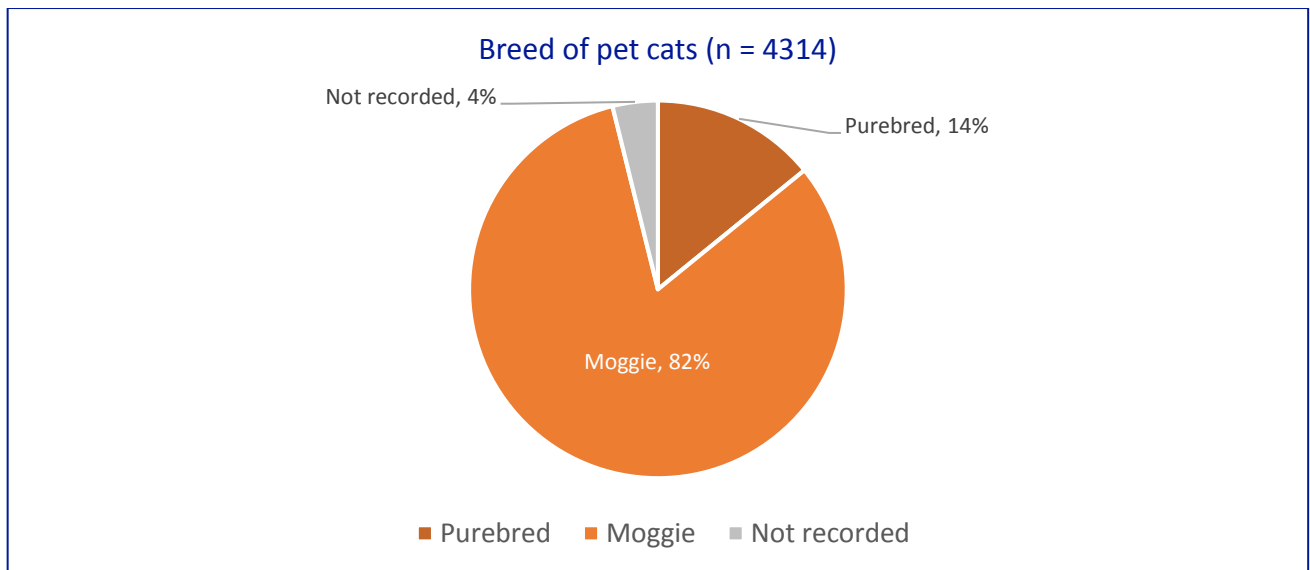
Top 25 female cat names	
Cat name	Frequency (number of cats)
1. Bella	39
2. Lucy	27
3. Missy	22
4. Molly	22
5. Lily	21
6. Coco	20
7. Luna	19
8. Daisy	16
9. Millie	15
10. Misty	15
11. Poppy	15
12. Lola	14
13. Kitty	13
14. Mia	13
15. Milly	13
16. Ruby	13
17. Bonnie	12
18. Holly	12
19. Lilly	12
20. Lulu	12
21. Maggie	12
22. Tilly	12
23. Rosie	11
24. Cleo	10
25. Willow	10

Some of the less common cat names were: Asteroid, BabyCakes, Big Ted, Bruce Willis Pussington, Catarina Purrallot, Chanel Fluffy-Bottom, Chief Leonardo De Cattrio, Couscous, Cucumber, Detective Teddy, Dr Destructo, Elvis Pussley, Fanta Pants, Fizzgig, Fluffyface, Ginger Ninja, Harry Barry White Pants, Hunter Houdini, James Blonde, Lady Velvet, Lottie McBottie, Louis Wane Stinky Splotchy Cat, Lucky Goldstar, Medium Rare, Melvin Van Peebles, Mephistopheles, Mister Darcy, Mr Baggins, Mr Hamish The Extraordinary Puss, Phantom Burger, Pop-Tart, Prince George of the Bushes, Reginald Flynn-Quinn Esquire, Sergeant Pepper, Sir Sparkles, Slim Charles, Smallbum, Stampylongnose, Stealth Bomber, Taylor Pawkins, Vegemite and Velcro-George.



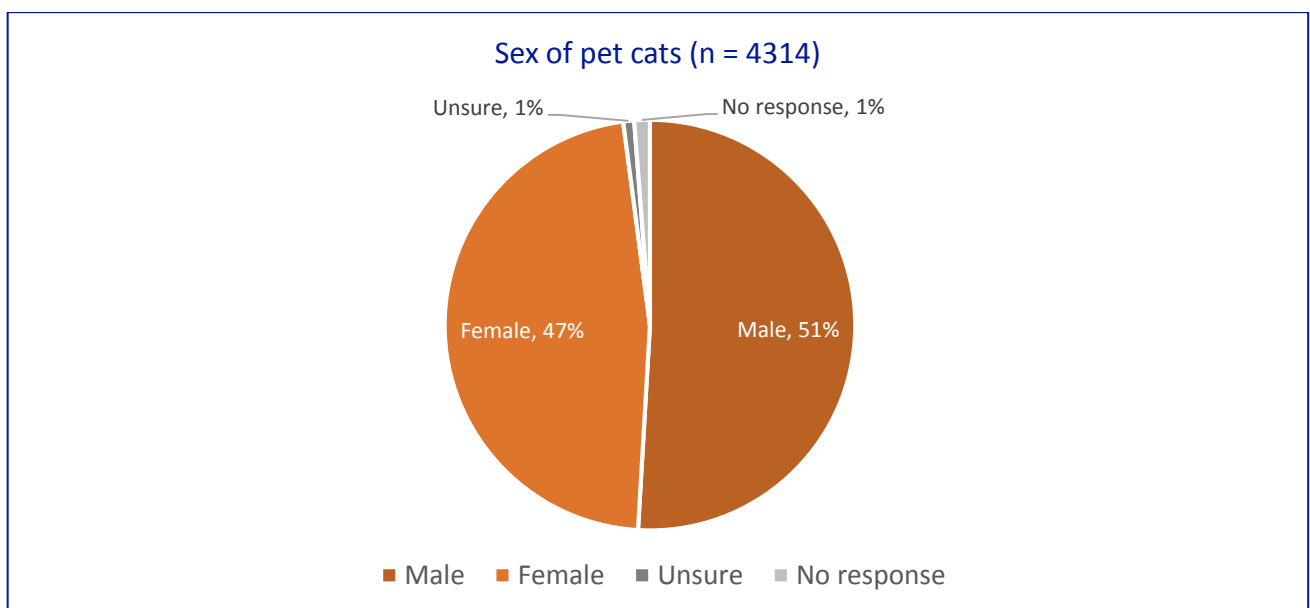
Cat demographics

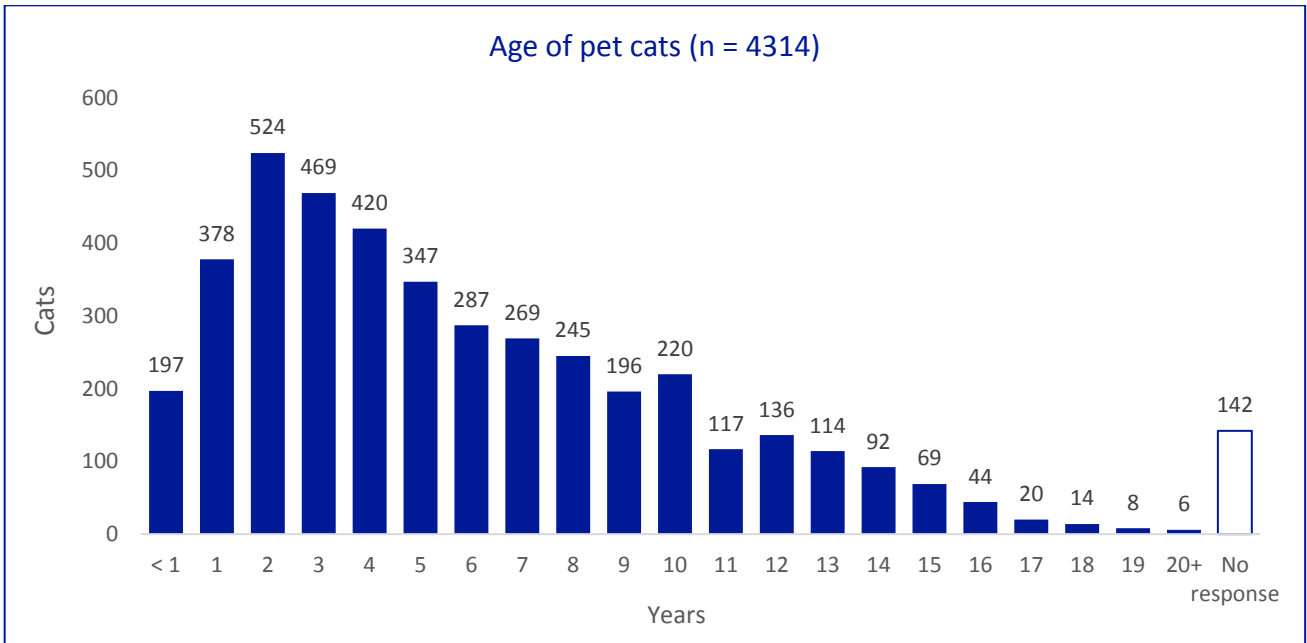
Participants were asked about the breed, age and sex of their cats. The chart below presents the responses to the question “*What type of cat is [your cat]?*” **Most of the cats of survey respondents were moggies.**



“I found an adult, long-haired moggy (I don't consider myself fancy and thus don't consider to have the need for a “fancy cat”).”

The charts below and on the next page present the responses to questions about the sex and age of pet cats. **Cat owners reported similar numbers of male and female cats and a wide range of cat ages.** The median age for the pet cats was 5 years-old.



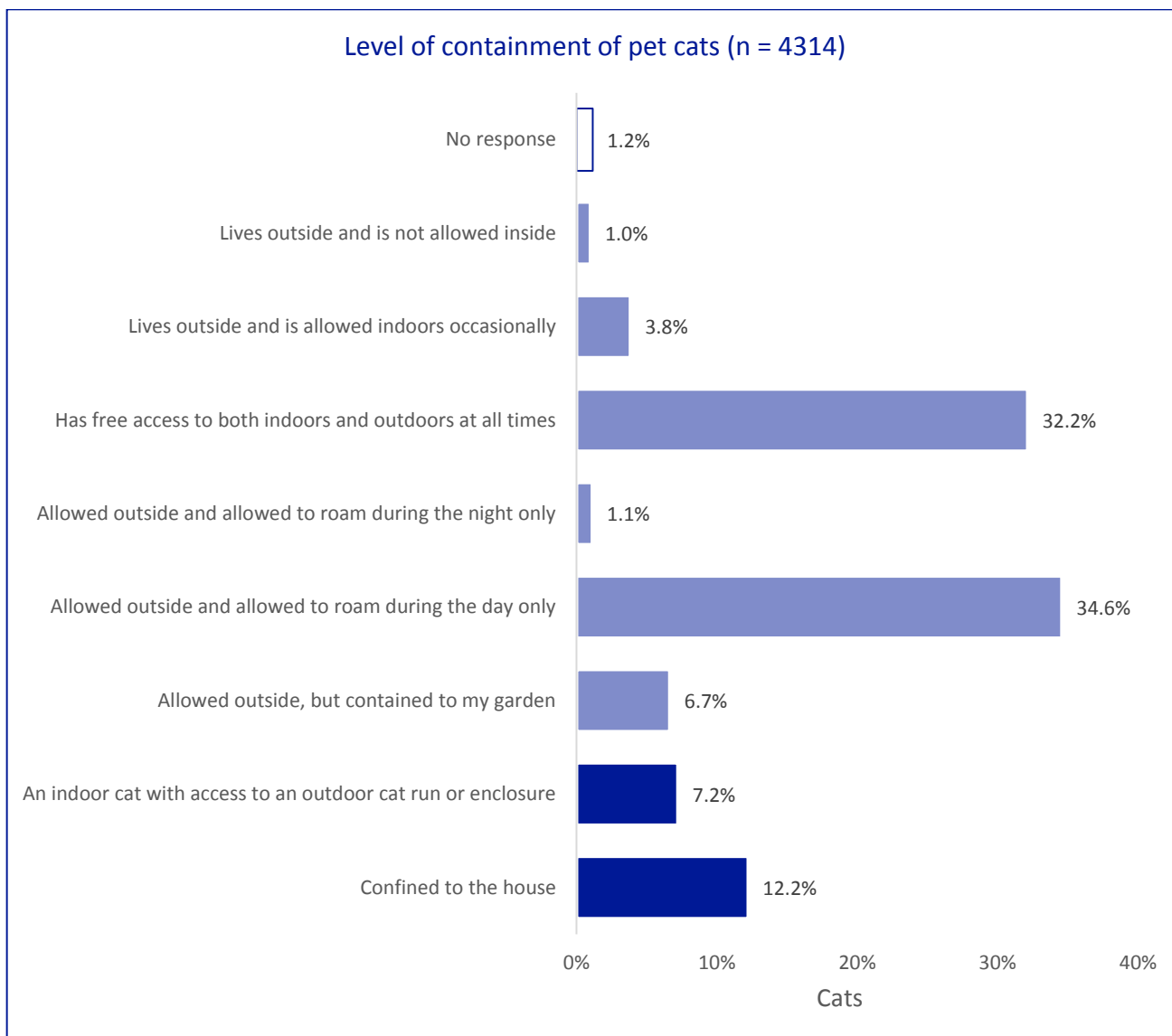


"I had a long break of about 6 years from owning a cat after a previous pet passed away and I was quite devastated by this loss. This cat lived for about 20 years and used to kill brown snakes! She was even bitten twice and survived."



Indoor and outdoor cats

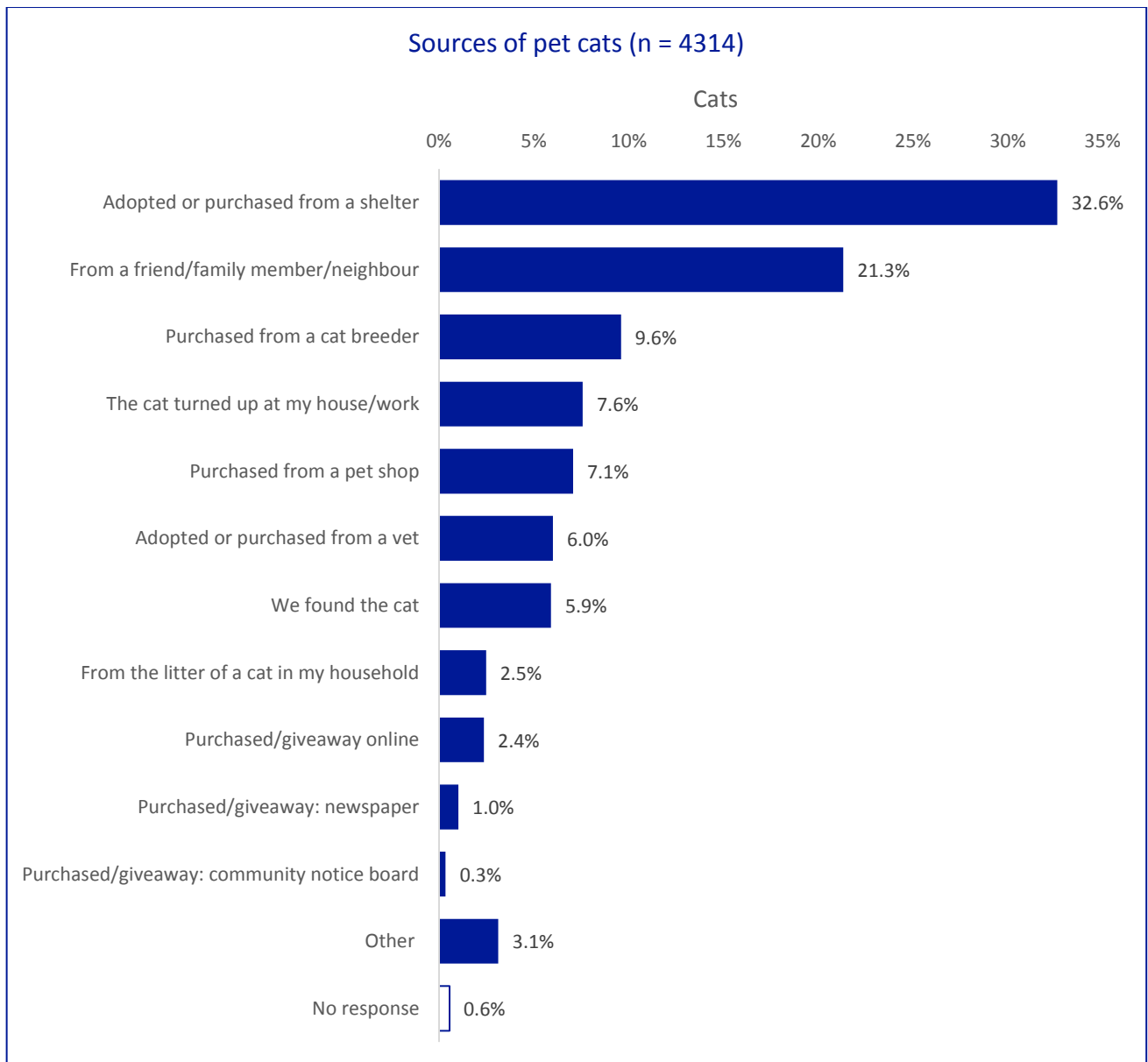
The chart below presents the responses to the question “Choose a category that best describes the lifestyle of [your cat]:” Cats that were allowed outdoors (79.4%) are shaded in a lighter blue colour. Cats considered indoor cats (19.5%) are shaded in the darkest blue. **Most cats were outdoor cats, with many reported to be kept inside at night.**



“My current cat was an outside cat with his previous owner, however as I live on a main road I decided to keep him indoors as I was worried he would jump over the fence and get run over. He quickly adjusted to being an inside cat and doesn't appear concerned that he doesn't go outside. I have a number of toys for him, which appear to keep him well amused!”

Sources of cats

The chart below presents the responses to the question “How did you come to own or care for [your cat]?”
Most cats were obtained from a shelter, a friend, a family member or a neighbour.

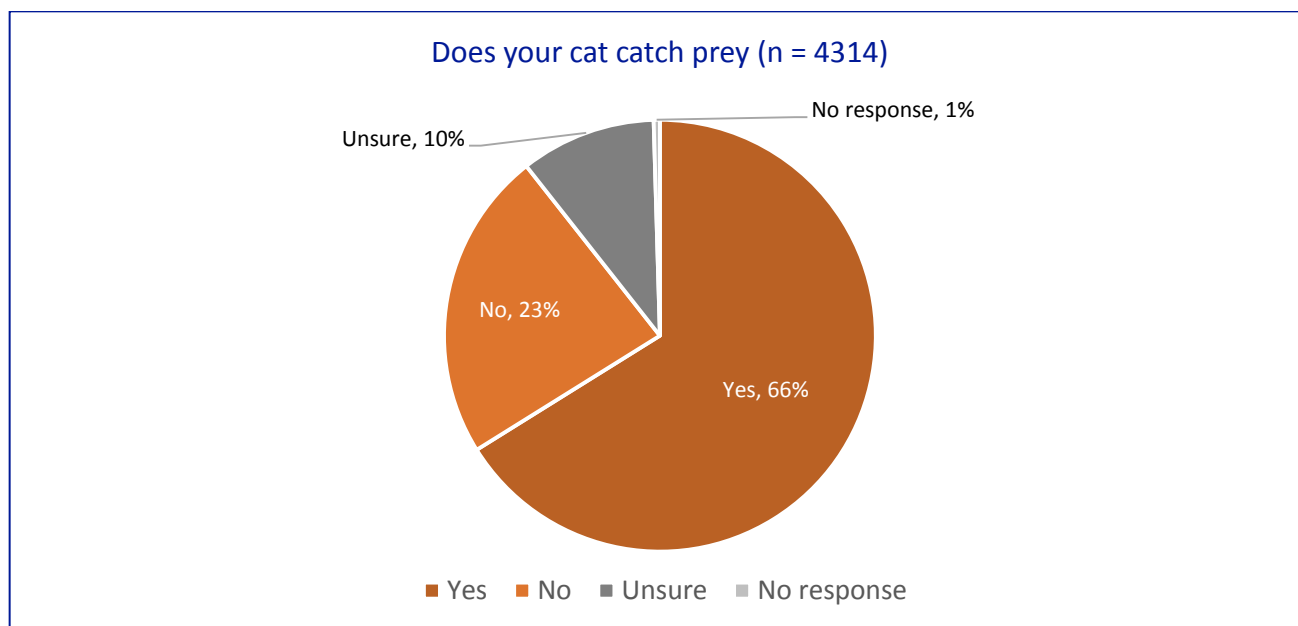


“[My cats] were dumped cats that appeared on our door step when they were about 12 weeks old. Couldn't find the owners so we took them to Adelaide... [to a shelter]... asked what the likelihood of them being put down was and they said very likely because they had a lot at the moment. So we decided to keep them (or they decided to stay with us). We had them desexed and they have given us a lot of pleasure and love over the last 6 years.”



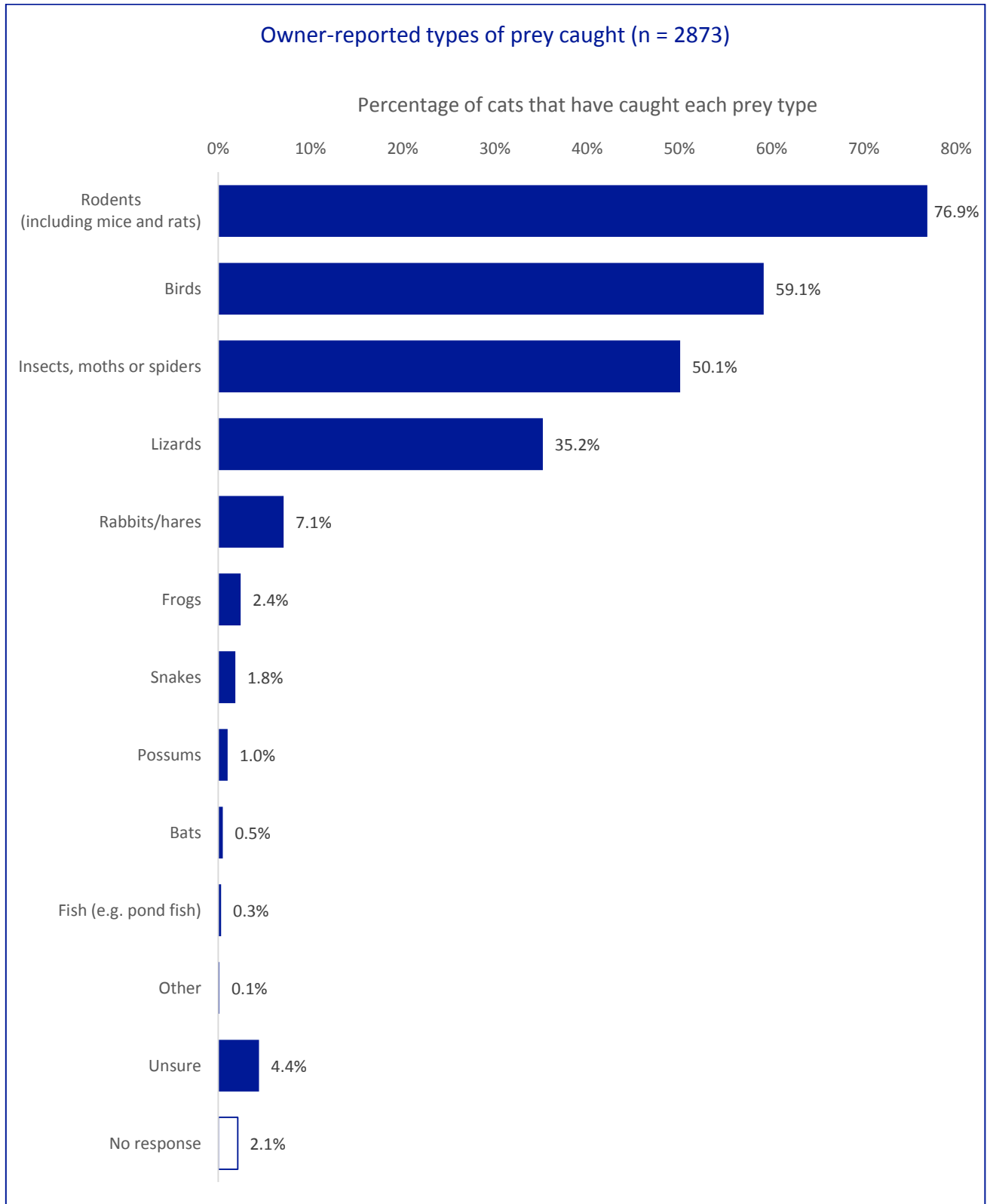
Prey seen by owners

The chart below presents the responses to the question “Does [your cat] catch prey indoors or outdoors (e.g. mice, birds, insects, reptiles)?” **Most survey respondents reported that their cats caught prey.** Please note that these data only include prey that has been seen by the cat owners. Owner-reported “prey seen” is not the same as “prey caught” as cats may catch prey that is not seen by their owner. For example, one study used small video cameras on cats to study predation and found that 23% of prey was taken back to the cat’s home (the other 77% of the cat prey was not likely to be seen by the owner)⁽¹⁾.



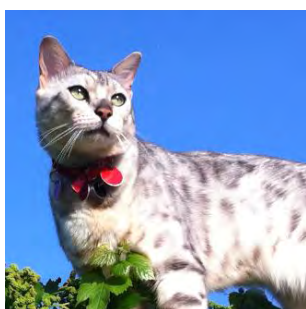
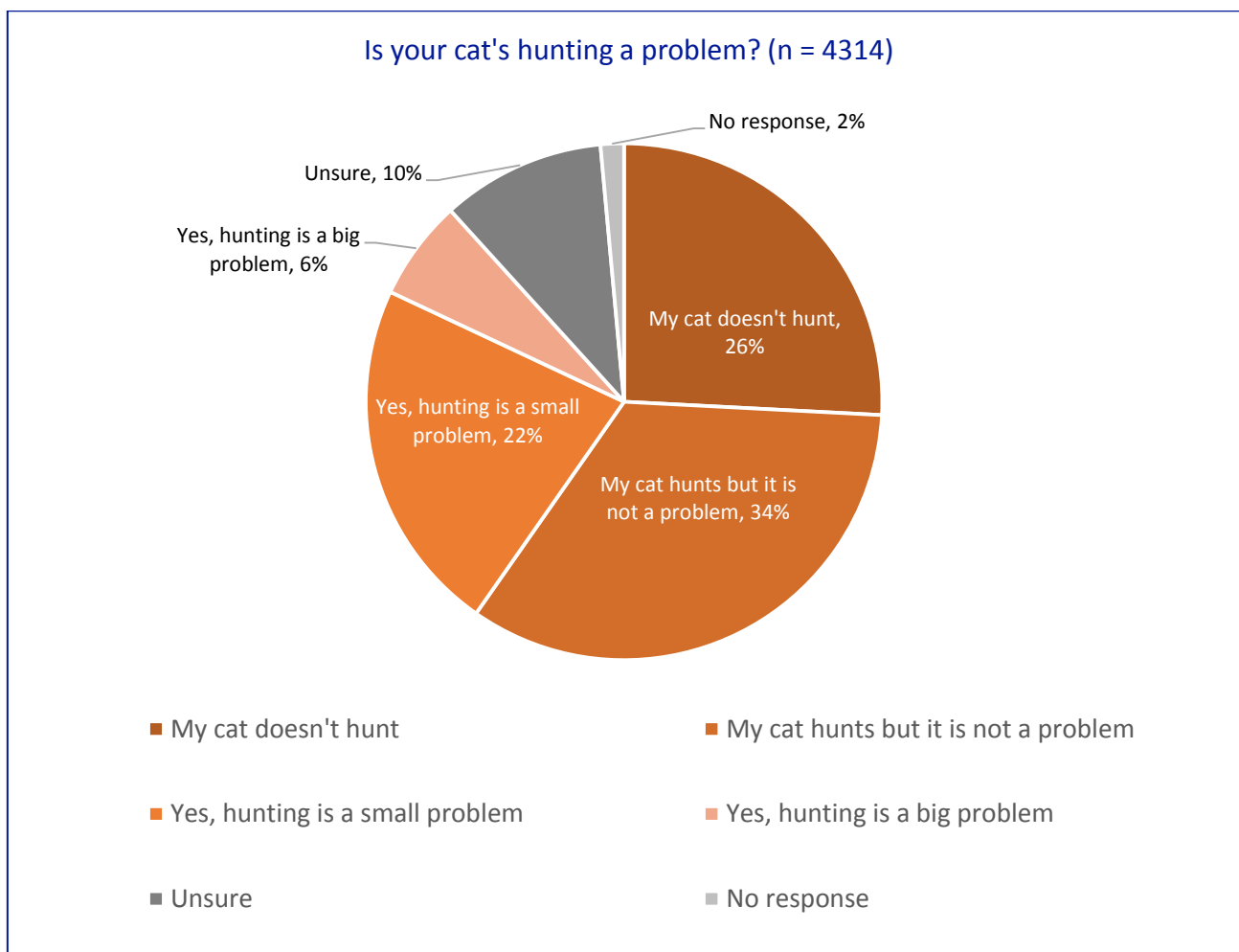
Cat prey

Respondents who had indicated that their cat caught prey were then asked “*What types of prey has [your cat] caught?*” Responses are presented in the chart below. **Rodents, birds, invertebrates (e.g. insects, moths and spiders) and lizards were the most common prey items reported.**



Opinions on hunting

The chart below presents the responses to the question “Do you believe that hunting by [your cat] is a problem?” Cat owners were asked this question for each of their cats, with five response options provided (see the chart). There was a mixed reaction to this question, with three main responses. **Cat owners reported that their cat’s hunting was not a problem (34%), that it was a problem (28%), or that their cat did not hunt (26%).** Most of the cat owners who reported that hunting was a problem selected the *small problem* option. There was also a group of cat owners who were unsure if their cat’s hunting was a problem (10% of the respondents).

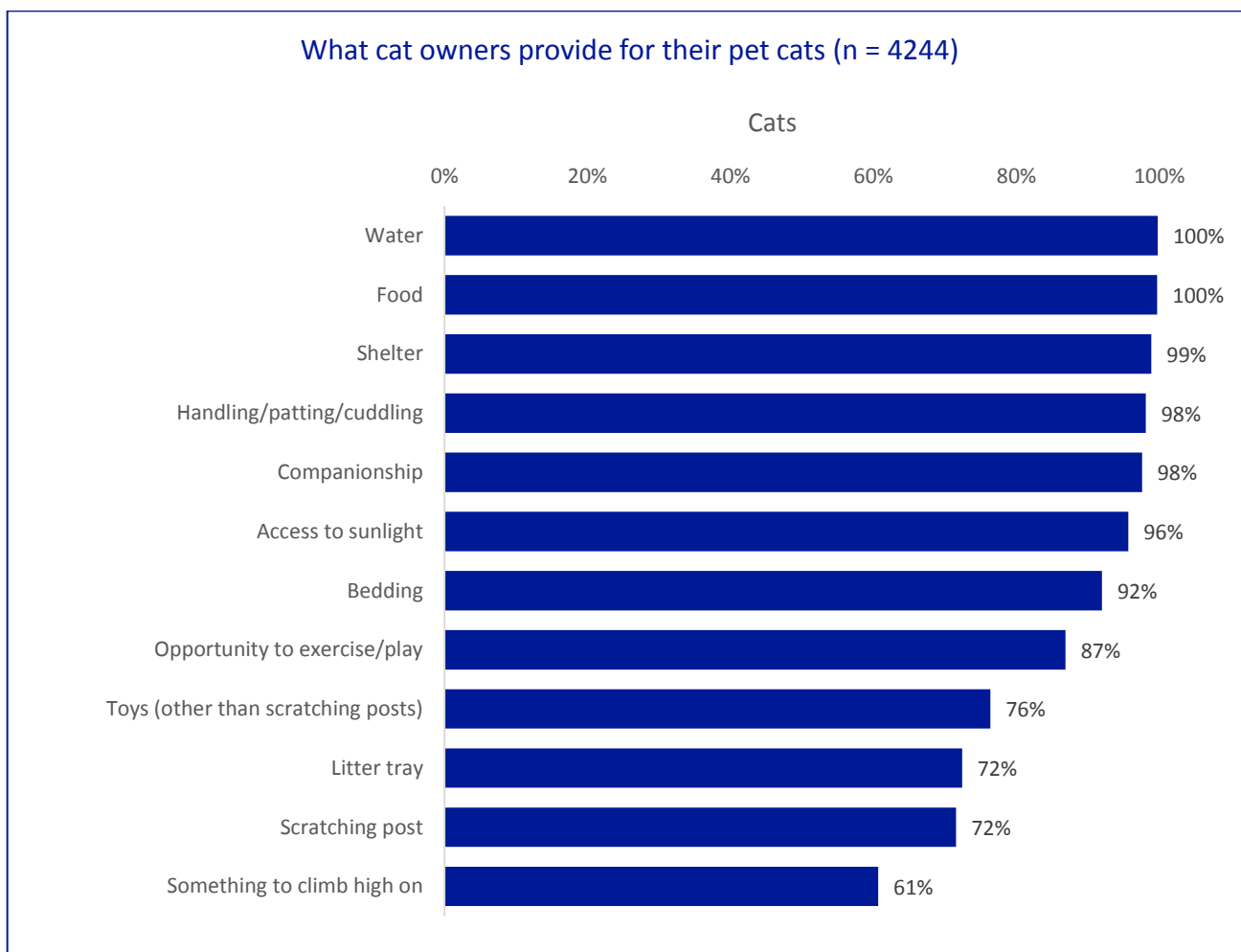


“I thought a male cat might not hunt so much but I was very wrong, [He] often brings home baby rabbits, mice and rats.”

Cat care

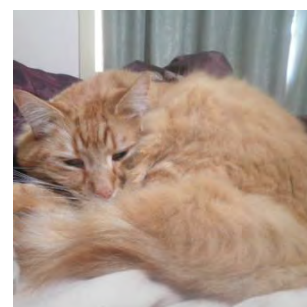
Provision for cats

The chart below presents the responses to the question “*What do you provide for [your cat]?*” **Cat owners provide a range of resources for their cats; the top five responses were water, food, shelter, handling and companionship.** Cat owners did not provide responses to this question for a small number of their cats (70 cats, which equals 1.6% of the total cat sample group).



“[My cat] has access to all of the house plus an enclosed atrium. She is not interested in toys and has the freedom to sit or climb on any of the furniture. As she is 7 years old and I have only had her as part of my life since December 14/2015, I find she loves nurses and cuddles, is very affectionate, but is not into 'playing' per se.”

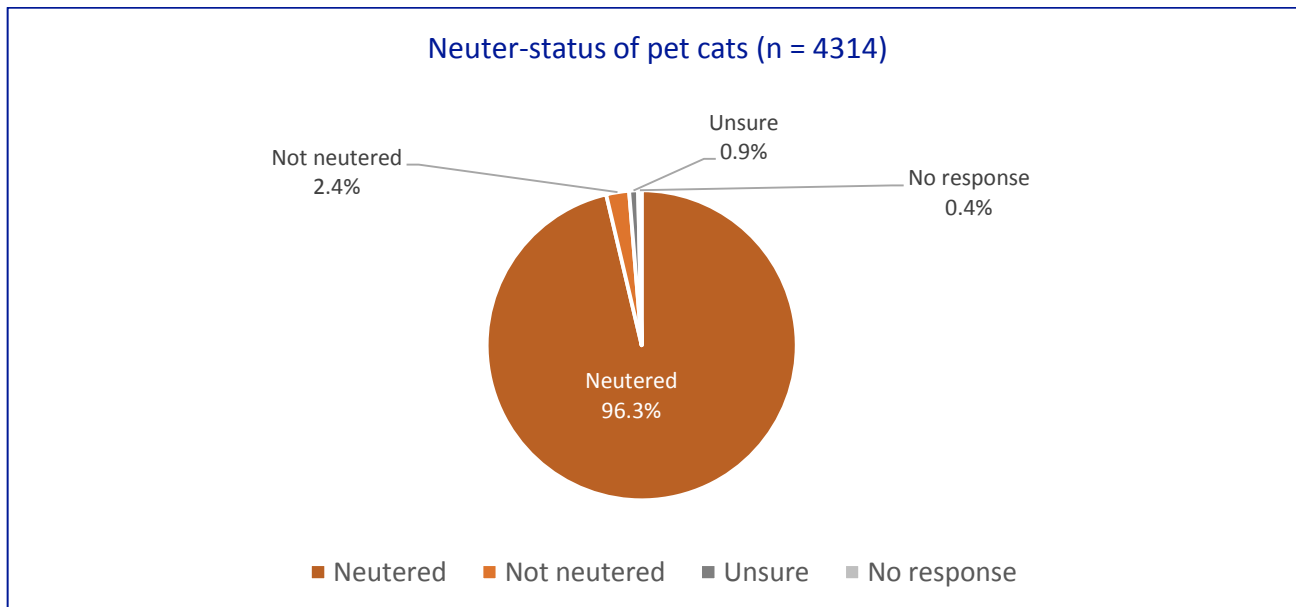
“Vet attention, regular flea/worm, treats, grooming, love, respect.”



Cat health care

Neuter status of cats

The chart below presents the responses to the question “Is [your cat] de-sexed (neutered/spayed)?” **Nearly all of the cat owners reported that their cats were neutered.**



“[I chose not to de-sex my cat] because it is expensive”

“[I chose not to de-sex my cat because I] haven't gotten around to it.”

“I'd never own a cat that was not desexed.”

Regular health treatments

The table below presents the responses to questions about regular health treatments for cats. Specifically, cat owners were asked if their cats were regularly wormed, treated for fleas, vaccinated, and checked by a vet. **Approximately three-quarters of cat owners reported that they provided regular health treatments for their cats.**

	Wormed (n = 4,269)	Flea treated (n = 4,262)	Vaccinated (n = 4,251)	Checked by a vet (n = 4,243)
Yes	76.8%	77.3%	71.4%	72.1%
No	19.6%	20.0%	23.6%	24.2%
Unsure	2.6%	1.6%	3.5%	2.1%
No response	1.0%	1.2%	1.5%	1.6%

Cat personality

Animal personality has been studied for a long time, particularly in relation to captive animals, such as zoo animals. It is important to understand the personality of captive animals in order to create an appropriate environment for them. For example, shy animals will benefit from places to hide. Also, an understanding of an animal's personality might help zoo keepers monitor the animal to ensure that it is happy in its environment. If a keeper notices changes in an animal's personality, it could be as a result of something in the animal's environment, like a fellow animal with a non-compatible personality. These things can be managed in zoos where environments can be controlled, and cat owners can also manage their pet's environment to ensure their pet is happy and healthy.

Researchers in the UK and the USA (Marieke Gartner, David Powell and Alexander Weiss)⁽²⁾ have developed a personality questionnaire for use with cats and utilised it for research with captive wildcats and with domestic cats in shelters. The questionnaire includes 52 personality characteristics and was based on personality research on numerous other animals, including humans. For example, respondents were asked to rate their cats on personality characteristics such as bold, smart, and playful, along a seven-point scale ranging from 'not at all' to 'very much so'. As part of the Cat Tracker project, we have utilised the questionnaire on a large number of pet cats in South Australia and New Zealand. The large number of cats has allowed us to analyse pet cat personality like never before! We performed an analysis of the personalities of 2,802 cats and found a set of five major personality factors: the **Feline Five**. The **Feline Five** factors are listed below with some examples of the characteristics they reflect.

1. Skittishness

- HIGH SCORES = anxious, fearful of people and other cats
- LOW SCORES = calm, trusting

2. Outgoingness

- HIGH SCORES = curious, active
- LOW SCORES = aimless, quitting

3. Dominance

- HIGH SCORES = bullying, aggressive to other cats
- LOW SCORES = submissive, friendly to other cats

4. Spontaneity

- HIGH SCORES = impulsive, erratic
- LOW SCORES = predictable, constrained

5. Friendliness

- HIGH SCORES = affectionate, friendly to people
- LOW SCORES = solitary, irritable

"[My cats] are from the same litter but they are like chalk and cheese. She... is extremely shy with people she doesn't know and scared of any disruption... but [she] is the bossiest little diva you can imagine with her Mum and Dad. She dictates meal times, bed time, cuddles, pats and playtime with an iron paw... [He] is a friendly, easy-going lad who loves to greet visitors and socialise, especially if pats and/or snacks are on offer. He's obliging and minds his own business most of the time... After 9 years they are still close, nuzzle and gravitate towards each other at any sign of trouble. A truly beautiful... pair who are very much loved."



Cat personality versus human personality

One interesting finding in our research is how similar cat personalities are to human personalities. Psychologists often refer to the Five-Factor Model of human personality, with the factors also known as the Big Five: extraversion, agreeableness, openness, conscientiousness and neuroticism. In the table below we have listed the Big Five alongside the Feline Five, so you can see which factors are similar, and which factors are not.

Feline Five (pet cat personality factors)	Big Five (human personality factors)	Similarity
Skittishness	Neuroticism	Some similarity
Outgoingness	Extraversion	Some similarity
Dominance	No Big Five equivalent	No similarity
Spontaneity	No Big Five equivalent	No similarity
Friendliness	Agreeableness	Some similarity
No Feline Five equivalent	Openness	No similarity
No Feline Five equivalent	Conscientiousness	No similarity

Managing cats with atypical personalities

Cat owners who completed the personality test questions within the **Cat Tracker** survey received a cat personality report. These reports outlined their cat's personality profile and provided some guidance on how this information could be used to make decisions about cat management. Below are the general suggestions we provided for cat owners, particularly for cats with atypical personalities (i.e. cats that received scores outside of the 'typical' range on any of the personality factors – see the graph on the next page).

PLEASE NOTE: if you are a cat owner, these are general examples and are not specific to your cat and your home. If you are concerned about your cat, we recommend you seek professional advice from your vet or an animal behaviour specialist.

Skittishness

- Cats with high scores may benefit from having hiding spots at home. You could also consider whether there could be something in your cat's environment that is stressing your cat.
- Low scores may reflect that your cat is well adjusted to its environment.

Outgoingness

- Cats with high scores may benefit from additional toys and play time.
- Cats with low scores are uncommon, but may be showing signs of ageing or related health issues.

Dominance

- Cats with high scores may experience difficulties being around other cats, both in your home and in your neighbourhood.
- Cats with low scores may adjust well to being in multi-cat households.

Spontaneity

- For cats with high scores, consider whether your cat could be reacting to something stressful in its environment.
- Cats with low scores may reflect that they are well adjusted to their environment, and may enjoy routine.

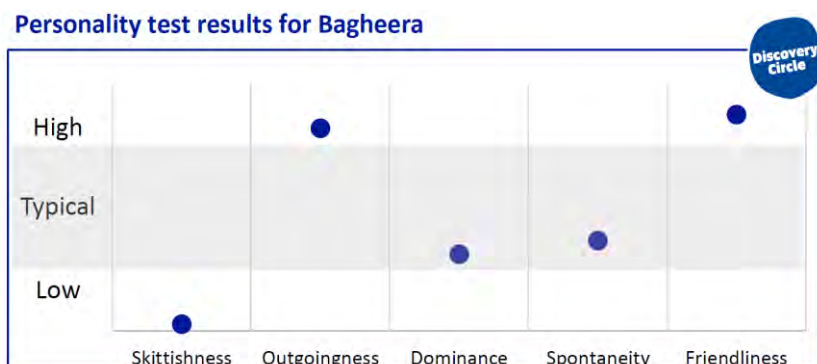
Friendliness

- Cats with high scores may adjust well to other people and animals in the home.
- Cats with low scores may have a solitary nature or they may be poorly socialised. If unfriendly behaviour is unusual for your cat it may indicate frustration, pain or illness.



Personality graphs

The reports also included a graph of individual cat's personality factors (rated on the **Feline Five**; see the image below). The reports were designed to be easy to interpret and we have received positive feedback about them.



Indoor and outdoor cats

Considering that cat personalities may change over time, we thought it would be interesting to have a look at the personalities of indoor cats and compare them to outdoor cats. We were wondering if keeping a cat indoors might change its personality. We found that the personalities of indoor and outdoor cats were very similar. In fact, the only statistically significant difference we found was that the indoor cats we assessed tended to be slightly more *friendly* than cats that spent time outside. We think this is good news for people who keep their cats indoors, as the results suggest there is no negative impact on the personality of a cat when it is kept indoors! However, more research is required in this area to ensure that any other possible explanations of our findings are discounted. For example, it is possible that friendly cats are more likely to be kept indoors. However, if keeping cats indoors did have a negative impact on their personality, then we would expect to see different results (e.g. perhaps skittishness or spontaneity would be higher in indoor cats, or outgoingness would be lower).





Attachment to cats

Cats play a much-cherished role in the lives of many South Australians, providing great companionship and enjoyment for those who live with them. For many people there is also a strong attachment to their cats. People can form strong emotional ties to their pets (including cats) and view them as members of their family. People who have high levels of attachment to their pets often see them as dependable sources of comfort, and as positive influences on their happiness and wellbeing. As the level of attachment to a cat may influence how it is managed and cared for, we were interested in cat-owner's attachment to their cats.

We utilised the **Lexington Attachment to Pets Scale**⁽³⁾, modifying it slightly to reflect our specific focus on pet cats (rather than pets in general). The scale included 23 items, with each item based on statements such as '*I enjoy showing other people pictures of my cat*' or '*This cat knows when I am feeling bad.*' Response to each item was on a five-point scale ranging from 'strongly agree' to 'strongly disagree.' We used data about 4,084 cats (where respondents had completed each item of the scale) and found a set of four attachment factors. The attachment factors are listed below with some examples of the characteristics they reflect.

1. General Attachment

- This cat makes me feel happy.
- I consider this cat to be a great companion.
- I play with this cat quite often.

2. Emotional Attachment

- This cat knows when I am feeling bad.
- Quite often I confide in this cat.
- I love this cat because he/she never judges me.

3. Belief in Animal Rights

- This cat deserves as much respect as humans do.
- Quite often, my feelings towards people are affected by the way they react to this cat.

4. Social Attachment

- I often talk to other people about this cat.
- I enjoy showing other people pictures of my cat.





Interpreting attachment to cats

We have conducted further analyses of the **attachment factors** along with other variables. Our preliminary findings are listed below.

- Female cat-owners typically attained higher scores on all four attachment factors than male cat-owners.
- The scores for all four attachment factors were typically higher for cats that spent more time with their owners.
- The scores for all four attachment factors were typically higher for cats that spent more time inside.
- General, emotional and social attachment scores were typically higher for purebred cats.
- General and social attachment scores were typically higher for younger cats.
- There were also some relationships between **Feline Five** (cat personality) scores and attachment scores:
 - General, emotional and social attachment scores were typically higher for friendly cats and for outgoing cats; and
 - General, emotional and social attachment scores were typically lower for skittish cats.

Further analysis of these data is needed and more detailed results will be published separately.

"[Our cat] was given to us by a friend two years ago. I was reluctant to have a cat again as I get way too attached and was still mourning death of our last cat... five years previously. However I was very surprised at how quickly we all fell in love with [our new cat] and how affectionate he is. We have lost some close family members recently and he seems to have a sixth sense about our feelings and his own way of comforting us."



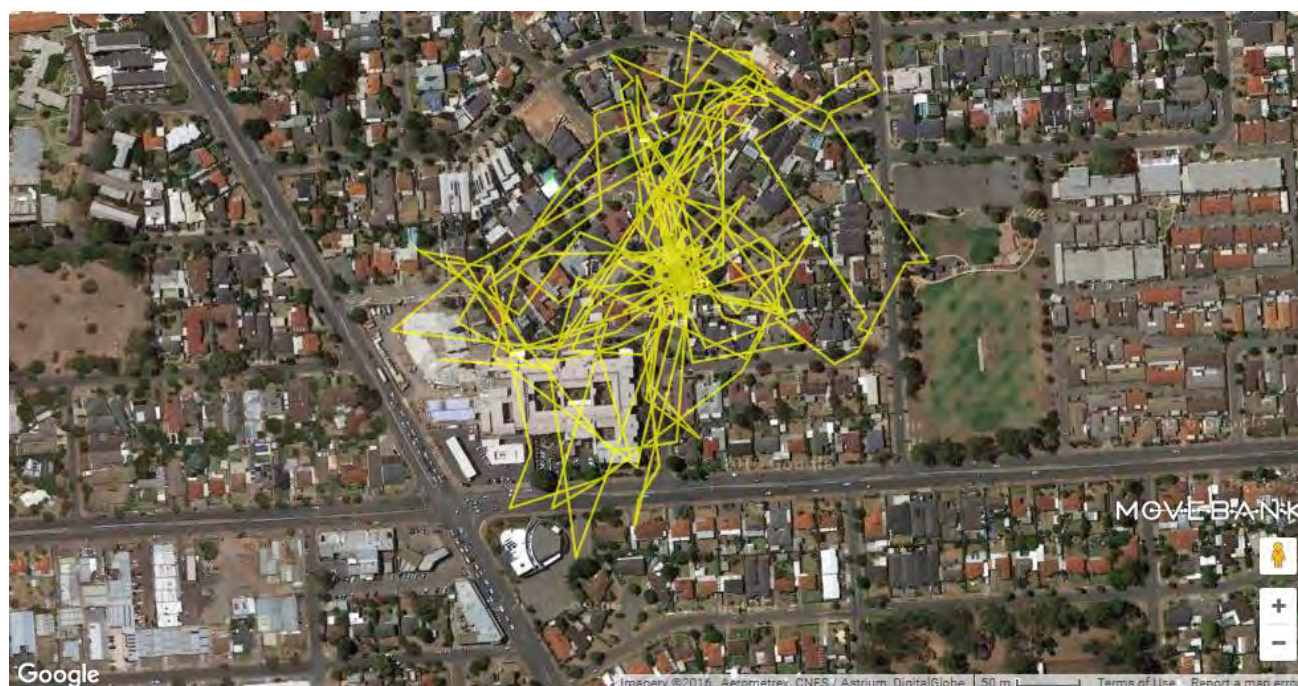
Cat tracking results

Discovering cat movement and home-ranges

The home-range of an animal is the area in which it lives, including places it normally travels to for food and shelter. Previous research on the movement ranges of domestic cats has typically focussed on very few cats. For example, Roland Kays and Amielle DeWan⁽⁴⁾ tracked the movement of 11 cats in the USA and found that most cats (with the exception of one) travelled a very small distance and did not enter a nearby nature preserve. However, the sample size was small and therefore results cannot be generalised beyond the cats studied. Other projects have tracked between 10 and 38 cats^(5,6,7,8). These studies do not have enough data to conduct robust analyses and explore the relationships between cat home-ranges and other variables. We tracked pet cats in order to better understand the home-ranges of these animals and to explore the relationships between home-ranges and other variables. We aimed to generate a large sample to enable a meaningful analysis, engaging the wider community to help – making **Cat Tracker** a **citizen science** project (a project that involves members of the public directly in scientific work).

Data collection

We conducted cat tracking in accordance with protocols developed in the USA for the **Cat Tracker** project being run in North Carolina. We posted GPS tracking units (i-gotU GT-120s) with harnesses to domestic cat owners in South Australia. Cat owners fitted the harnesses and GPS units to their cats to track their pet's movement for a week. The GPS units were pre-programmed to commence tracking after arriving at the cat's house, allowing time for the fitting of the harness and to make sure the cat was accustomed to wearing the equipment before tracking commenced. The GPS units were programmed to cease tracking after one week. Participants then posted the equipment back to the research team. We uploaded the cat's tracks to **Movebank** (www.movebank.org/), an online infrastructure for storing animal tracking data. The tracks are available for public review through the [Discovery Circle](#) website (see an example below). In total, we tracked 443 cats.



Calculating pet cat home-range ‘snapshots’

There are many different approaches to calculating animal home-ranges, but one of the original methods is still commonly used: the **Minimum Convex Polygon** (MCP) method⁽⁹⁾. Simply described, this method involves creating a shape (a polygon) that encloses all of the locations where an individual animal has been recorded. The area of the polygon represents the animal’s home-range and it is usually reported in hectares.

One hectare is equal to 100 metres by 100 metres, or 10,000 square metres. One hectare is roughly equivalent to:

- **Half of the playing surface at the Adelaide Oval**
(the grassed oval area is approximately 1.9 hectares); or
- **Eight Olympic-sized swimming pools**
(these pools are typically 50 metres long and 25 meters wide)

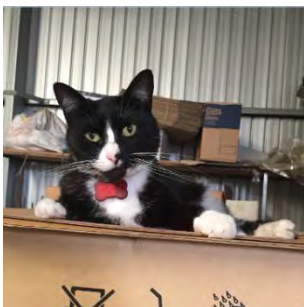
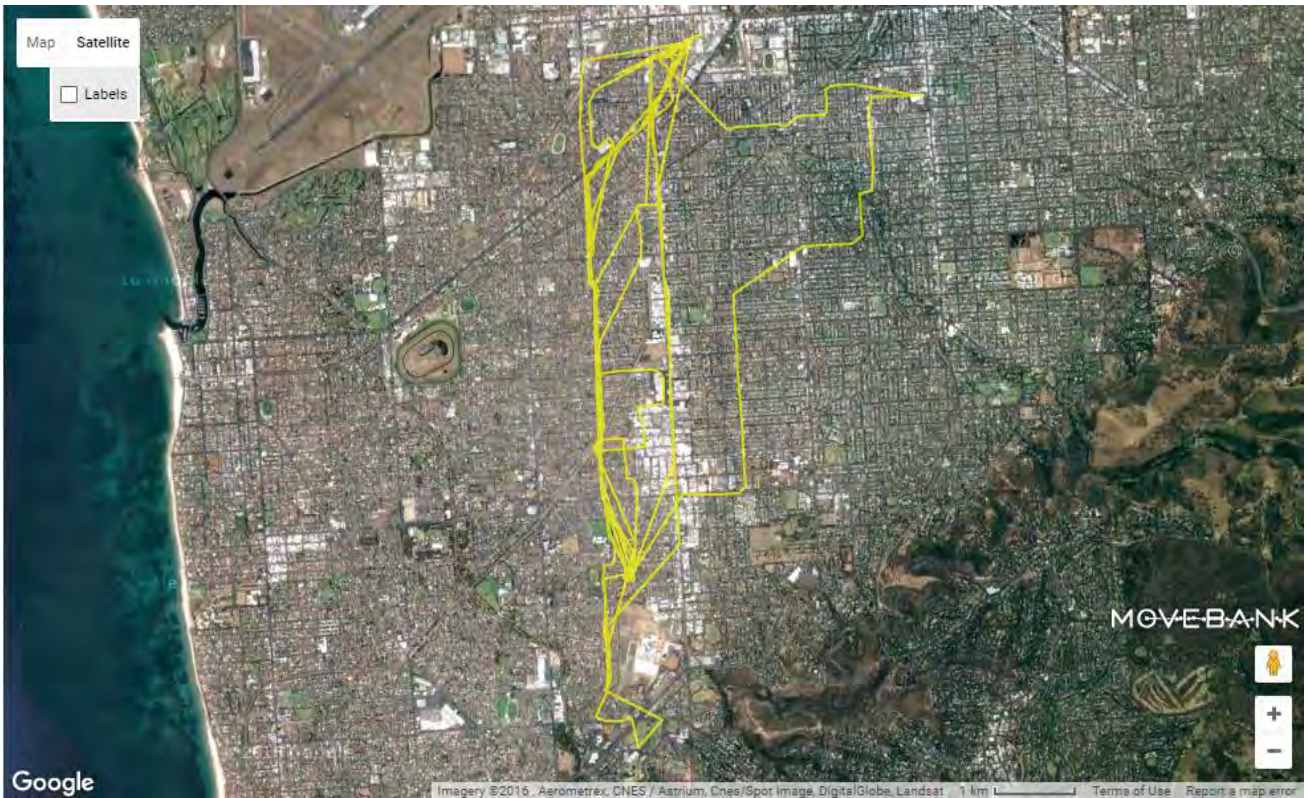
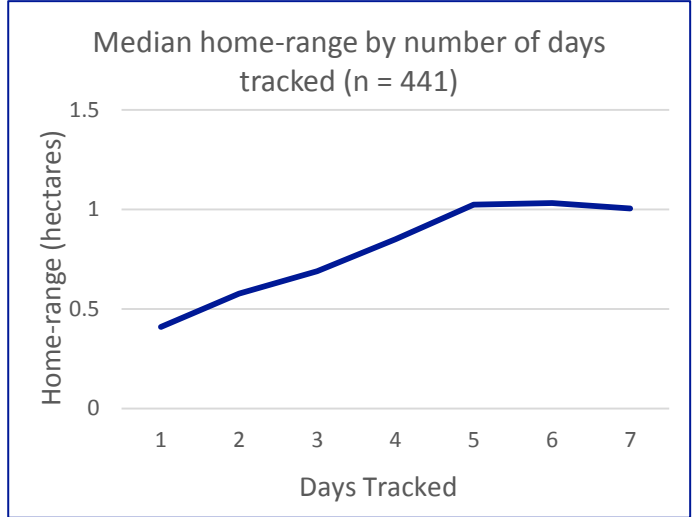
Tracking data were processed by the research team, using optimisation software supplied with the GPS units, plus speed filters and manual checks in **Movebank**. One cat is not displayed publically at the request of the owner and two cats were not included in further analysis as they regularly travelled in their owners’ cars (see the example picture on the opposite page).

We used an online infrastructure called **ZoaTrack** (zoatrack.org/) to calculate the home-ranges. ZoaTrack utilises the statistical software ‘R’ and the **adehabitatHR** package to calculate home-ranges⁽¹⁰⁾. The online software allowed us to generate **95% MCPs**, which include areas where an animal spends 95% of its time and excludes extreme points that may not be part of an animal’s typical range.

The Cat Tracker project was deliberately established to track a large number of cats. We used readily-available GPS units that were able to track cats for one week. This tracking enabled us to see a ‘snapshot’ of the cats’ lives. Cats may vary their home-ranges in different seasons and in response to changing competition (i.e. from other cats) or the availability of mating partners, food or other resources. We therefore consider our home-range calculations to be a ‘snapshot’ into the lives of the cats we have tracked. These ‘snapshot’ home-ranges are sufficiently detailed to enable an analysis of the characteristics of cats and cat management that might influence the movement of pet cats.

We could not use the data from all 443 of the cats we had tracked for further analyses. Two cats were excluded from further analyses as they travelled regularly by car. A further 13 cats were excluded as they were tracked for insufficient time. While the GPS units were programmed to track cats for seven days, and the batteries in the GPS units would typically last for that length of time, in some cases the GPS units did not record data for seven days. In most cases, we understood that this problem was caused by the variable power usage of the GPS units, which is influenced by environmental conditions, and the age of the battery. The table on the next page provides details of the number of days for which each cat was tracked. We have limited our dataset to cats that had been tracked for a minimum of five days (measured in 24-hour periods from the time tracking commenced). We selected five days as a minimum tracking period following a preliminary analysis of the data where we ascertained that the median home-range levelled-off after that number of days (see the graph on the next page: the median home-range by number of days tracked). Thus, 13 cats were excluded and data from 428 cats were included in further analyses. For the cats included for further analyses we had 61,250 data points. The median number of data points per cat was 128.5. Some sample images of home-ranges are provided on the following pages.

Number of days tracked	Number of cats tracked
1	441
2	441
3	439
4	436
5	428
6	405
7	354



“We were living at the beach at the time and the cat would walk with us on the beach through the water as it came back and forth. We frequently took that cat in the car and he was fine with car travel.”

The home-ranges of six cats tracked around Walkley Heights and Ingle Farm (within the City of Salisbury). This map was created in **Google Earth** (<https://www.google.com/earth/>).



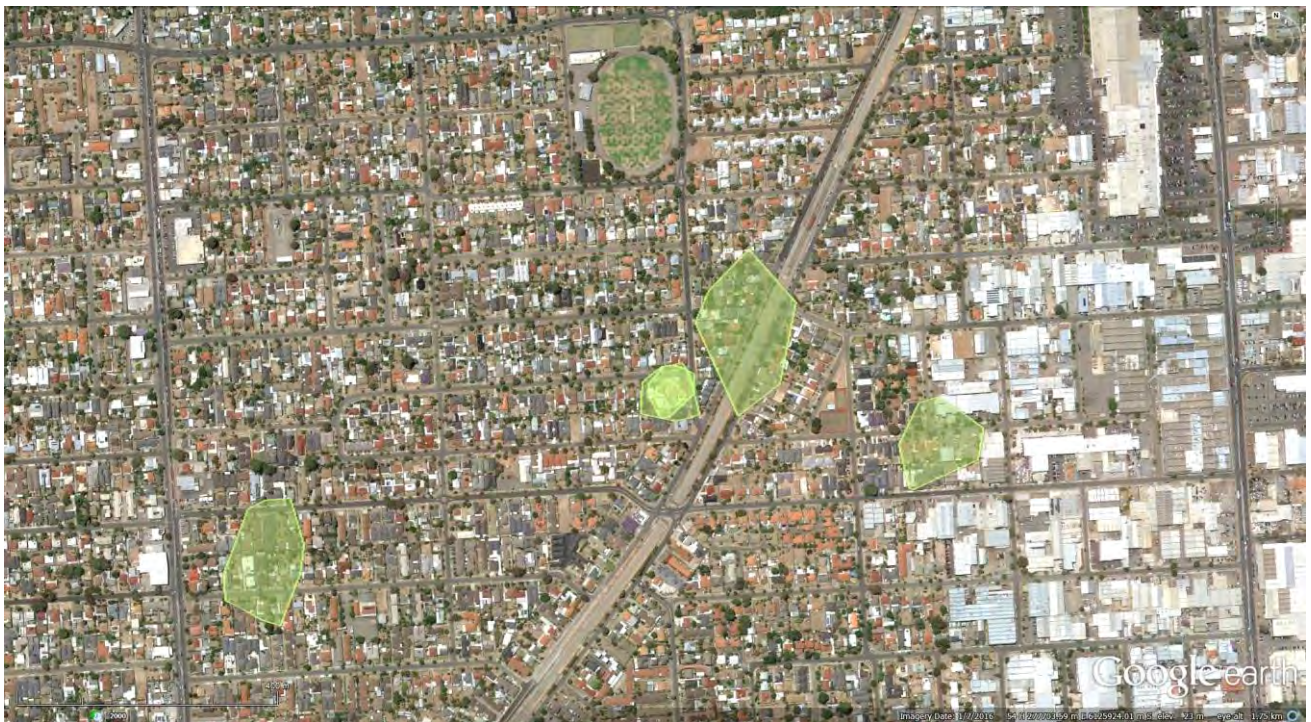
The home-ranges of eight cats around Netherby, Kingswood, Hawthorn, Mitcham, Lower Mitcham and Torrens Park (within the City of Mitcham). This map was created in **Google Earth** (<https://www.google.com/earth/>).



The home-ranges of six cats tracked around Eden Hills and Blackwood (within the City of Mitcham). This map was created in **Google Earth** (<https://www.google.com/earth/>).



The home-ranges of six cats around Ascot Park and Edwardstown (within the City of Marion). This map was created in **Google Earth** (<https://www.google.com/earth/>).



Cat travel statistics

We calculated the home-ranges and other descriptive statistics of 428 cats. These descriptive statistics are provided in [Appendix 1](#). We then conducted statistical tests to determine whether the sizes of the cats' home-ranges were significantly different for cats in various groups. The first groups required a test that could be conducted on data that could be split into two groups. For example, the sex of the cats could be split into two groups (male and female cats). Other two-group variables suitable for this type of test were the neuter-status and breeds of the cats. The appropriate type of statistical test was the **Mann-Whitney U** test.

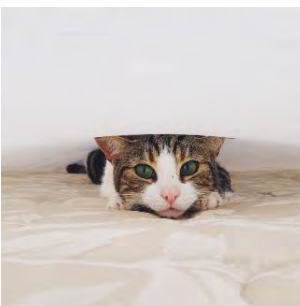
Sizes of home-ranges

The average size of the cat home-ranges was 1.99 hectares, which is slightly larger than the playing surface at the Adelaide Oval (the grassed oval area is approximately 1.9 hectares). However, an average is not always the best statistic to reflect the typical value in a set of data. **In the home-range data set, the median statistic better reflects the typical cat home-range.** The median represents the mid-point in the home-ranges (in our case, half of the home-ranges were larger than the median and half of the home-ranges were smaller than the median). **The median home-range size was 1.042 hectares**, almost half of the average size. This median size is approximately **half of the playing surface at the Adelaide Oval, or eight Olympic-sized swimming pools.** The reason that the average home-range size was higher than the median home-range size was that most cats (75%) had home-ranges under 2 hectares, while a few cats had much larger home-ranges (3% of cats had home-ranges over 10 hectares). The average of any set of data is skewed when a few samples in the data-set are quite different from the bulk of the data, and in these cases it is best to use the median to represent a typical case.

Roads crossed per day

We calculated the number of road crossings made by each cat while it was tracked. We then divided the number of roads crossed by the number of days the cat was tracked in order to determine the road crossings per day. The 428 cats tracked crossed between zero and 63 roads per day. **The average number of roads crossed per day was 4.8 and the median was 3.4.**

The number of roads crossed were calculated using **ArcMap 10.3** software. The road data were provided by the South Australian Department of Planning, Transport and Infrastructure, available through a [Creative Commons \(attribution\) License](#). The road data were downloaded from: <https://data.sa.gov.au/data/dataset/roads>.



"[Our cat] drowned as a kitten and was revived and is not your normal cat, he may have some brain damage. He likes to follow me around the farm like a dog and helps supervising chores from digging holes to rounding up animals. He behaves like the dogs and will take on the cows if they get in his business. The kids can torment him and he will just let them do it. I hope that he stays within our property but I do wonder where he strays to."

Male and female home-ranges

- **Male cats had larger home-ranges than female cats, and the difference was statistically significant.**
- This test included 217 male cats and 188 female cats (23 owners did not report the sex of their cats); further details about the statistical testing are presented in [Appendix 2](#).

Home-range and neuter-status

- **Entire (non-neutered) cats had larger home-ranges than neutered cats, and the difference was statistically significant.**
- **WARNING:** This test included 406 neutered cats, but only 7 entire cats (15 owners did not report the neuter-status of their cats). Therefore, the results should be considered as an indicator that non-neutered cats had larger home-ranges, subject to further research; further details about the statistical testing are presented in [Appendix 2](#).

Home-range and breed

- **There was no statistically significant difference in the size of cats' home-ranges between purebred and moggie cats.**
- This test included 67 purebred cats and 340 moggie cats (21 owners did not report the breed of their cats); further details about the statistical testing are presented in [Appendix 2](#).



Sedentary versus wandering cats

We separated the cats into two groups, **wanderers** and **sedentary** cats, based on the sizes of their home-ranges. We based our “cut-off” point on previous work in this area^(8,11,12). Wanderers are cats with home-ranges greater than one hectare, while sedentary cats have home-ranges of one hectare or less.

Variable (further details about these variables are in Appendix 1)	Classification	Number of cats fitting this classification	Average scores	Median scores
Roads crossed per day	Sedentary	207	2.72	2.14
	Wanderer	221	6.79	5.29
Fight frequency	Sedentary	199	2.59	2
	Wanderer	214	3.24	4
Prey caught	Sedentary	136	3.30	2
	Wanderer	162	4.94	3
Time spent inside	Sedentary	196	12.17	12
	Wanderer	211	10.60	10
Age	Sedentary	197	6.31	6
	Wanderer	209	5.27	5
Provision for cat	Sedentary	200	10.34	11
	Wanderer	214	10.04	10
Time spent with owner	Sedentary	200	2.64	2
	Wanderer	214	2.66	2
Owner-estimated distance cat travels	Sedentary	93	1.85	2
	Wanderer	74	2.18	2

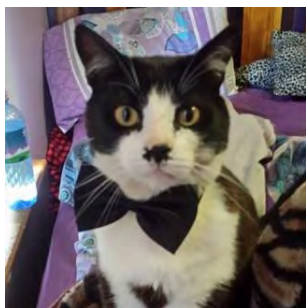
We then conducted statistical tests to determine the statistical significance of differences between wanderers and sedentary cats on the variables of interest (i.e. the variables listed in the table above). Again, **Mann-Whitney U** tests were appropriate as we were dealing with two groups (sedentary and wandering cats). The results are provided below and on the following pages.

Roads crossed

- **Wandering cats typically crossed more roads per day than sedentary cats, and the difference was statistically significant.**
- This test included 207 sedentary cats and 221 wandering cats; further details about the statistical testing are presented in [Appendix 2](#).

Cat fights

- **Wandering cats typically showed signs of being in fights with other cats more often than sedentary cats, and the difference was statistically significant.**
- This test included 199 sedentary cats and 214 wandering cats (15 owners did not report how often their cats got into fights); further details about the statistical testing are presented in [Appendix 2](#).
- Please note that the owner-reported “fight frequency” is likely to be an **underestimation** of cat fighting for both sedentary and wandering cats as cats may fight without showing signs of fighting (we asked, “how often *your cat* shows signs of being in a fight with cats that are not your cats?”).



“.....He used to appear inside when no-one had let him in - a mystery that was solved when mum saw him taking a run-up along the back path, then a flying leap for the handle of the back door; he swung the door-handle down, used his weight to swing the door open, leapt off at the exact right moment, and was inside in a flash before the quick-closing door had shut....”

Prey

- **Wandering cats were typically seen with prey more often than sedentary cats, and the difference was statistically significant.**
- This test included 136 sedentary cats and 162 wandering cats (130 owners did not report how much prey they saw); further details about the statistical testing are presented in [Appendix 2](#).
- Please note that the owner-reported “prey caught” is likely to be an **underestimation** for both sedentary and wandering cats as cats may catch prey that is not known to the owner – our comparison was relative (i.e. we compared two groups that were likely to include similar underestimations; see our section on [“Prey seen by owners”](#) for further details about this underestimation).

Time inside

- **Wandering cats typically spent less time inside than sedentary cats, and the difference was statistically significant.**
- This test included 196 sedentary cats and 211 wandering cats (21 owners did not report how much time their cats spent inside); further details about the statistical testing are presented in [Appendix 2](#).

Age

- **Wandering cats were typically younger than sedentary cats, and the difference was statistically significant.**
- This test included 197 sedentary cats and 209 wandering cats (22 owners did not report the age of their cats); further details about the statistical testing are presented in [Appendix 2](#).

Provision for cats

- **Wandering cats typically had less provided for them than sedentary cats, and the difference was statistically significant.**
- This test included 200 sedentary cats and 214 wandering cats (14 owners did not report what they provided for their cat); further details about the statistical testing are presented in [Appendix 2](#).



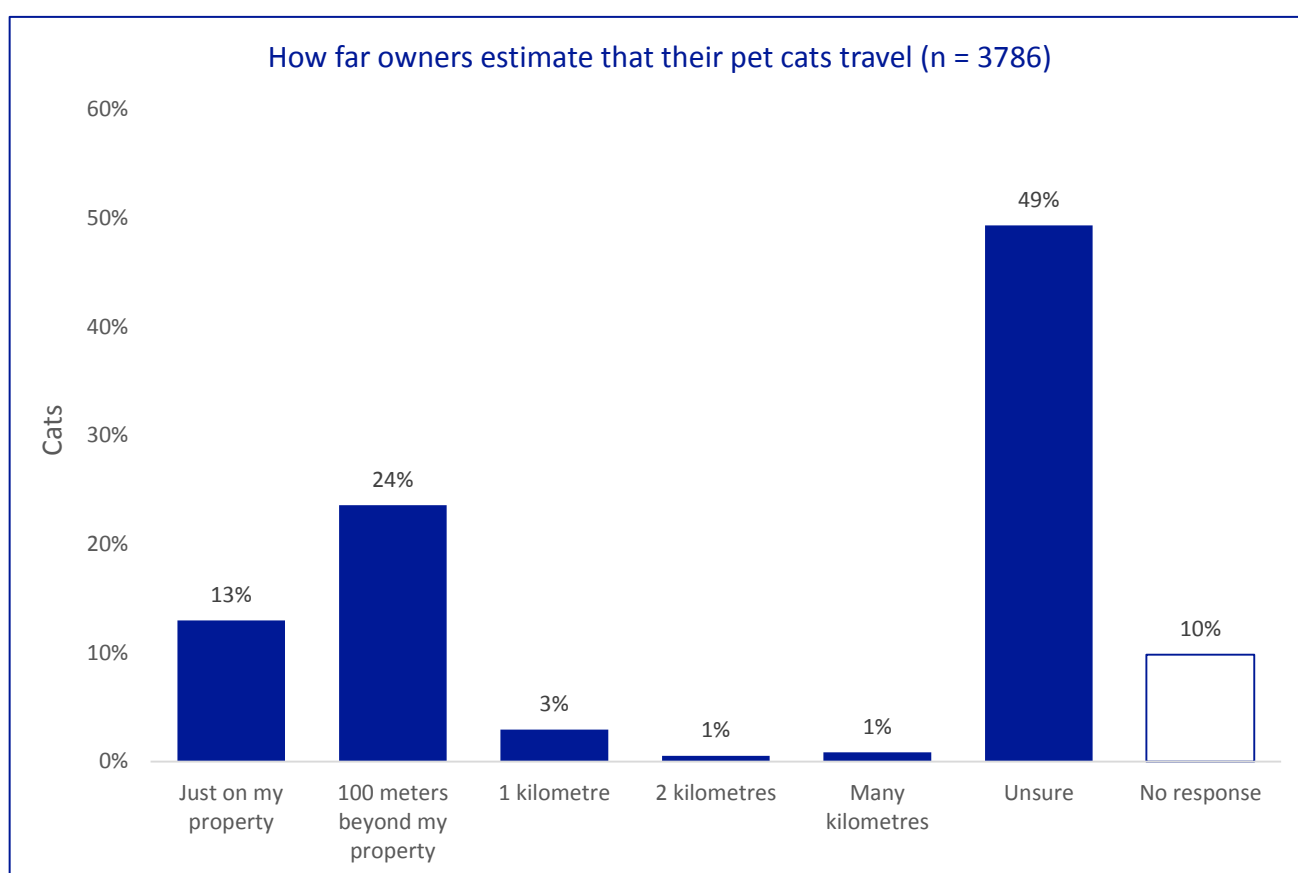
“We have a cat that thinks - no he knows - that he is an exulted emperor. He shows that the saying is true about dogs' having owners and cats' having staff. We are very much [our cat's] staff and acolytes. We know our place in his household. But we wouldn't be without him.”

Time with owners

- Regarding time spent with owners, there was no statistically significant difference between wanderers and sedentary cats.
- This test included 200 sedentary cats and 214 wandering cats (14 owners did not report the time they spent with their cats); further details about the statistical testing are presented in [Appendix 2](#).

Estimated distance travelled

Most cat owners who completed the **Cat Tracker** questionnaire were either unsure of how far their cats travelled (49%) or chose not to respond to this question (10%). The chart below provides further details about all non-indoor cats (not just the cats we tracked), presenting the responses to the question “How far from your house does [your cat] go?”



For the 428 cats we tracked and have included in further analyses, 167 (39%) of the owners estimated how far their cats travelled from home (prior to tracking). Most of the cat owners whose cats we tracked (261) did NOT estimate how far their cats travelled.

- Cat owners typically estimated correctly that the cats we classified as **wandering** went further from home than the cats we classified as **sedentary** (i.e. cat-owner estimates of how far their cat travelled typically reflected the size of the cats home-range and the difference between sedentary and wandering cats was statistically significant).
- This test included 93 sedentary cats and 74 wandering cats (261 owners did not estimate how far their cats travelled); further details about the statistical testing are presented in [Appendix 2](#).



Day cats versus night cats

We separated the movement data into day-time and night-time datasets. We then calculated day-time and night-time home-ranges for each cat. We found that **88% of the cats (374 cats) had larger home-ranges at night**, while only 12% of cats (52 cats) had larger home-ranges during the day.

Variable	Description	Number of observations	Minimum - maximum	Average (mean)	Median
Day-time Home-range	Based on GPS cat tracking and home-range calculations	427	0.02 – 21.77 hectares	0.96 hectares	0.51 hectares
Night-time Home-range	Based on GPS cat tracking and home-range calculations	428	0.06 – 32.61 hectares	1.94 hectares	0.96 hectares

Day-time versus night-time home-ranges

Statistical tests (**Wilcoxon Signed Ranks Test**) were conducted to determine whether the difference in the sizes of cats' day-time and night-time home-ranges were statistically significant. This type of test was used because the same cats were sampled twice (day-time and night-time), therefore a "repeated-measures" test was required. The results are presented below.

- **Cats had larger home-ranges at night, and the difference was statistically significant.**
- This test included 428 night-time home-ranges and 427 day-time home-ranges (one cat did not have enough day-time data to calculate a day-time home-range); further details about the statistical testing are presented in [Appendix 2](#).



Clandestine cats

It is worth noting that cat owners are not always aware of their pets' night-time activity. For example, we had a case where a cat had been tracked for seven days, and the owner was unaware that the cat had been wandering. When the GPS tracking unit was returned to us the owner apologised that the cat had not been outside because the weather had been poor. When we inspected the data and calculated the cat's home-range we found that, contrary to the owners' expectations, the home-range was comparatively large. The size of the home-range indicated that the cat was a **wanderer**, with a home-range in the top few percent of home-range sizes recorded in South Australia during the **Cat Tracker** project. Upon further inspection of the data, we found that the cat had a large home-range at night only. Interestingly, if only day-time data were used for calculating the cat's home-range, the cat would have been considered **sedentary**.

The case of the clandestine cat described above was not an isolated incident. We inspected the data and found that we had tracked 177 cats that had been classified by their owners as "**Allowed outside and allowed to roam during the day only**". We then checked the night-time home-ranges of these cats and found that 69 of them had night-time home-ranges over one hectare. Thus, **39% of the cats that owners considered to be indoors at night had home-ranges at night that were large enough to classify the cats as wanderers**.

"...keeping cats in at night, while ideal, is not always feasible. I know our cat is very sneaky and if he wants to get out at night he will find a way!"



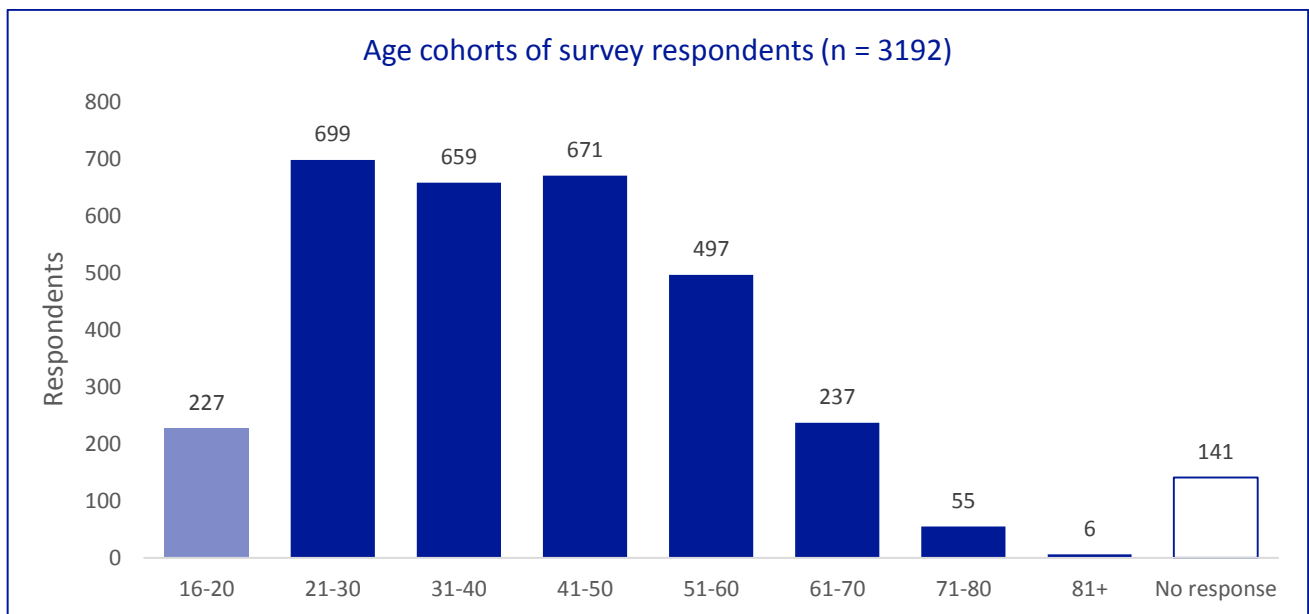


Meet the people

At the completion of data collection, we removed duplicate and spurious surveys. After data cleaning, we had a total of 3,192 surveys. In this section we provide information about the people who answered the survey and their attitudes towards cat management issues, including roaming cats and semi-owned cats.

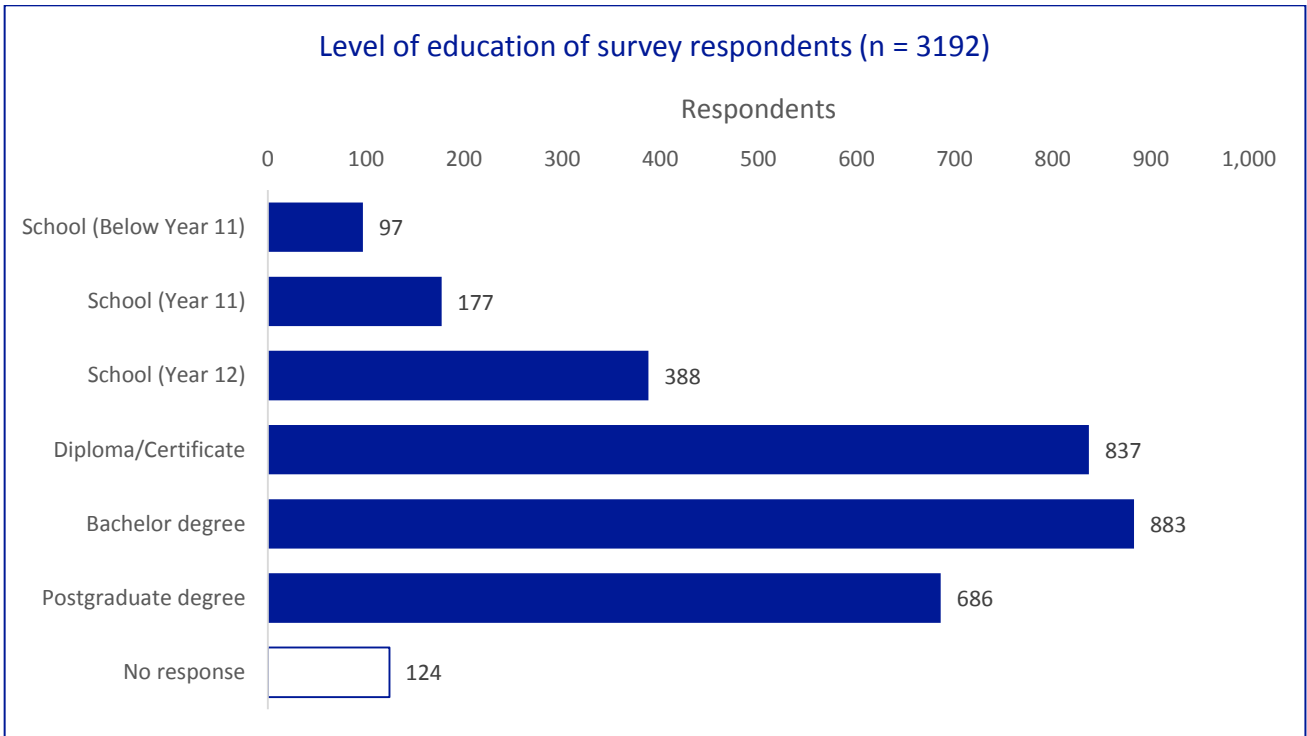
Respondent demographics

Survey respondents were mostly female (2,511), with 565 males and 116 people who did not respond to the question about their gender. In most types of survey-based research, it is typical for more females than males to complete surveys. The substantial number of female respondents may also be related to our finding that females are typically more attached to their pet cats (see our section on [attachment to cats](#)). Charts below and on the next page present information about the age and education of survey respondents. When examining the first chart, please note that the first (lightly shaded) bar represents a smaller age range (4 years) than the other bars (10 years, until 81+) and, therefore, care should be taken in comparing the age cohorts. The median age cohort of the survey respondents was 31 to 40 years-old and the median level of education was a bachelor degree.



“I am a cat man. I have had cats since I was a child although we moved around the world - which is how I came to befriend any passing cat. Cats like me too, they do not see me as a threat and come readily if encouraged. When I moved to Australia I brought our cat with us from the UK and she thrived until 20 years old. I must have had 10-12 cats over time, the largest number being 3.”

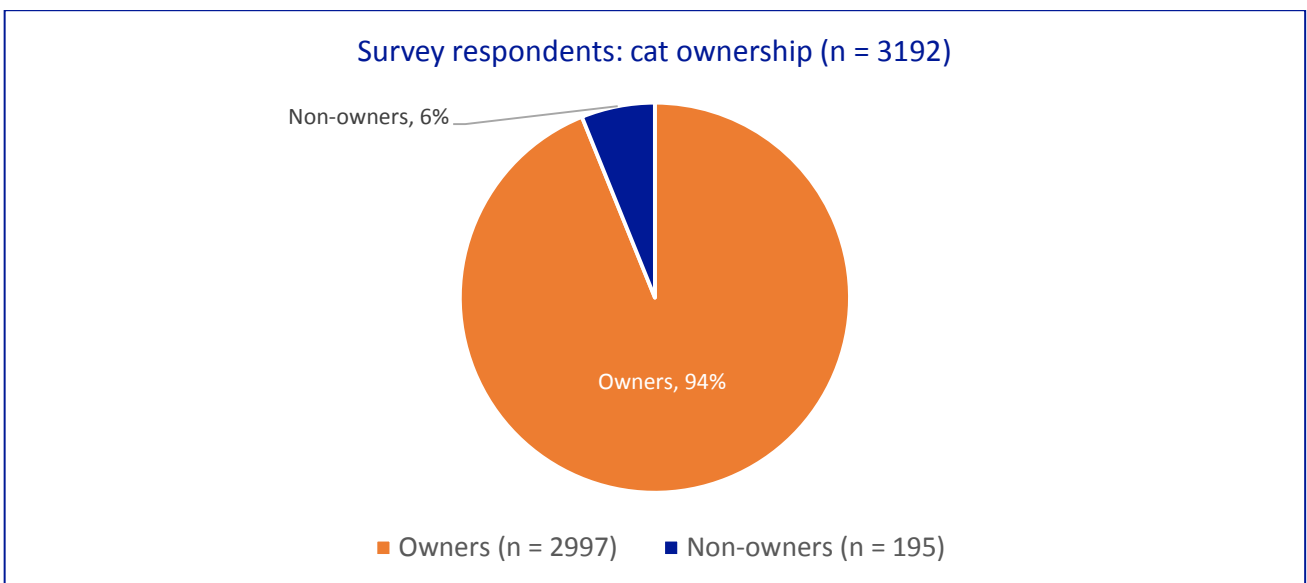




Cat ownership

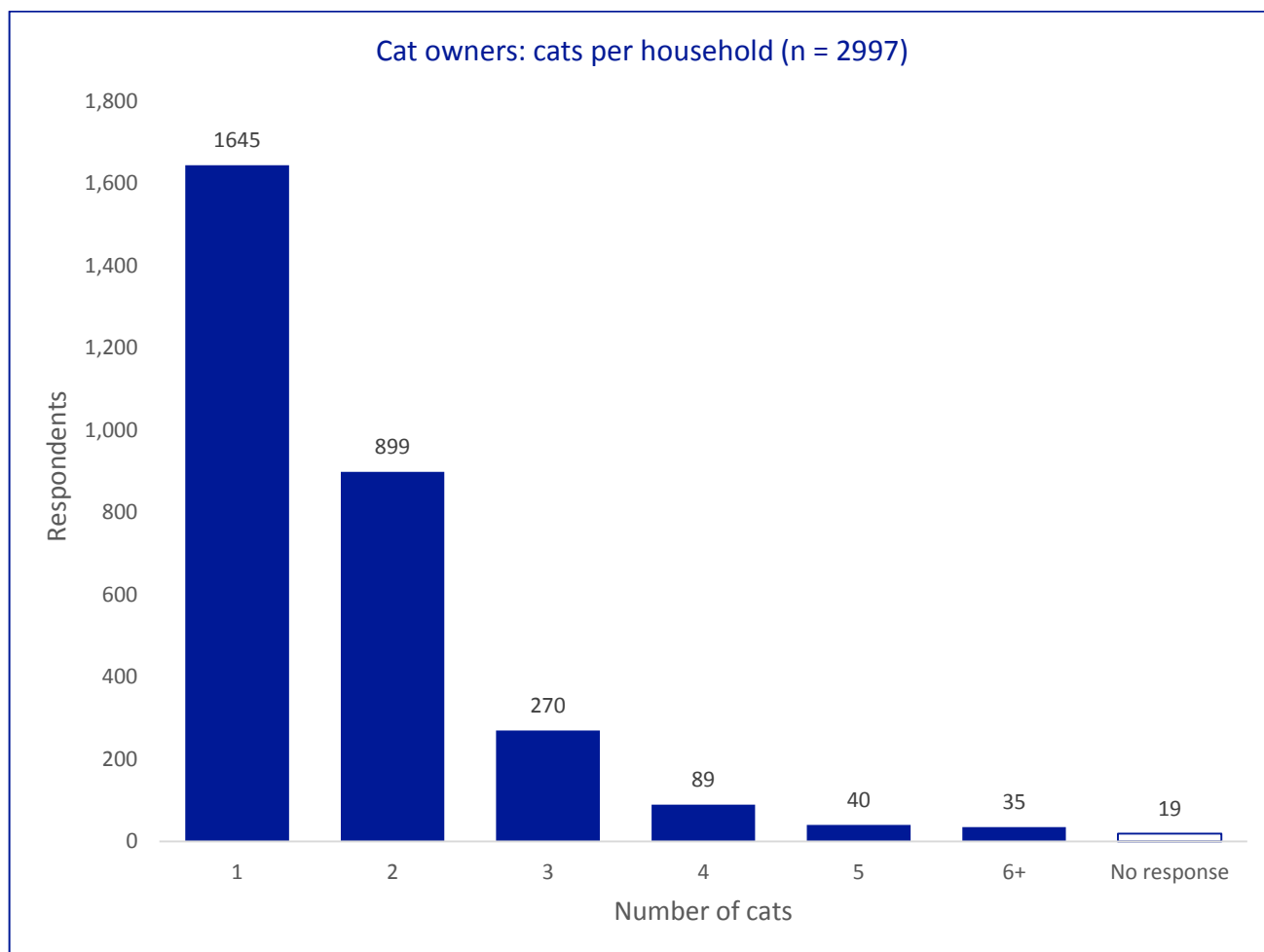
Cat owners and non-owners

Most people who completed the *Cat Tracker* survey were cat owners. The chart below presents responses to the question “Which best describes your cat ownership?”



Cats per household

The average number of cats per household was 1.5 and the median was 1 cat per house (for the 2,997 *Cat Tracker* survey respondents who were cat-owners). The chart below presents the responses to the question “How many cats are owned by members of your household?”



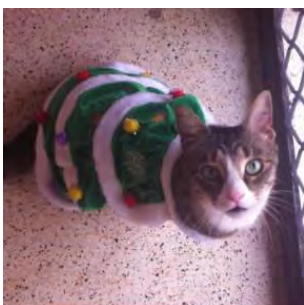
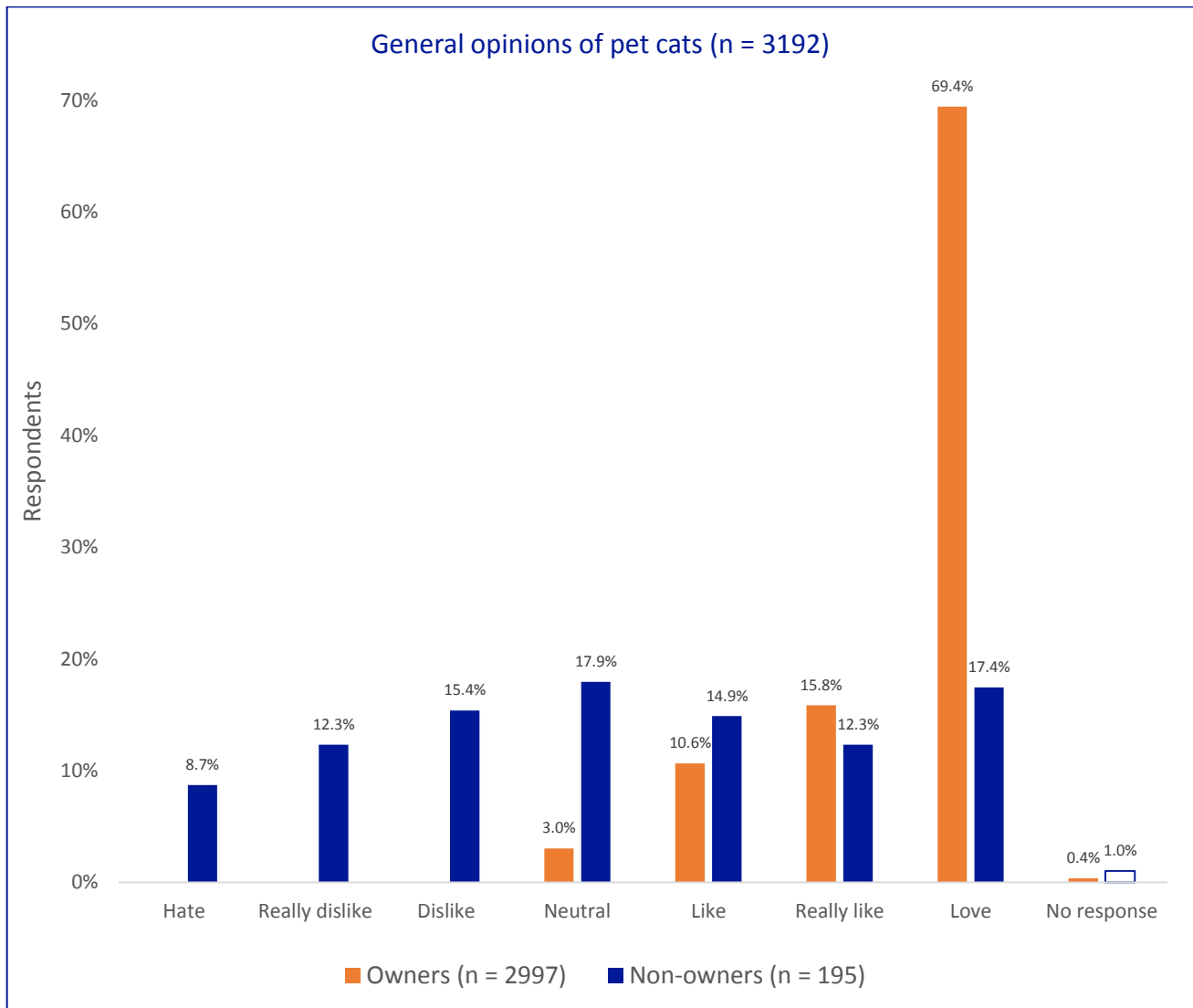
“The family once went to the AWL [Animal Welfare League] to pick a puppy and we came home with three kittens instead.”

“I normally only have 1 or two cats at any time; they are allowed the run of the place (Farm) they help keep the rodents under control and are great company.”



Opinions about cats

The chart below presents the responses to the question about “*My general opinion of pet cats*”. **Cat owners reported significantly more positive general opinions of pet cats** (see [Appendix 2](#) for further details of the statistical tests). Non-owners reported a fairly even spread of views.

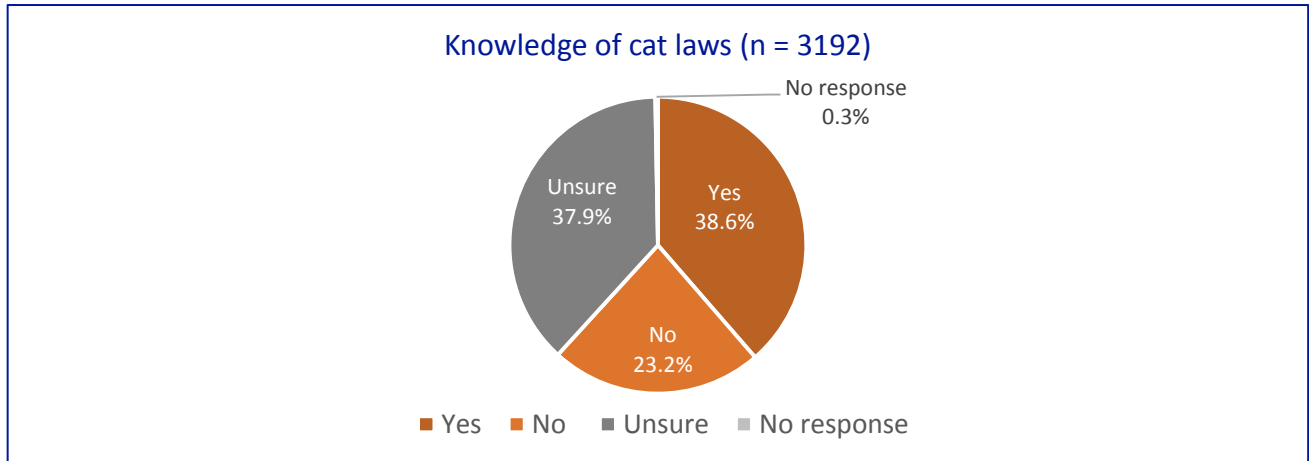


“The cats are the glue of the family. When the kids were little the cats were the trusting playmate. Now they have left home on return visits the cats are the drawcard to come home and visit. One daughter has moved overseas and is sent daily photos of her cat’s antics. If they aren’t well or feeling low, they return to cuddle up with their cats to recuperate. The house is never empty or lonely with cats to talk to, to look after.”

Cat management

Cat management laws

We found that 38.6% of respondents thought that they knew the laws about cats in their area. **Most respondents reported that they were unsure or did not know cat laws in their area.** The chart below presents responses to the question “Do you know what the laws are about cats in your area?”



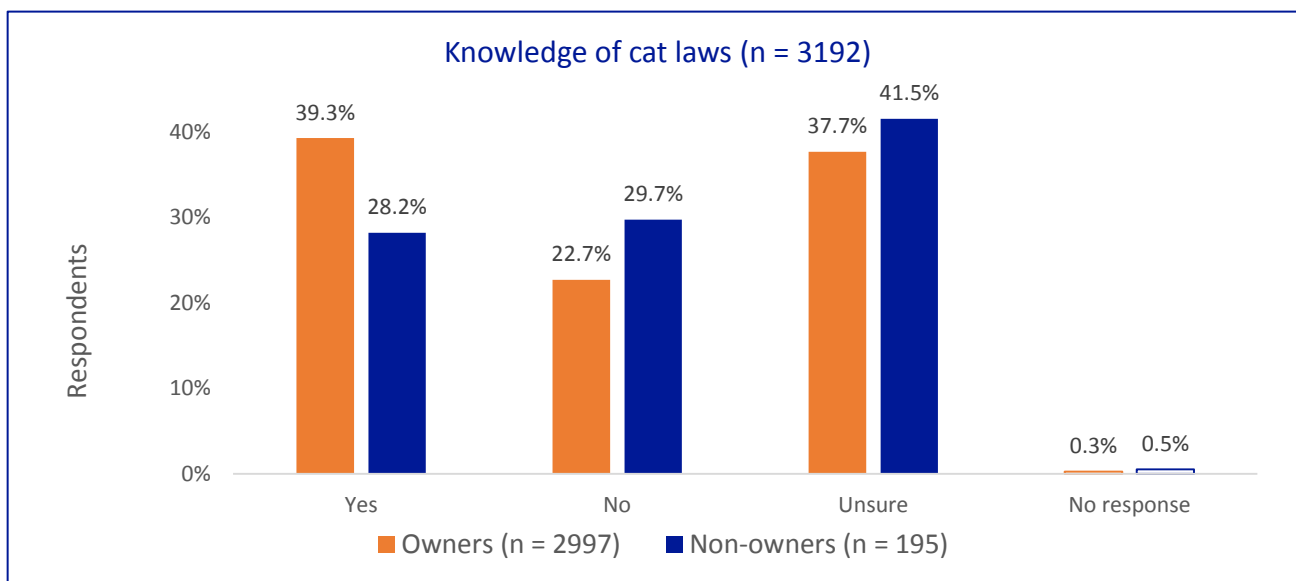
“There is a 2 cat by-law where I live. Cats must be identified in order for a shelter/vet to hold onto a stray otherwise they can by law be rehomed/euthanased immediately. I believe in my council that they are supposed to be contained to the property.”



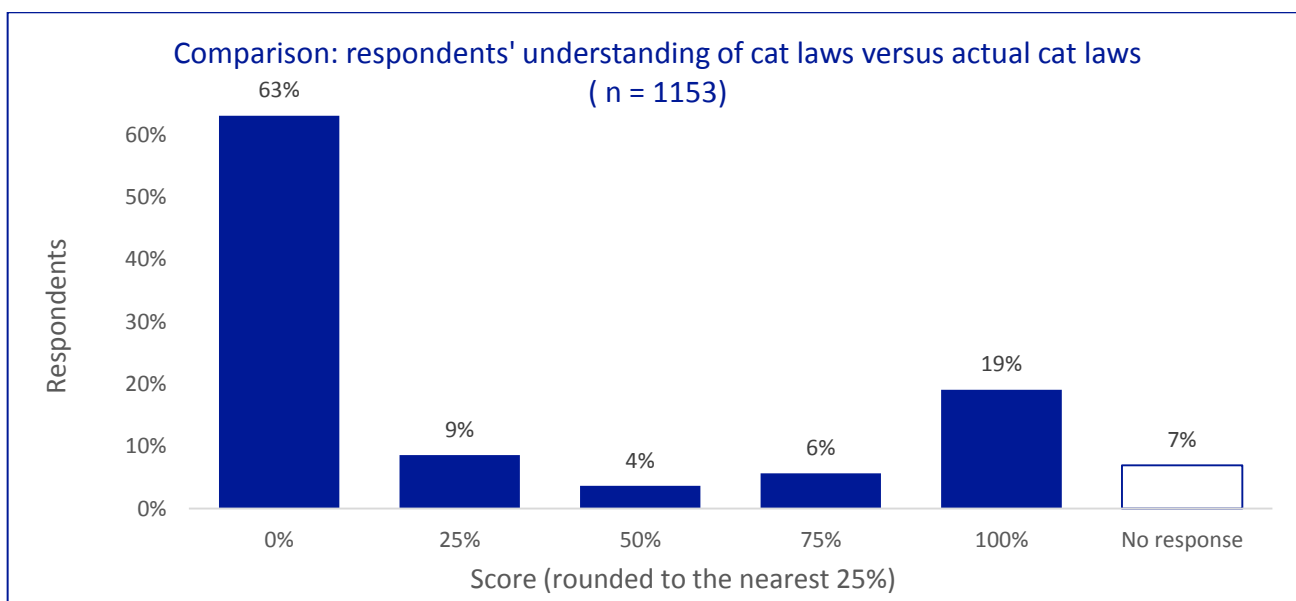
Knowledge of cat laws

The chart below presents the data about the knowledge of cat laws with survey respondents separated into two groups: cat owners and non-owners. **Most respondents from both groups (owners and non-owners) were either unsure about laws or reported they did not know the laws.**

We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their knowledge of cat laws. We found a statistically significant association. The tests revealed that more cat owners reported that they knew the cat laws than would be expected (if there was no association). Conversely, fewer non-owners reported that they knew the cat laws than would be expected. Further details about statistical testing are presented in [Appendix 2](#).

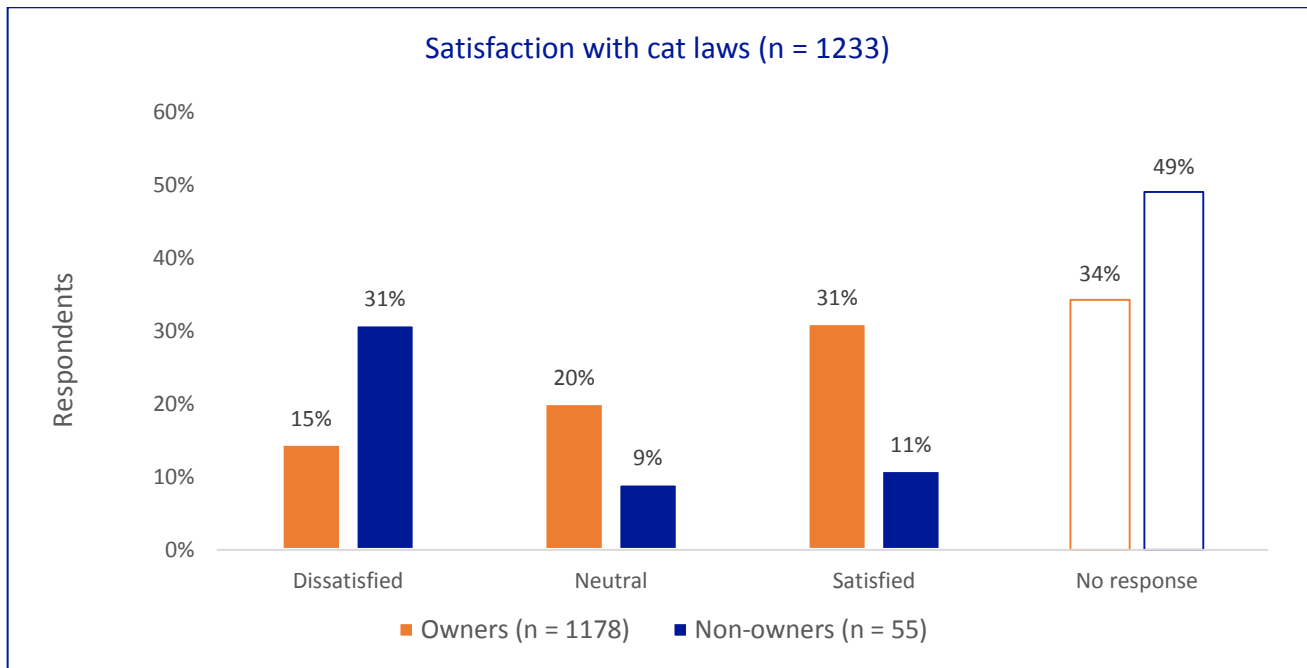


We then asked respondents who stated that they knew cat laws, to describe those laws (respondents could write about as little or as much as they wanted in an open-ended response). We then compared what each respondent had written to the actual cat laws in their local government area. We scored each respondent for the number of local laws they were correct about. We found that **most respondents had a limited knowledge of cat laws** (most scoring less than 50% when comparing stated laws to actual laws). The chart below presents the results of the comparison.

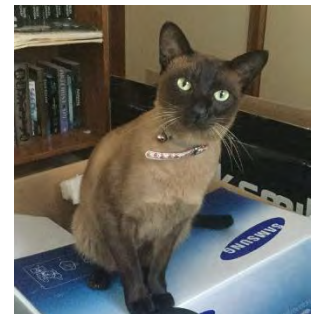


Satisfaction with cat management laws

We also asked respondents who stated that they knew the cat laws in their area if they were satisfied with those laws. We found that **cat owners had significantly higher satisfaction with cat laws than non-owners** (further information about our statistical testing is presented in [Appendix 2](#)). The chart below presents the responses to the question “How satisfied are you with the laws about cats in your area?”

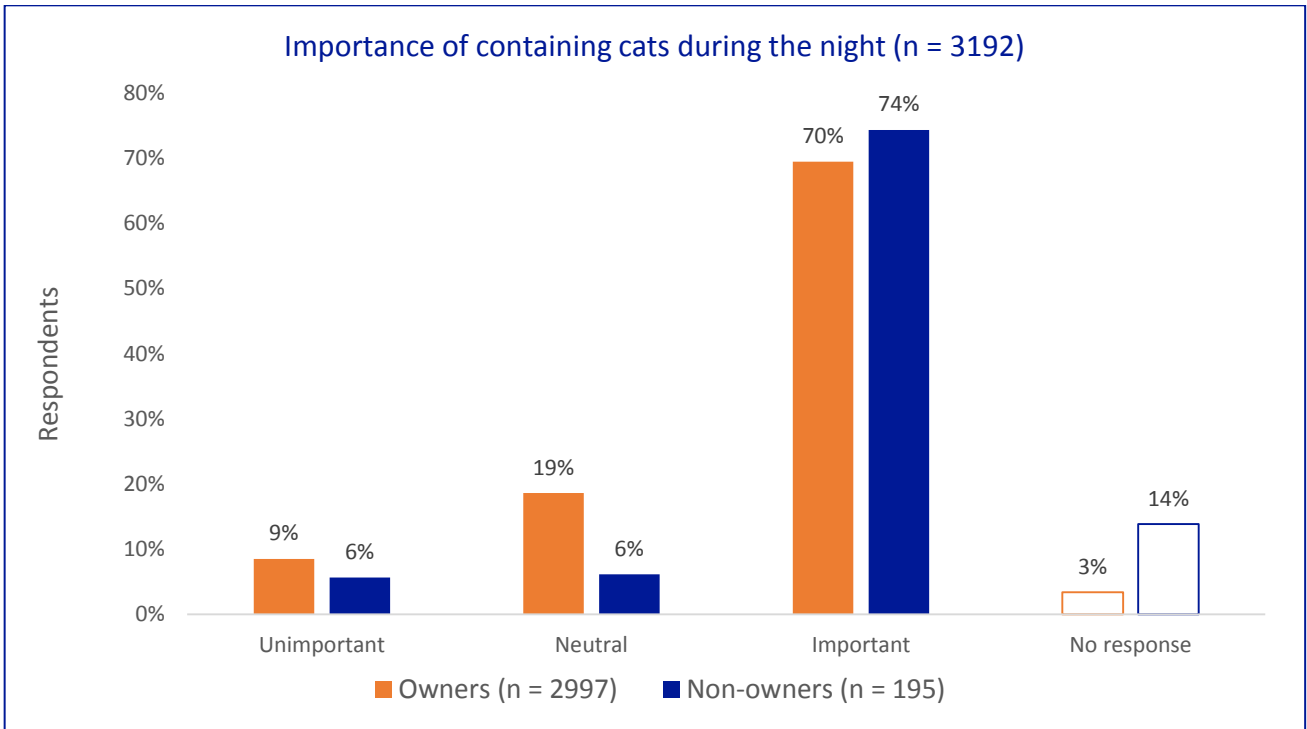


“I personally do not like cats, however I am not opposed to people owning them as pets as long as they are responsible. I am proud of my local council for adopting cat bylaws as I have seen firsthand damage feral cats can do to the local fauna. I think more councils should adopt similar bylaws and educate their community on responsible cat ownership.”

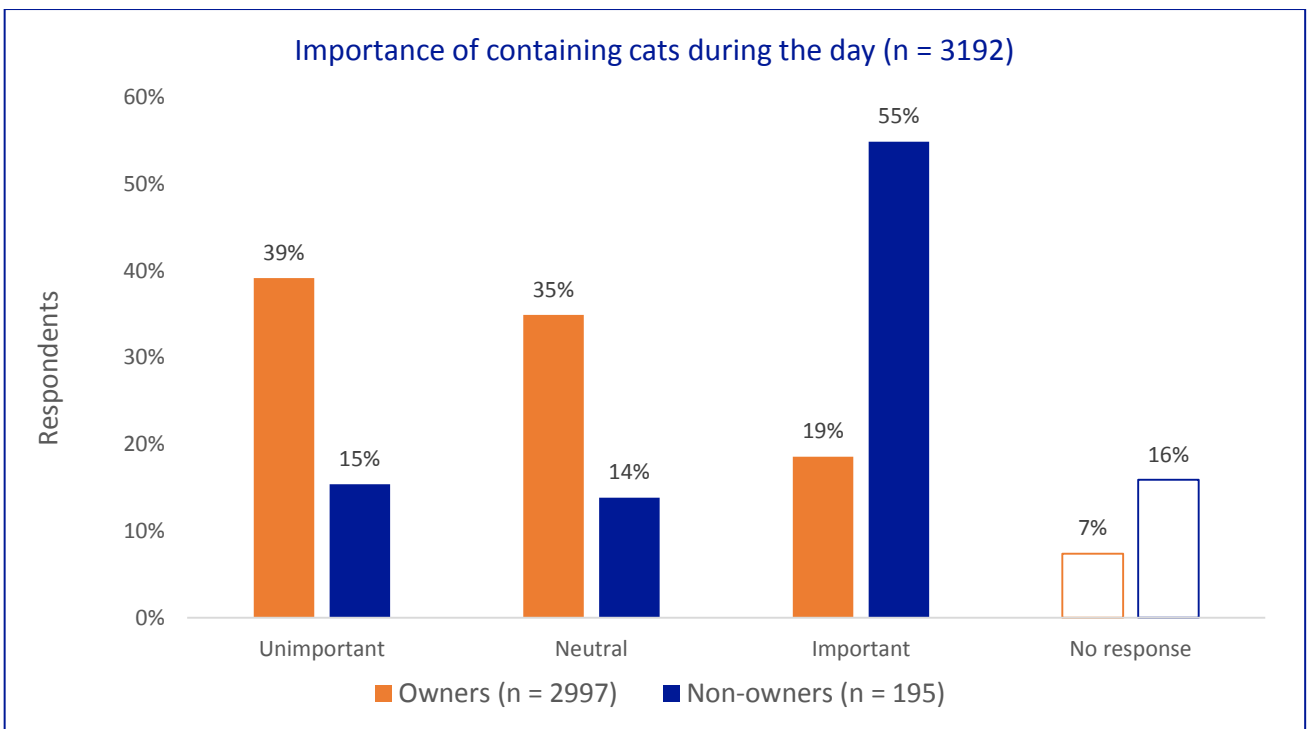


Cat containment

Respondents were asked “Please indicate how important you think it is to contain a cat (e.g. keep the cat inside a house or cat run)?” Respondents could indicate how important they felt it was to contain cats during the day and at night, from very unimportant, through neutral, to very important. The results are presented in two charts on the next page. **The majority of cat owners (70%) and non-owners (74%) reported that they thought it was important to contain cats at night.** It should be noted that more cat owners were neutral about containment at night, and that while the majority of both groups thought it was important to contain cats at night, non-owners did place a significantly higher importance on containing cats during the night than cat owners (further information about our statistical testing is presented in [Appendix 2](#)).



Regarding the containment of cats during the day, the results are quite different. **Most non-owners (55%) reported that they thought it was important to contain cats during the day. Conversely, only about one-in-five cat owners (19%) thought it was important to contain cats during the day,** and many cat owners (39%) thought it was unimportant to contain cats during the day. Interestingly, almost as many cat owners reported that they were “neutral” on the subject (35%) as those who thought it was unimportant (39%). Additionally, more than half of the respondents who owned cats (54%) were either neutral or reported that cat containment during the day was important. Statistically, non-owners did place a significantly higher importance on containing cats during the day than non-owners (further information about our statistical testing is presented in [Appendix 2](#)).



“Containment protects the cat but can be difficult for the owner.”

“I believe cats would rather freedom than being confined to a place.”

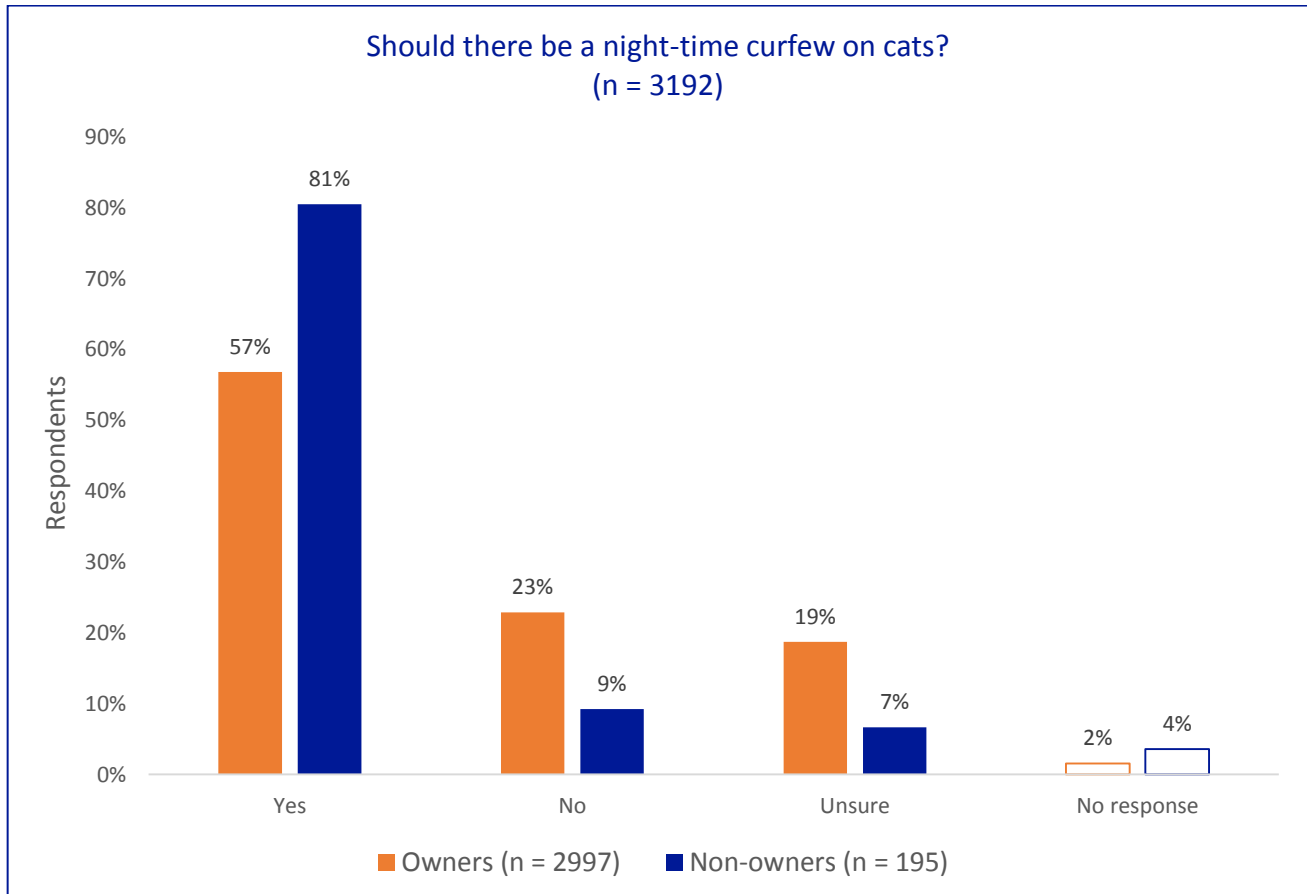
“We converted our front patio veranda into a Catio which our 2 cats love. They have access to it day and night through my bedroom window and they spend part of the night sleeping on my bed and part of the night out in the Catio watching moths etc.”

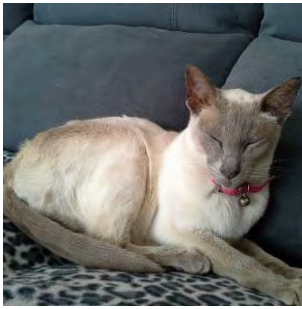


Cat curfew

The chart below presents responses to the question “Would you support a night-time curfew on cats (e.g. that cats must be contained to their owner’s residential property at night)?” **Most respondents (58%) stated that they would support a night-time curfew of cats, regardless of whether they owned a cat or not.**

We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their opinions about a night-time curfew on cats. We found a statistically significant association. The tests revealed that more cat owners were unsure or negative about a cat curfew than would be expected (if there was no association). Conversely, more non-owners were positive about a cat curfew than expected. It must be noted that, despite these significant results, **most members of both groups were supportive of a night-time curfew.** For example, the majority of cat owners (57%) supported a night-time curfew. Further details about statistical testing are presented in [Appendix 2](#).





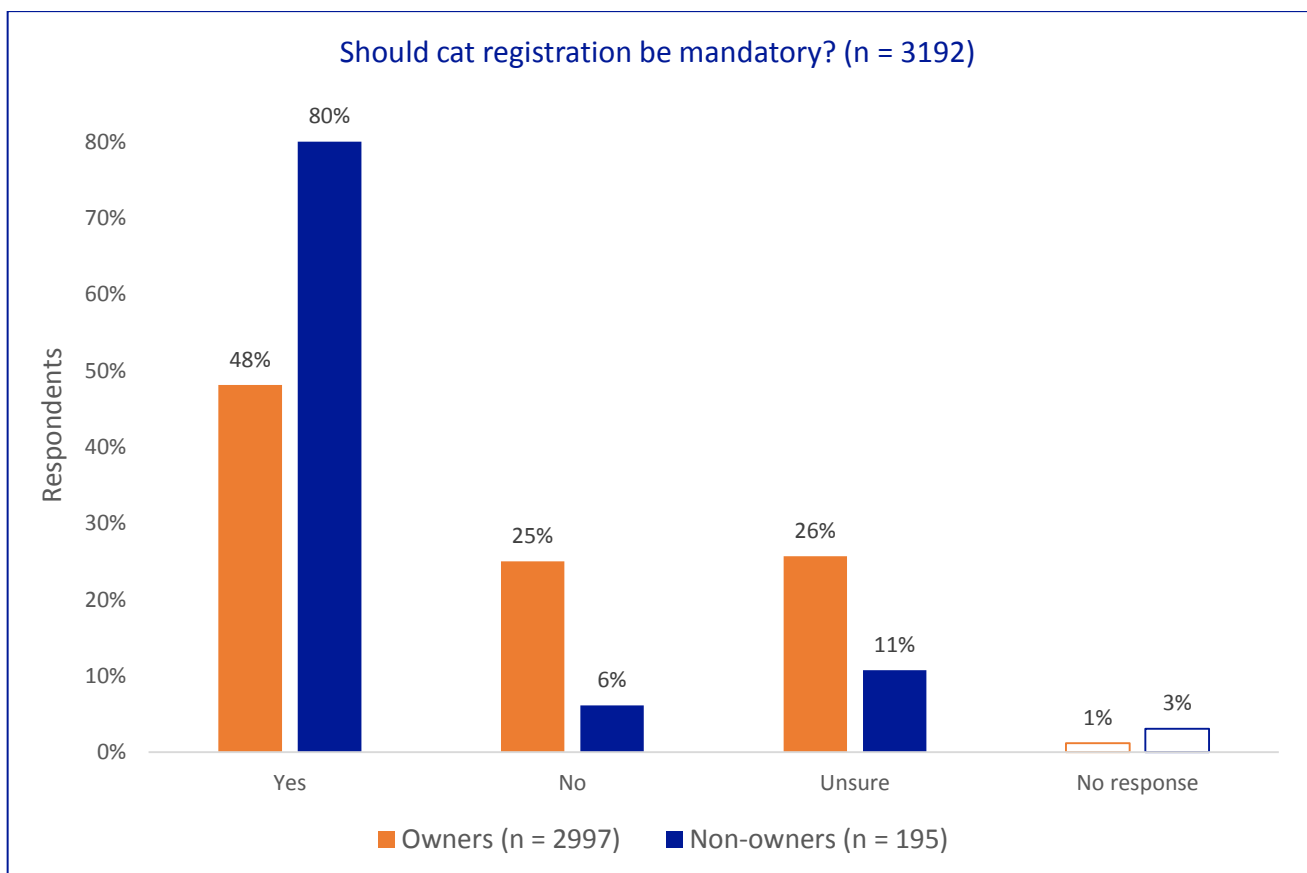
“I think it is important to contain cats at night as I feel this is when they roam and hunt more. So for their own safety and to prevent cat fights and to also protect nocturnal wildlife and roosting birds.”

“Forget the night time curfew. Cats should be contained to houses and cat runs 24 hours a day.”

Cat registration

The chart below presents responses to the question *“Do you think cat registration should be mandatory?”* **Overall, 50% of respondents to the survey responded in the affirmative**, that cat registration should be compulsory.

We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their opinions about cat registration. We found a statistically significant association. The tests revealed that more cat owners were unsure or negative about cat registration than would be expected (if there was no association). Conversely, more non-owners were positive about cat registration than expected. Additionally, fewer non-owners were unsure or negative than expected. Further details about statistical testing are presented in [Appendix 2](#).



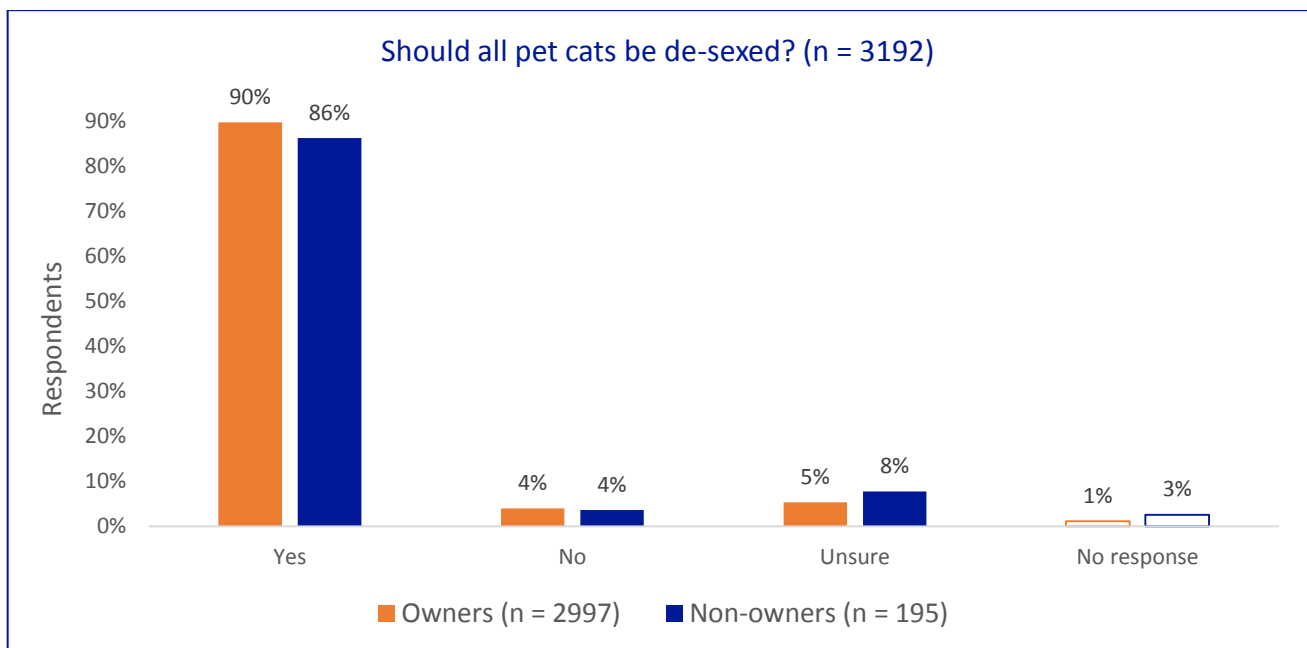
“Cats are great pets, and registration will help to keep them as pets and not as pests.”

“I don't think [registration] affects whether a cat roams the neighbourhood or not, it is just another means of revenue raising. Rabbits and guineapigs and parrots should be registered as well if cats are mandatory.”



Mandatory de-sexing

The chart below presents responses to the question *“Do you think all cats should be de-sexed (with some exceptions for registered cat breeders)?”* **The majority of respondents (89%) supported mandatory de-sexing** (with some exceptions for registered cat breeders). Additionally, we found no significant association between cat ownership and opinions about cat registration (i.e. both owners and non-owners responded similarly). Further information about our statistical testing is presented in [Appendix 2](#).



“I believe all animals should be de-sexed microchipped and treated as part of the family.”

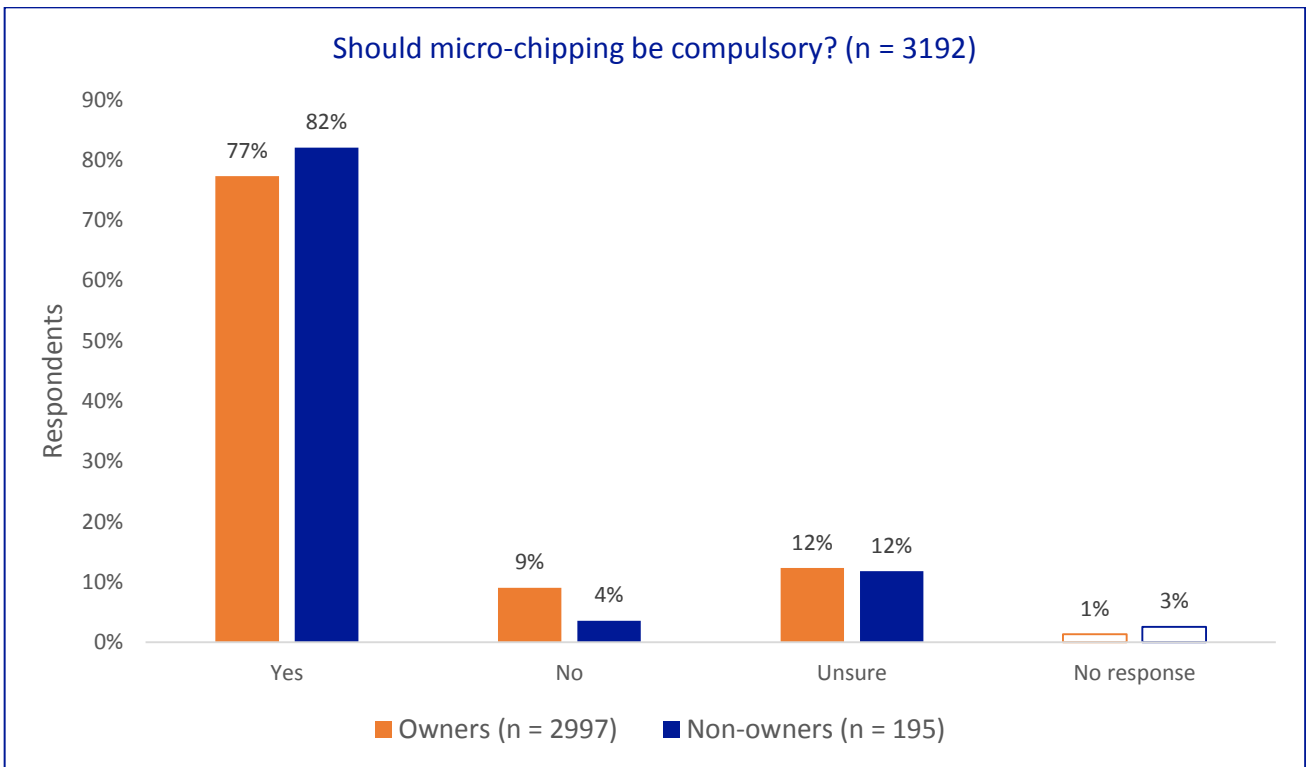
“...[My first cat] was a stray who we found in a back garden with a litter of 5 kittens. We re-homed the kittens and decided to keep their mother... thinking that she would be less likely to attract a new owner. We had her de-sexed and loved her for nearly 13 years...”



Mandatory micro-chipping

The chart below presents responses to the question “Do you think micro-chipping for cats should be compulsory?” **Overall, 78% of respondents to the survey responded in the affirmative**, that micro-chipping should be compulsory for cats.

We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their opinions about a night-time curfew on cats. We found a statistically significant association. The tests revealed that more cat owners were negative about mandatory micro-chipping than would be expected (if there was no association). It must be noted that, despite these results, **most members of both groups were supportive of mandatory micro-chipping**. For example, the majority of cat owners (77%) supported micro-chipping. Further details about statistical testing are presented in [Appendix 2](#).



“May alleviate the amount of ‘strays’ that get handed in to rescue agencies.”

“Not everyone can afford it”

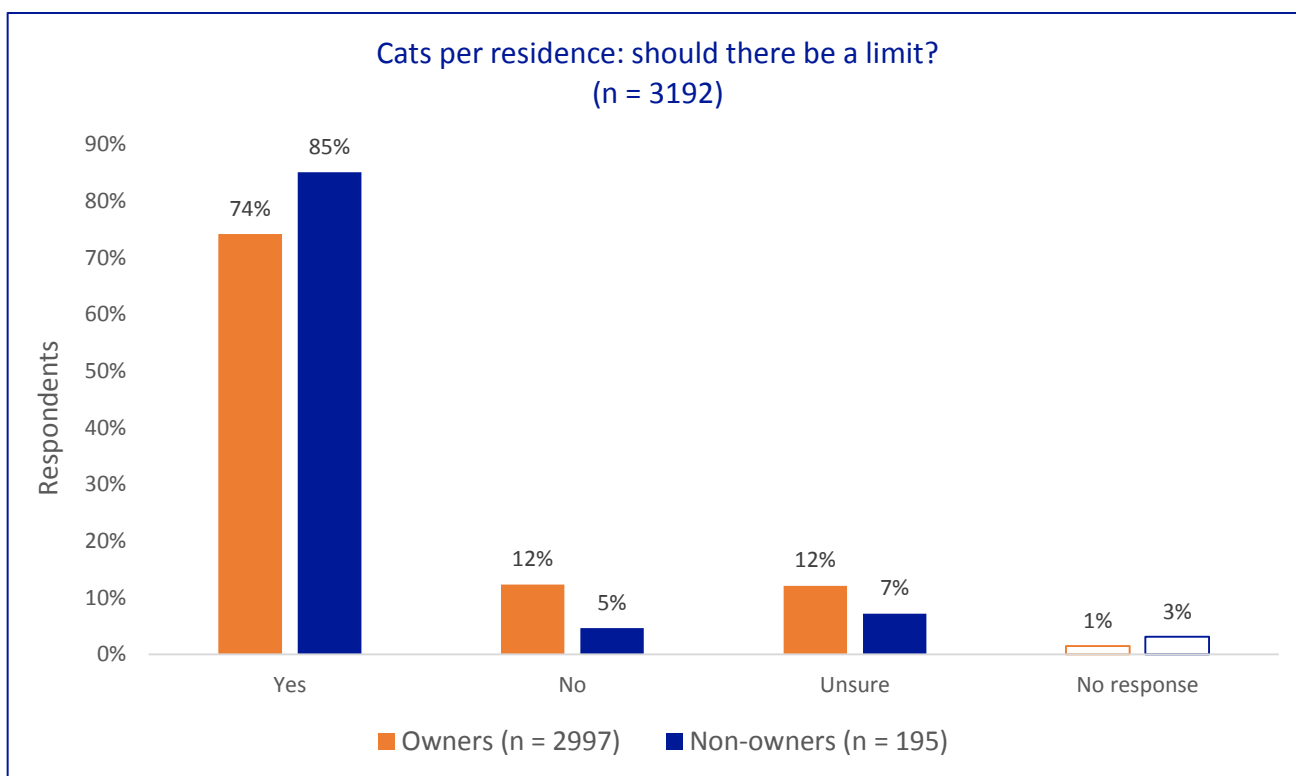
“Lost a cat for 18 months, climbed under car, fell out 10km from home. Found him again via microchip at vet.”

Reminder: Microchips are only as useful as the information on them. If your cat has a micro-chip, ensure that it is up-to-date. For information on how to change your contact details, please visit: www.petaddress.com.au

Limits on the number of cats per household

The chart below presents responses to the question “Do you think there should be a limit on the number of cats kept on any residential premises?” **Overall, 75% of respondents to the survey agreed that there should be a limit to the number of cats per household.**

We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their opinions about a limit on the number of cats per premises. We found a statistically significant association. The tests revealed that more cat owners were negative about a limit on the number of cats than would be expected (if there was no association). Conversely, more non-owners were positive about a limit on the number of cats than expected. It must be noted that, despite these results, **most members of both groups were supportive of a limit on the number of cats.** For example, the majority of cat owners (74%) supported a limit. Further details about statistical testing are presented in [Appendix 2](#).

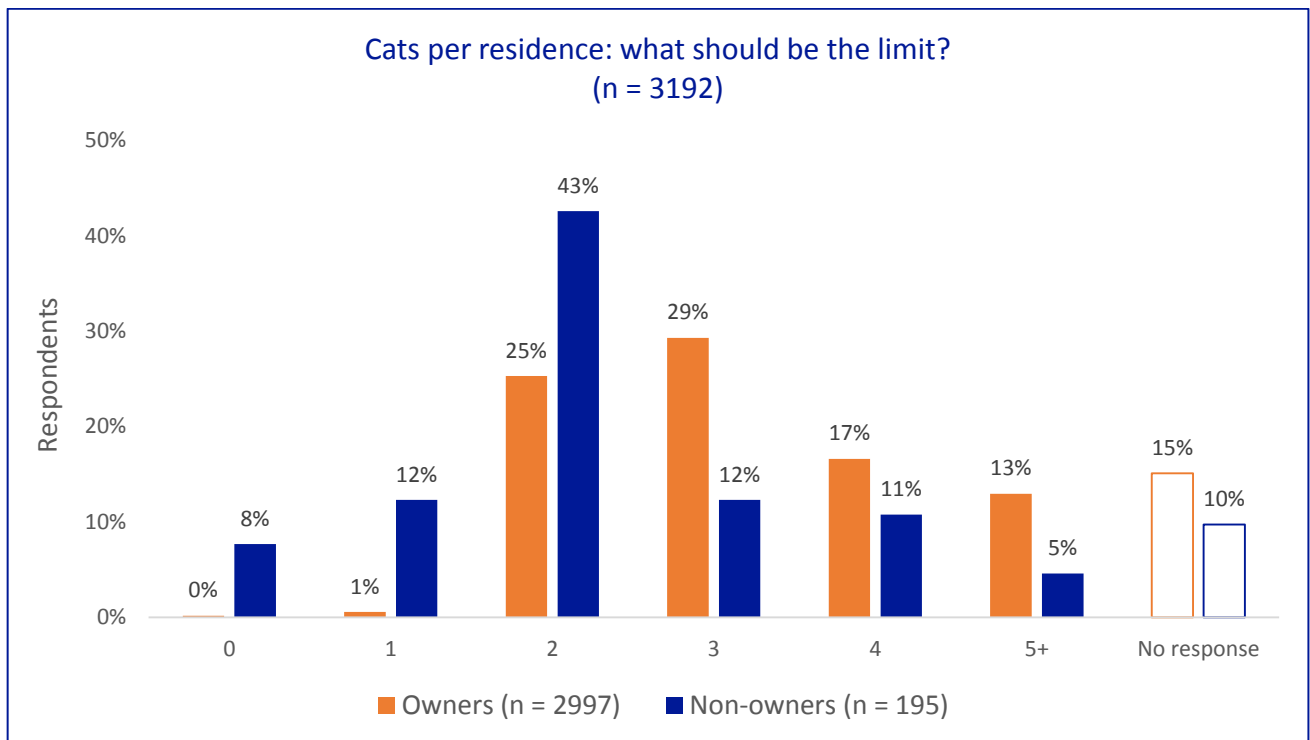


“In regards to the last question about if there should be a limit to cats I think yes and no. If the owners are responsible and have de-sexed & microchipped their cats and prevent them from bothering their neighbours (either by keeping them contained or because they don't have close neighbours) then they should not be restricted to how many cats they can own. For owners who don't de-sex and let their cats roam free and bother their neighbours, then they should be regulated.”



How many cats per household?

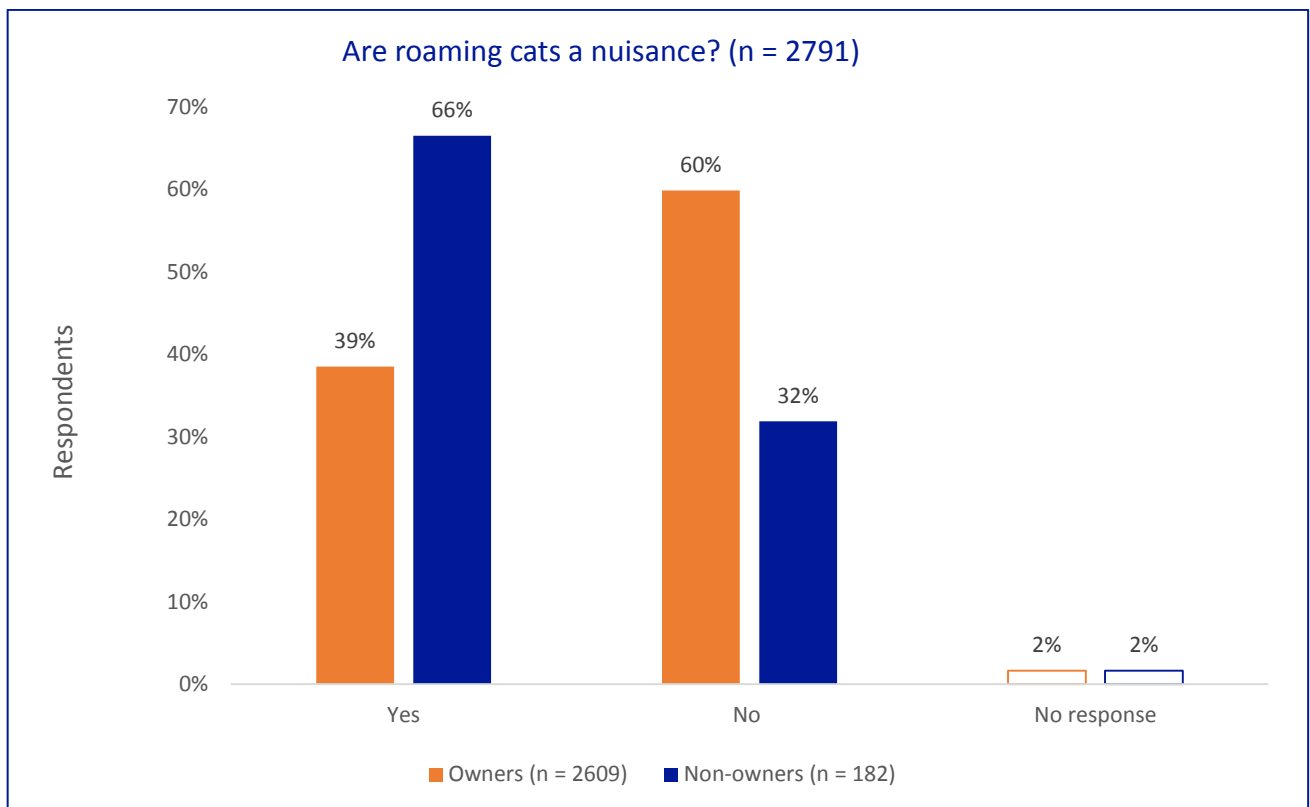
Respondents who thought cat numbers should be limited or were unsure, were asked “What do you think is a reasonable limit to the number of cats kept on any residential premises?” **For all survey respondents, the average response to this question was 3.2 cats per house and the median response was 3 cats per house.** We found a statistically significant difference between owners and non-owners. The average response for cat owners was 3.3 cats per house and their median response was 3 cats per house. The average response for non-owners was 2.3 cats per house and their median response was 2 cats per house. The chart below presents the responses. Further information about our statistical testing is presented in [Appendix 2](#).



Roaming cats

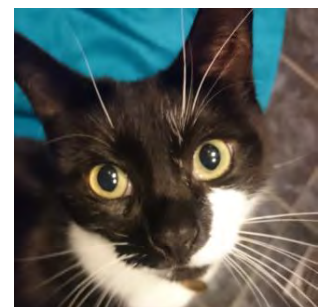
Respondents were asked “Do you have cats that roam in your neighbourhood (they could be owned or un-owned cats)?” Overall, **87% of survey respondents reported that they do have cats that roam in their neighbourhoods**. These respondents were then asked “Do you find the roaming cats to be a nuisance?” Responses to this second question are presented in the chart below. **Overall, 40% of respondents to this question reported that roaming cats were a nuisance**. The chart below depicts differences in the way cat owners and non-owners responded.

We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their opinions about roaming cats. We found a statistically significant association. The tests revealed that more cat owners reported that roaming cats were not a nuisance than would be expected (if there was no association). Conversely, more non-owners reported that roaming cats were a nuisance than expected. Further details about statistical testing are presented in [Appendix 2](#).



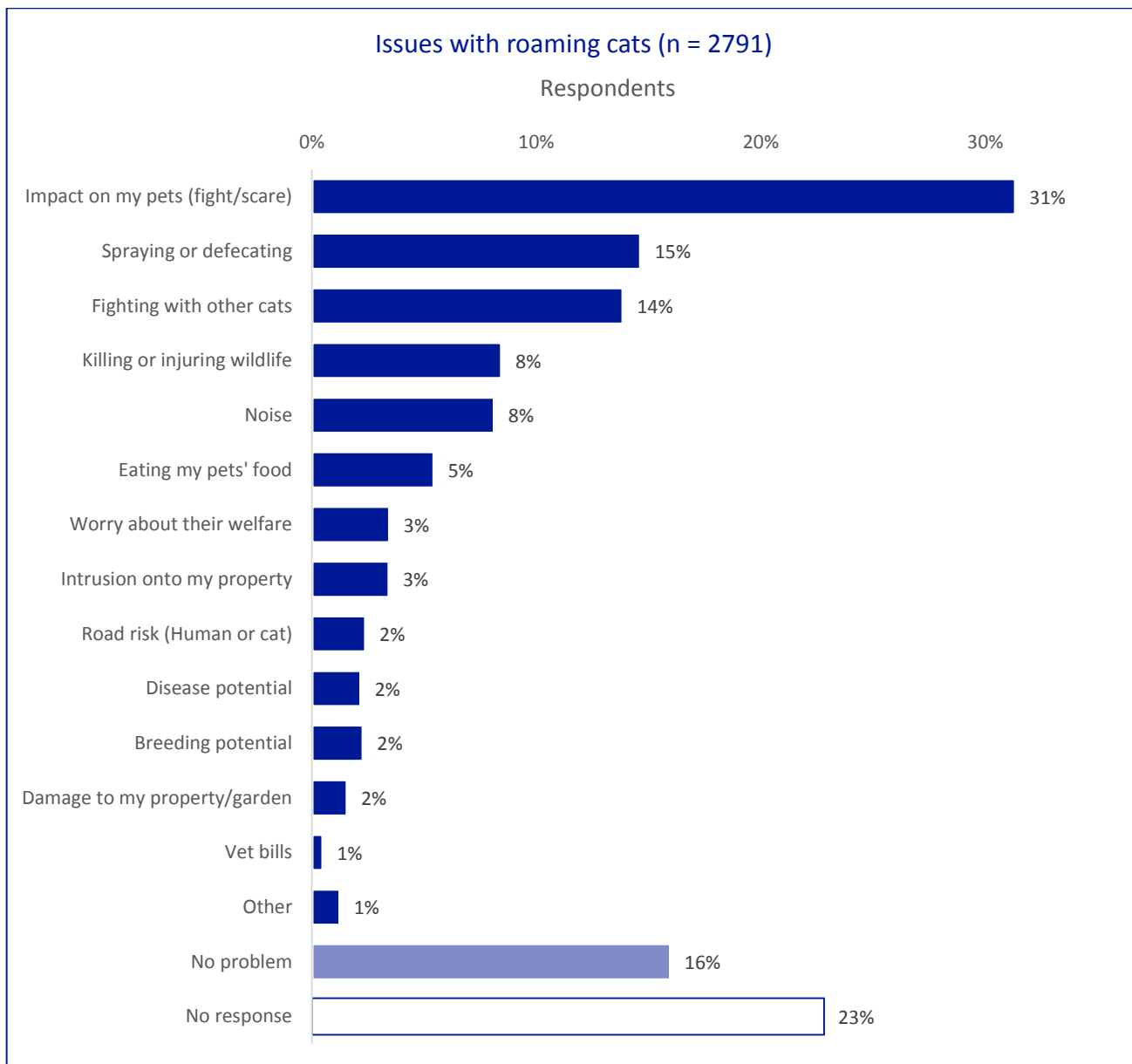
“I don't find them to be a nuisance, but I feel bad for them.”

“...I see first-hand the absolutely devastating effect they have on wildlife.”



Issues with roaming cats

Respondents were then asked “What types of issues do you have with the roaming cats?” The results are presented in the chart below. **The major concern respondents had with roaming cats was the impact on their own pets (e.g. fighting with them or scaring them).** Other concerns were that roaming cats spray/defecate and fight with other cats.



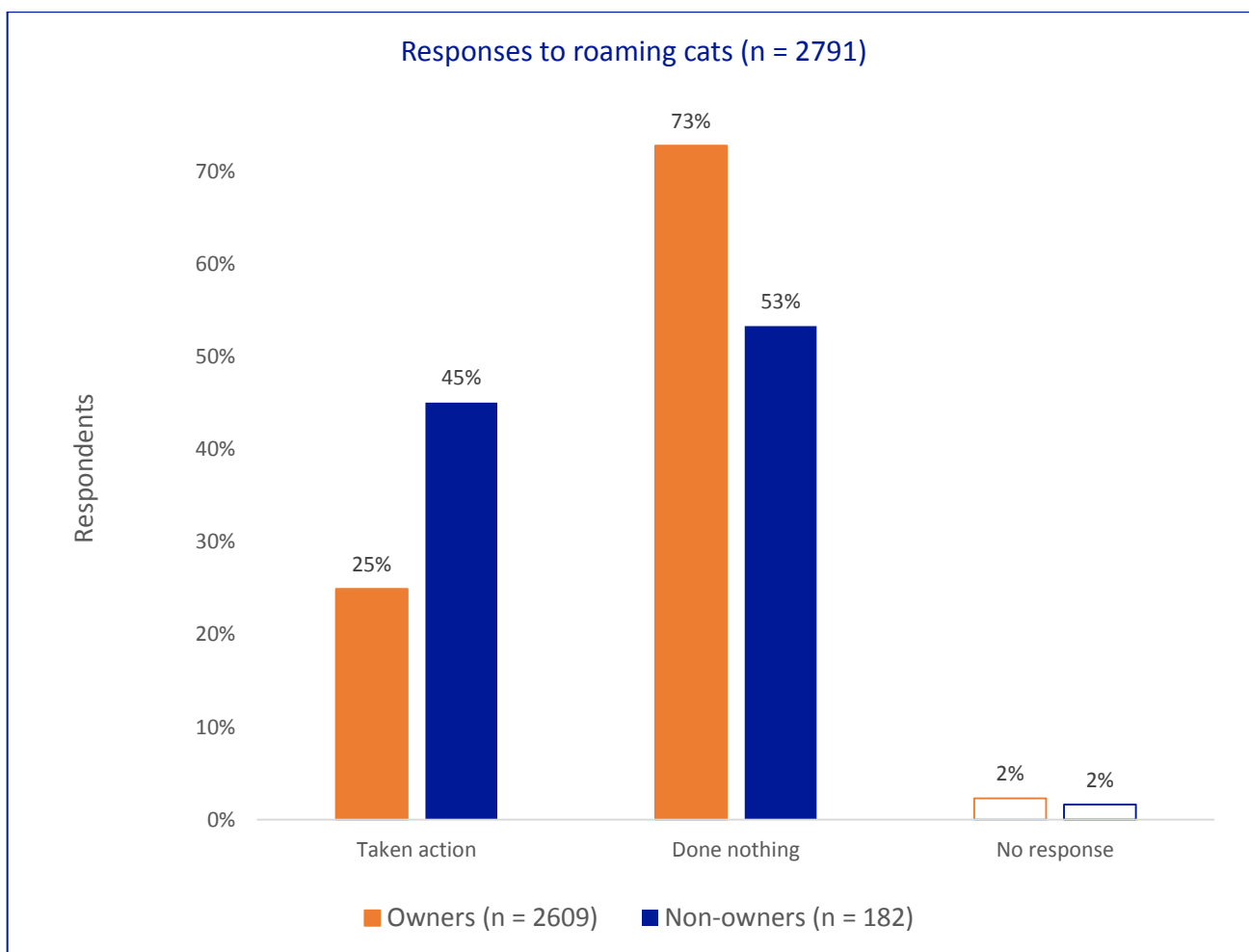
“...Her inquisitive nature however has seen her roam some, which is why I guess I'm so curious to know what she does with her time out of the house...”

“[My cat] likes to hunt and roam. People in town often call to say he is with them. He always comes home as though he has never left. He seems to care for his twin sister...”

Management of roaming cats

The chart below presents results to a further question asked of people who reported having cats that roamed in their neighbourhoods: “How have you managed roaming cats?” **While 40% of respondents reported that roaming cats were a nuisance, only 26% of respondents had taken some action** regarding the roaming cats.

We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and reported responses to roaming cats. We found a statistically significant association. The tests revealed that more cat owners took no action than would be expected (if there was no association). Conversely, more non-owners took action than expected. Further details about statistical testing are presented in [Appendix 2](#).



“I’ve adopted two that were obviously unowned, and have gotten others spayed/neutered”

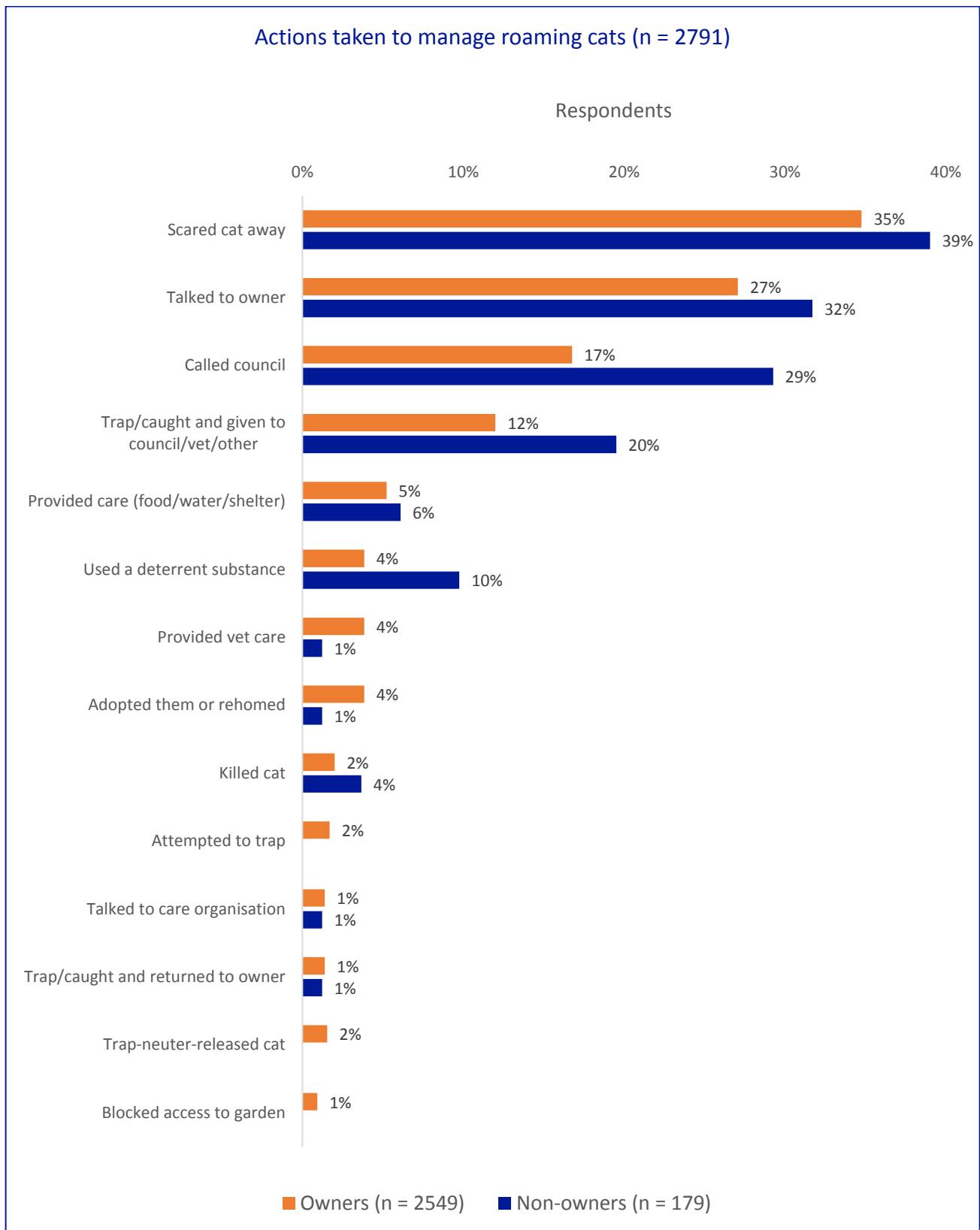
“We have trapped and taken to an animal shelter if no ID.”

“[We] let neighbours know we’re doing a cat cull, caught the strays and taken to vet to be put down”



Roaming cats: taking action

We then asked respondents who reported having roaming cats about the actions they had taken. The responses were sorted and categorised for presentation in the chart below. **The two most common responses were scaring the cat or talking to the owner of the cat.**



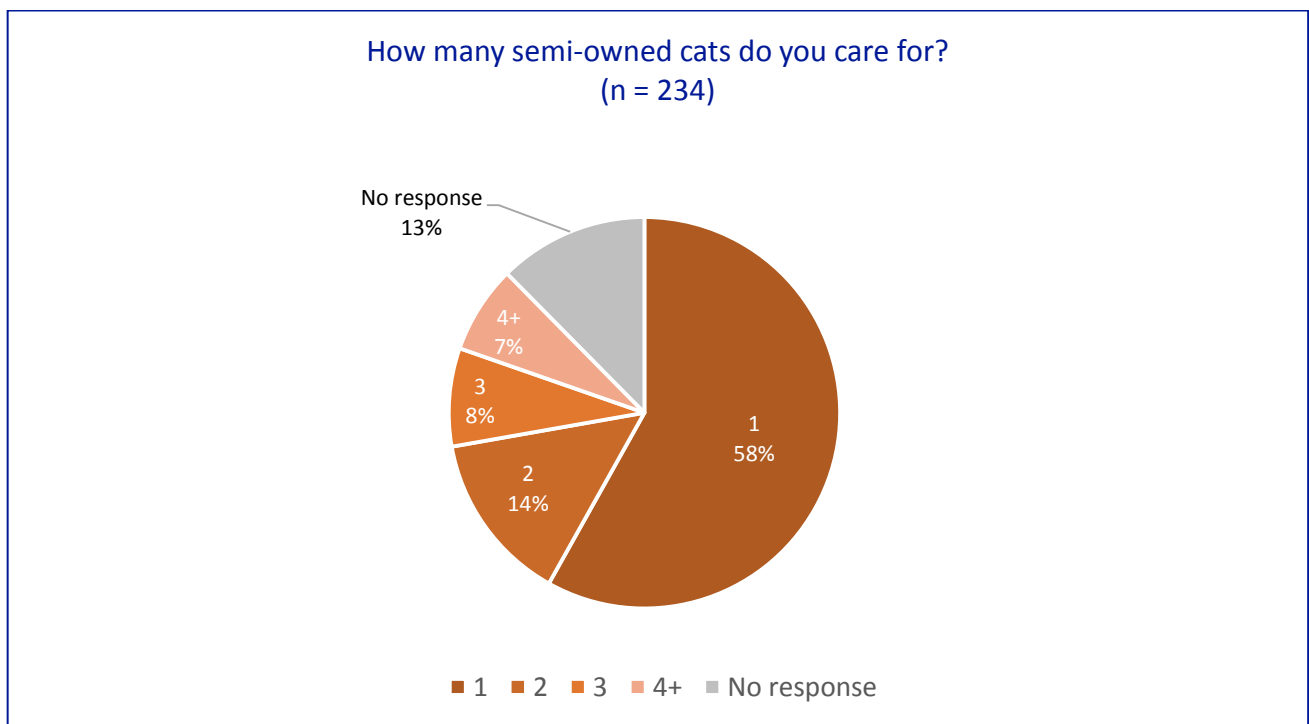
Semi-owned cats

Semi-owned cats are cats that are intentionally provided with food, medical treatment or shelter, but are not considered to be owned by anyone. See our section on [‘ownership status’](#) at the beginning of this report for further information (part of our [‘background cat facts’](#)).

Survey respondents were asked “Do you provide care (e.g. food/shelter/other) for any semi-owned cats?” A total of 3,133 people responded to the question, with **234 people (7.5%) reporting that they provided some care for semi-owned cats.**

Care for semi-owned cats

Most people who provide care for semi-owned cats only provide care for one. The chart below presents responses to the question “How many semi-owned cats do you care for?”



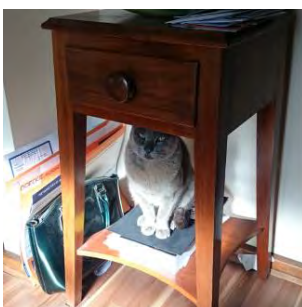
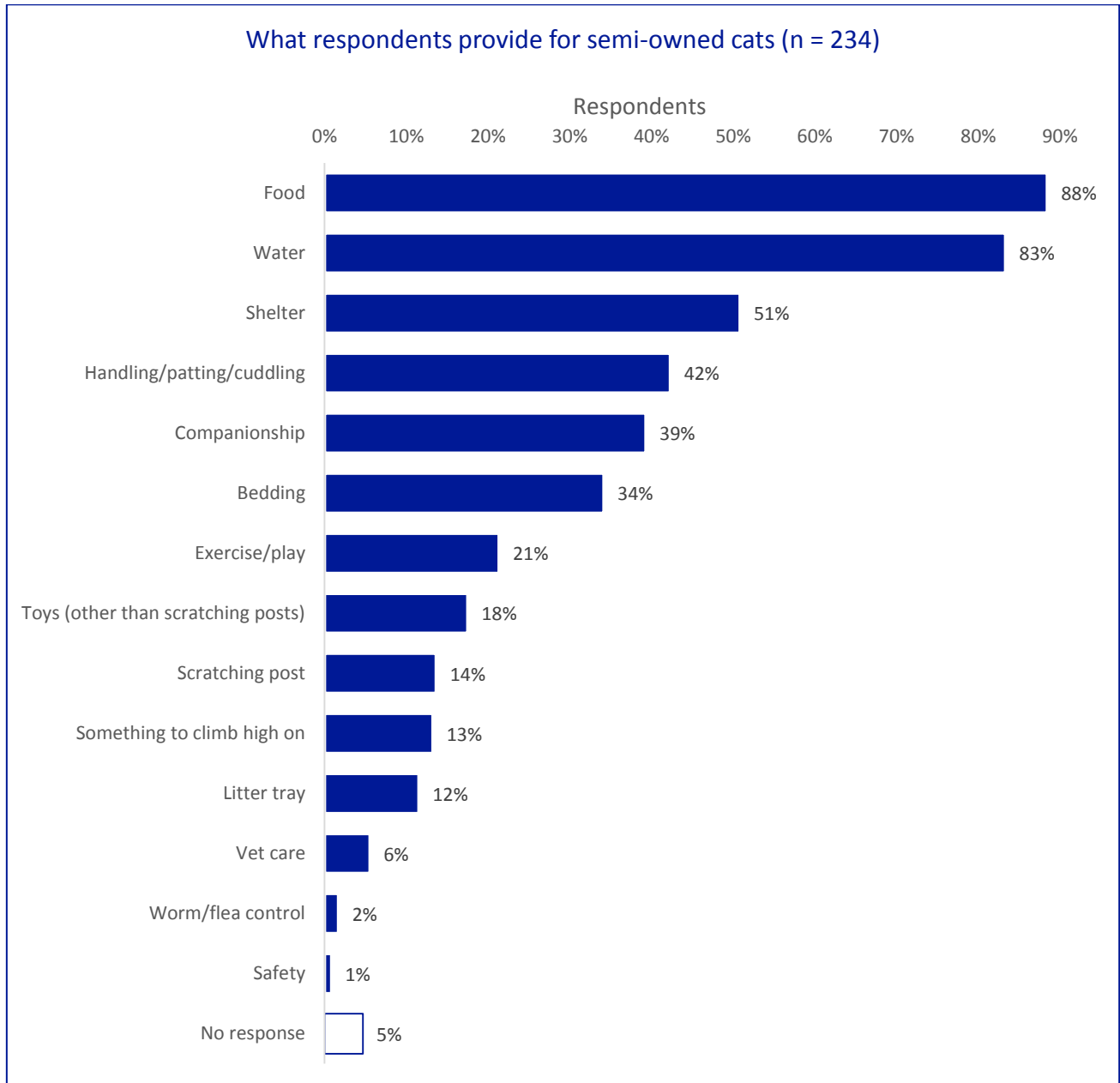
“The cat turns up at work, I don’t think it has an owner.”

“Cat left behind from previous house owner.”



Provision for semi-owned cats

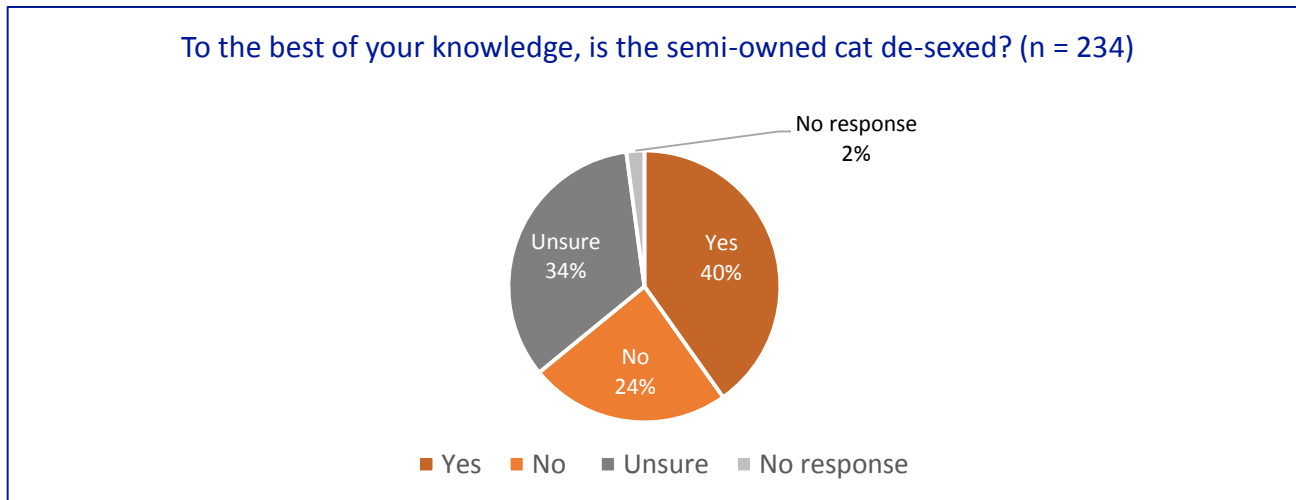
Those who responded that they did care for semi-owned cats were then asked about that care. The chart below presents responses to the question “*What do you provide for the semi-owned cat/s?*” **Food and water were the most common responses, but very few people also provide vet care and health treatments (e.g. worm or flea control).**



“...it is not the cat's fault. It is the stupid humans' fault that put the cat in that situation. The cat deserves to feel safe in its environment. It also deserves food and water and shelter. The cat deserves to live a happy life.”

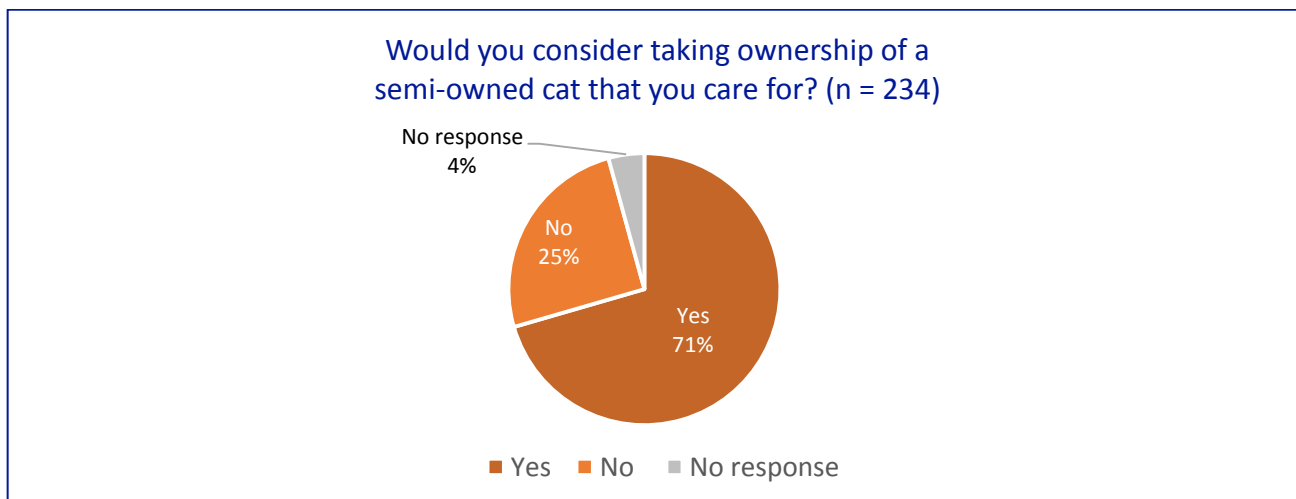
De-sexing of semi-owned cats

Regarding semi-owned cats, the chart below presents responses to the question “To the best of your knowledge, is the cat/s de-sexed?” There was a mixed response and many respondents were unsure.

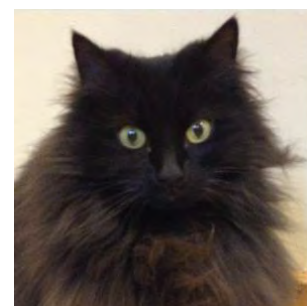


Taking ownership of semi-owned cats

Ideally, cats that are “semi-owned” are fully cared for. This outcome is possible if someone takes ownership of the cat (or cats). We were interested to find out what people perceived to be the barriers to taking ownership of semi-owned cats. We first asked the 234 people who had reported that they provided some care for semi-owned cats if they would consider taking ownership of the cats. **Most respondents stated that they would consider taking ownership of the semi-owned cat they cared for.**

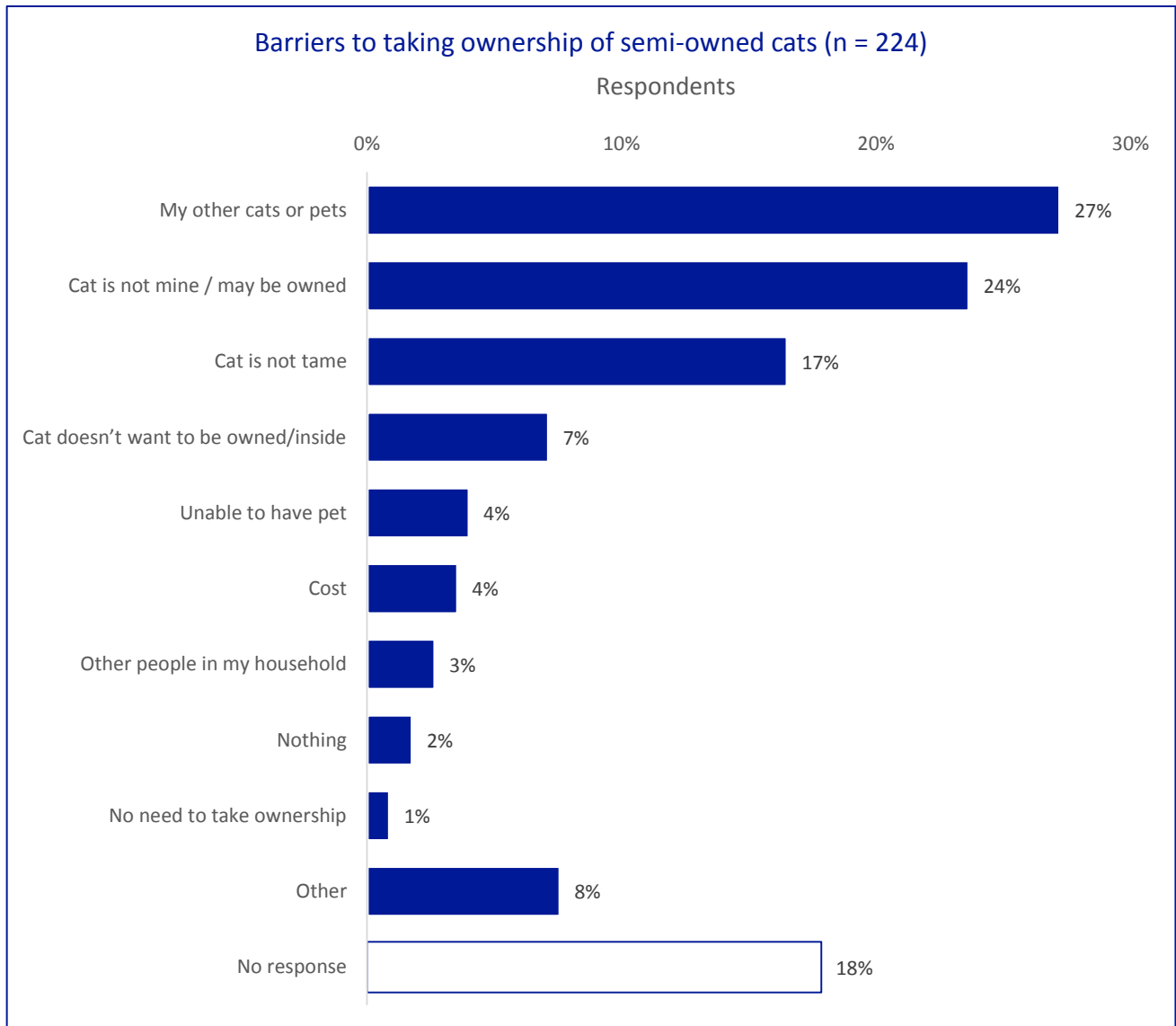


“She gave birth in our yard and had a litter of kittens. Felt responsible to care for her as she became friendly and reliant for food and shelter. Also desexed her so she would be happier and live longer.”



Barriers to ownership of semi-owned cats

We then asked if there were any barriers to taking ownership of semi-owned cats and the responses are presented in the chart below. **The most common barriers to taking ownership of semi-owned cats were having other pets (including cats), concerns about correct ownership of the cats, and the nature of the cat (e.g. how tame the cat was).**



"I found my cat in a car park... he was starving, eating chicken bones he'd found on the ground. I approached him & he accepted some of my sandwich. I spent about 5 minutes with him... A little while later I left the office... he came out of the garden nearby & rubbed up against my leg... he followed me for 25mins approximately & he became very tired, so I picked him up... I could not leave him so I brought him home. In a day or two he had a full vet check, was micro chipped, de-sexed & vaccinated. He was about 6mths old then, he's been my mate & buddy ever since."

Concluding summary

We used a **citizen science** approach, getting people involved in research, to study pet cats in South Australia. Using this approach we were able to track many cats and gather a large sample of survey data from cat owners and non-owners. For analysis we had a total of 3,192 surveys, including data about 4,314 cats (there are more cats than people because some people owned more than one cat). Here we summarise the key findings from each of our results sections in this report.

Meet the cats

Regarding the cats owned by survey respondents, there were similar numbers of male and female cats, most were moggie cats, and the median cat age was 5 years-old. Most cats were outdoor cats, with many reported to be kept inside at night.

- Most cats were obtained from a shelter, a friend, a family member or a neighbour.
- Most survey respondents reported that their cats caught prey.
- Cat owners reported that their cat's hunting was not a problem (34%), that it was a problem (28%), or that their cat did not hunt (26%).
- Cat owners provide a range of resources for their cats, including water, food, shelter, handling and companionship.
- Nearly all of the cat owners reported that their cats were neutered and approximately three-quarters of cat owners reported that they provided regular health treatments for their cats.

Cat Personality

We found a set of five major personality factors for pet cats: the **Feline Five**. The five factors we found were: **skittishness, outgoingness, dominance, spontaneity** and **friendliness**. We provided cat owners with reports about their cats' personalities – information that may help them make decisions about cat management (e.g. skittish cats may benefit from having hiding spots). We also compared the personalities of indoor and outdoor cats and found them to be very similar.

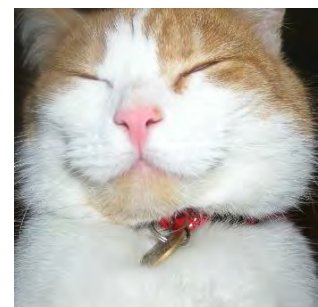
Attachment to cats

We found a set of four attachment factors for the owners of pet cats. The four factors we found were: **general attachment, emotional attachment, belief in animal rights** and **social attachment**. Generally, female cat-owners had higher levels of attachment to their pet cats, and levels of attachment were higher for cats that spent more time with their owners or more time inside. We found that, for some of the attachment factors, cat owners had higher levels of attachment to purebred and younger cats. We also found relationships between **Feline Five** (cat personality) scores and cat attachment scores, with higher levels of attachment typical for friendly and outgoing cats, and lower for skittish cats.

"Thanks for the chance to talk about [my cat]."

"I think citizen involvement in such projects is a great idea benefitting all."

"Great project! I look forward to getting the results and participating in more projects."



Cat Tracking

Data from 428 cats were included in our analyses, including 61,250 location data points. These cats were tracked for at least five days. The home-ranges of the cats ranged from 0.07 to 31.13 hectares, and the median home-range was 1.04 hectares, approximately half of the playing surface at the Adelaide Oval, or eight Olympic-sized swimming pools. Key findings of our statistical testing include that home-ranges were typically larger for male cats (compared to females) and there was no significant difference between purebred and moggie cats. We found that entire cats typically had larger home-ranges than neutered cats, but our sample of entire cats was too small for this finding to be considered robust (more research on this matter is needed).

We compared **sedentary** cats and **wandering** cats. Wanderers are cats with home-ranges greater than one hectare, while sedentary cats are those with home-ranges of one hectare or less. Wandering cats typically crossed more roads per day, showed signs of being in fights with other cats more often, were seen with prey more often, and spent less time inside. Wandering cats were also typically younger and had less provided for them by their owners (e.g. toys and scratching posts). Regarding time spent with their owners, we found no significant difference between wanderers and sedentary cats.

We were interested in the differences between cat home-ranges during the day and at night. We found night-time home-ranges were significantly larger than day-time home-ranges, with 88% of the cats (374 cats) having larger home-ranges at night. We had tracked 177 cats that had been classified by their owners as being kept inside at night. When we then checked the night-time home-ranges of these cats we found that many of them (39%) had night-time home-ranges over one hectare, large enough to classify the cats as wanderers.

Meet the people

Survey respondents were mostly female, from a wide range of ages and levels of education. Most people who completed the *Cat Tracker* survey were cat owners, who owned a median of one cat per household. Cat owners reported significantly more positive general opinions of pet cats than non-owners.

Regarding cat laws, most respondents were unsure or did not know cat laws in their area. For respondents who reported that they thought they knew local cat laws, we compared their account of the cat laws with actual cat laws in their local government area. We found a very limited knowledge of cat laws. We also asked about satisfaction with cat laws and found that cat owners had significantly higher satisfaction with cat laws than non-owners.

There was agreement between most cat owners and non-owners on these matters:

- It is important to contain cats at night;
- They would support a night-time curfew on cats;
- It should be mandatory to de-sex cats (with some exceptions for registered cat breeders);
- It should be mandatory to micro-chip cats; and
- There should be a limit to the number of cats per household.

However, there was not agreement on all matters:

- Most non-owners thought it was important to contain cats during the day, a view held by only around one-fifth of the cat owners;
- Regarding an actual limit to the number of cats per residence, the median responses were three cats per residence for cat owners and two cats per residence for non-owners; and
- While half of the respondents to the survey responded positively to mandatory cat registration, statistical tests revealed that more cat owners were unsure or negative than expected, and more non-owners were positive about cat registration than expected.

Roaming cats

Most survey respondents reported that they have cats that roam in their neighbourhoods. Many (40%) of the respondents who reported having roaming cats in their neighbourhoods thought that these cats were a nuisance. The major concern respondents had with roaming cats was the impact on their own pets (e.g. fighting with them or scaring them). Other concerns were that roaming cats spray/defecate and fight with other cats. However, only 26% of respondents had taken some action regarding the roaming cats. The two most common actions reported were scaring the cat or talking to the owner of the cat. More non-owners reported that roaming cats were a nuisance and took action about them than expected, while more cat owners reported that roaming cats were not a nuisance and took no action than would be expected.

Semi-owned cats

Semi-owned cats are cats that are intentionally provided with food, medical treatment or shelter, but are not considered to be owned by anyone. There were 234 people who reported that they provided some care for semi-owned cats. Most provided care for just one semi-owned cat, but some people reported that they care for multiple cats. Food and water were the most common provisions reported, and very few people also provided vet care and health treatments (e.g. worm or flea control). Most of these people (71%) would consider taking care of the semi-owned cats that visit them. The most common barriers to taking ownership of semi-owned cats were having other pets (including cats), concerns about correct ownership of the cats, and the nature of the cat (e.g. how tame the cat was).

A final thank you

The **Cat Tracker** project has allowed us to learn and share a great deal of information about pet cats in South Australia. We now better understand the cat-owner attachment to cats and the personalities of the cats. We know more about the home-ranges of pet cats, including the differences between sedentary and wandering cats, and the clandestine activities of some cats at night. We also know more about community views on cat management. We thank all of the people who have contributed to our work, and particularly the members of the South Australian community who contributed their time, completing surveys and tracking their cats during 2015 and 2016. We hope that this information will inform cat owners and help them to make decisions about the care, welfare and management of their cats.



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Appendix 1: Descriptive statistics for cats tracked

Descriptive statistics were calculated for the 428 cats included in further analyses. In the table below (and on the next page) we provide the descriptive statistics for the cat home-ranges and other variables used in subsequent analyses. We used SPSS software to run statistical analyses.

Variable	Description of variable	Number of observations	Minimum and maximum results	Average	Median
Home-range	Obtained from GPS tracking of the cats and home-range calculations in ZoaTrack	428	0.07 – 31.13 hectares	1.99 hectares	1.04 hectares
Age	Owner-reported ages of cats	406 (5% missing)	0.25 – 19 years old	5.78 years old	5 years old
Time spent with owner	Owner responses to the following categories: <ol style="list-style-type: none"> 1. Less than 1 hour/week 2. 1-10 hours/week 3. 10-20 hours/week 4. 20+ hours/week 	414 (3% missing)	1 – 4 See the categories in the description of this variable to see what these responses indicate.	2.64 This result is based on the categories for this variable; the average of 2.64 indicates an average between categories 2 and 3.	2 This result is based on the categories for this variable and corresponds to 1-10 hours per week .
Fight frequency	How often cats showed signs of being in fights with other cats that are not owned by the same household; based on owner responses in the following categories: <ol style="list-style-type: none"> 1. Never 2. Every few years 3. Yearly 4. 6-monthly 5. Monthly 6. Weekly 	413 (4% missing)	1 – 6 See the categories in the description of this variable to see what these responses indicate.	2.92 This result is based on the categories for this variable; the average of 2.92 indicates an average close to category three: yearly .	3 This result is based on the categories for this variable and corresponds to yearly .
Prey caught	Owner responses to the following categories: <ol style="list-style-type: none"> 1. <1 item of prey/month 2. 1 item of prey/month 3. 2 items of prey/month 4. 3 items of prey/month 5. 4 items of prey/month... <i>...continuing up to category 21 (this final category indicated 20+ items of prey/month)</i>	298 (30% missing)	1 – 21 See the categories in the description of this variable to see what these responses indicate.	4.20 This result is based on the categories for this variable; the average of 4.20 corresponds approximately to three items of prey per month .	3 This result is based on the categories for this variable and corresponds to two items of prey per month .
Time spent inside	Owner-reported number of hours that the cat spent inside each day	407 (5% missing)	1 – 24 hours per day	11.36 hours per day	12 hours per day

Variable	Description of variable	Number of observations	Minimum and maximum results	Average	Median
Provision for cat	<p>What owners provided for their cats, with owner responses scored as one point each for each of the following 12 items:</p> <ul style="list-style-type: none"> • Shelter • Water • Food • Bedding • Companionship • Litter tray • Scratching post • Toys • Something to climb high on • Opportunity to exercise/play • Handling/patting/cuddling • Access to sunlight 	414 (3% missing)	3 – 12 This result is based on the scores for each cat; the minimum score of 3 indicates that all cats tracked were provided with at least three of the items listed; the maximum score of 12 indicates that some of the cats tracked received all 12 of the items listed; see the description of this variable for the list of potential provisions.	10.18 This result is based on the scores of each cat; the average of 10.18 indicates that, on average, the cats tracked were provided with approximately 10 of the 12 items in the list of provisions.	11 This result is based on the scores of each cat (i.e. the median score for this variable was 11 of the 12 items in the list of provisions).
Owner-estimated distance that their cat travels	<p>Owner responses to the following categories:</p> <ol style="list-style-type: none"> 1. Just on my property 2. 100 m beyond my property 3. 1 km 4. 2 km 5. Many kms 	167 (61% missing)	1 – 5 See the categories in the description of this variable to see what these responses indicate.	1.99 This result is based on the categories for this variable; the average of 1.99 indicates an average very close to category two: 100 metres beyond my property ; note the large amount of missing data.	2 This result is based on the categories for this variable and corresponds to 100 metres beyond my property ; note the large amount of missing data.
Roads crossed per day	The number of road crossings made by each cat while it was tracked, divided by the number of days they were tracked; calculated using ArcMap 10.3 software	428	0 – 63.40 road crossings per day	4.82 road crossings per day	3.43 road crossings per day

Appendix 2: Statistical test results

The results in the table that begins below are presented in the same order as results presented in the main body of this report.

Topic and type of test	Result	Additional information
Home-ranges (male/female cats) Mann-Whitney U test	Male cats had larger home-ranges than female cats ($U = 16620$, $p = .001$).	Mean ranks: <ul style="list-style-type: none"> • Male cats: 220.41 ($n = 217$) • Female cats: 182.90 ($n = 188$)
Home-ranges (neutered/non-neutered cats) Mann-Whitney U test	Entire (non-neutered) cats had larger home-ranges than neutered cats ($U = 640$, $p = .013$)	Mean ranks: <ul style="list-style-type: none"> • Entire cats: 318.57 ($n = 7$) • Neutered cats: 205.08 ($n = 406$) WARNING: This test included 406 neutered cats, but only 7 entire cats, therefore the results should be considered as an indicator that non-neutered cats had larger home-ranges, subject to further research.
Home-ranges (purebred/moggie cats) Mann-Whitney U test	There was no statistically significant difference in the size of cats' home-ranges between purebred and moggie cats ($U = 10491$, $p = .307$).	Mean ranks: <ul style="list-style-type: none"> • Purebred cats: 217.42 ($n = 67$) • Moggie cats: 201.36 ($n = 340$)
Roads crossed (wandering/sedentary cats) Mann-Whitney U test	Wandering cats typically crossed more roads per day than sedentary cats, and the difference was statistically significant ($U = 9212.5$, $p < .001$).	Mean ranks: <ul style="list-style-type: none"> • Wandering cats: 276.31 ($n = 221$) • Sedentary cats: 148.50 ($n = 207$)
Cat fights (wandering/sedentary cats) Mann-Whitney U test	Wandering cats typically showed signs of being in fights with other cats more often than sedentary cats, and the difference was statistically significant ($U = 16590$, $p < .001$).	Mean ranks: <ul style="list-style-type: none"> • Wandering cats: 228.98 ($n = 214$) • Sedentary cats: 183.37 ($n = 199$) Note: the owner-reported "fight frequency" is likely to be an underestimation of cat fighting for both sedentary and wandering cats as cats may fight without showing signs of fighting (we asked, "how often <i>your cat</i> shows signs of being in a fight with cats that are not your cats?").
Prey caught (wandering/sedentary cats) Mann-Whitney U test	Wandering cats were typically seen with prey more often than sedentary cats, and the difference was statistically significant ($U = 8851$, $p = .003$).	Mean ranks: <ul style="list-style-type: none"> • Wandering cats: 162.86 ($n = 162$) • Sedentary cats: 133.58 ($n = 136$) Note: the owner-reported "prey caught" is likely to be an underestimation for both sedentary and wandering cats as cats may catch prey that is not known to the owner – our comparison was relative (i.e. we compared two groups that were likely to include similar underestimations; see our section on " Prey seen by owners " for further details about this underestimation).
Time inside (wandering/sedentary cats) Mann-Whitney U test	Wandering cats typically spent less time inside than sedentary cats, and the difference was statistically significant ($U = 17593$, $p = .009$).	Mean ranks: <ul style="list-style-type: none"> • Sedentary cats: 219.74 ($n = 196$) • Wandering cats: 189.38 ($n = 211$)
Age of cat (wandering/sedentary cats) Mann-Whitney U test	Wandering cats were typically younger than sedentary cats, and the difference was statistically significant ($U = 17799.5$, $p = .018$).	Mean ranks: <ul style="list-style-type: none"> • Sedentary cats: 217.65 ($n = 197$) • Wandering cats: 190.17 ($n = 209$)

Topic and type of test	Result	Additional information
Provision for cat (wandering/sedentary cats) Mann-Whitney <i>U</i> test	Wandering cats typically had less provided for them than sedentary cats, and the difference was statistically significant ($U = 19009$, $p = .044$).	Mean ranks: <ul style="list-style-type: none"> Sedentary cats: 219.46 ($n = 200$) Wandering cats: 196.33 ($n = 214$)
Time with owners (wandering/sedentary cats) Mann-Whitney <i>U</i> test	Regarding time spent with owners, there was no statistically significant difference between wanderers and sedentary cats ($U = 21038$, $p = .749$).	Mean ranks: <ul style="list-style-type: none"> Wandering cats: 209.19 ($n = 214$) Sedentary cats: 205.69 ($n = 200$)
Estimated distance travelled (wandering/sedentary cats) Mann-Whitney <i>U</i> test	Cat-owner estimates of how far their cat travelled typically reflected the size of the cats home range and the difference was statistically significant (i.e. cat owners typically estimated correctly that the cats we classified as wandering went further from home than the cats we classified as sedentary). ($U = 2830$, $p = .021$).	Mean ranks: <ul style="list-style-type: none"> Wandering cats: 92.26 ($n = 74$) Sedentary cats: 77.43 ($n = 93$) Note: Only 167 (39%) of the owners whose cats we tracked estimated how far their cats travelled from home (prior to tracking). Most of the cat owners whose cats we tracked (261) did NOT estimate how far their cats travelled. This lack of data was due to the fact that most cat owners who completed the Cat Tracker questionnaire were either unsure of how far their cats travelled (49%) or chose not to respond to this question (10%).
Home-ranges (day-time/night-time) Wilcoxon signed-rank test	Cats had larger home-ranges at night, and the difference was statistically significant ($Z = -14.707$, $p < .001$). This test included 428 night-time home-ranges and 427 day-time home-ranges (one cat did not have enough day-time data to calculate a day-time home-range).	Mean ranks: <ul style="list-style-type: none"> Test results included 374 positive mean ranks (221.58), where night-time home-ranges were larger, 52 negative mean ranks (155.38), where day-time home-ranges were larger, and one tied mean rank.
General opinions of pet cats (cat owners/non-owners) Mann-Whitney <i>U</i> test	Owners had higher general opinions of cats than non-owners, and the difference was statistically significant ($U = 92705.5$, $p < .001$)	Mean ranks: <ul style="list-style-type: none"> Owners: 1655.45 ($n = 2986$) Non-owners: 577.34 ($n = 193$)
Knowledge of cat laws (cat owners/non-owners) Chi square test	There was a statistically significant association between cat ownership and knowledge of cat laws ($\chi^2 = 10.470$, $df = 2$, $p = .005$).	Sample size <ul style="list-style-type: none"> Cat owners ($n = 2989$) Non-owners ($n = 194$) Adjusted residual scores >2 or < -2 : <ul style="list-style-type: none"> The percentage of cat owners who reported that they knew cat laws was higher than expected, while the percentage of cat owners who reported that they did not know cat laws was lower than expected. The percentage of non-owners who reported that they did not know cat laws was higher than expected, while the percentage of non-owners who reported that they did know cat laws was lower than expected.
Satisfaction with cat laws (cat owners/non-owners) Mann-Whitney <i>U</i> test	Owners had higher satisfaction with cat laws than non-owners, and the difference was statistically significant ($U = 5694.0$, $p < .001$).	Mean ranks: <ul style="list-style-type: none"> Owners: 408.14 ($n = 774$) Non-owners: 217.86 ($n = 28$)

Topic and type of test	Result	Additional information
<p><u>Importance of containing cats during the night</u> (cat owners/non-owners) Mann-Whitney U test</p>	<p>Non-owners placed higher importance on containing cats during the night than owners, and the difference was statistically significant ($U = 180252.0, p < .001$).</p>	<p>Mean ranks:</p> <ul style="list-style-type: none"> • Non-owners: 1907.57 ($n = 168$) • Owners: 1510.74 ($n = 2896$) <p>Note: while the results of this statistical test indicate that non-owners placed a significantly higher importance on containing cats during the night than cat owners, the majority of cat owners (70%) and non-owners (74%) both reported that they thought it was important to contain cats at night.</p>
<p><u>Importance of containing cats during the day</u> (cat owners/non-owners) Mann-Whitney U test</p>	<p>Non-owners placed higher importance on containing cats during the day than owners, and the difference was statistically significant ($U = 117323.5, p < .001$).</p>	<p>Mean ranks:</p> <ul style="list-style-type: none"> • Non-owners: 2142.11 ($n = 2775$) • Owners: 1430.28 ($n = 164$)
<p><u>Should there be a night-time curfew on cats?</u> (cat owners/non-owners) Chi square test</p>	<p>There was a statistically significant association between cat ownership and opinions about a night-time curfew on cats ($\chi^2 = 48.713, df = 2, p < .001$).</p>	<p>Sample size</p> <ul style="list-style-type: none"> • Cat owners ($n = 2950$) • Non-owners ($n = 188$) <p>Adjusted residual scores >2 or < -2:</p> <ul style="list-style-type: none"> • The percentages of cat owners who reported that they did not support a night-time curfew or that they were unsure was higher than expected, and percentage of cat owners who reported that they did support a night-time curfew was lower than expected. • The percentage of non-owners who reported that they did support a night-time curfew was higher than expected, while the percentages of non-owners who were unsure or who did not support a night-time curfew was lower than expected.
<p><u>Should cat registration be mandatory?</u> (cat owners/non-owners) Chi square test</p>	<p>There was a statistically significant association between cat ownership and opinions about cat registration ($\chi^2 = 82.279, df = 2, p < .001$).</p>	<p>Sample size</p> <ul style="list-style-type: none"> • Cat owners ($n = 2962$) • Non-owners ($n = 189$) <p>Adjusted residual scores >2 or < -2:</p> <ul style="list-style-type: none"> • The percentages of cat owners who reported that they did not support mandatory registration or that they were unsure was higher than expected, and percentage of cat owners who reported that they did support mandatory registration was lower than expected. • The percentage of non-owners who reported that they did support mandatory registration was higher than expected, while the percentages of non-owners who were unsure or who did not support mandatory registration was lower than expected.
<p><u>Should all pet cats be de-sexed?</u> (cat owners/non-owners) Chi square test</p>	<p>There was <u>no</u> statistically significant association between cat ownership and opinions about cat registration ($\chi^2 = 2.147, df = 2, p = .342$).</p>	<p>Sample size</p> <ul style="list-style-type: none"> • Cat owners ($n = 2964$) • Non-owners ($n = 190$)
<p><u>Should micro-chipping be compulsory?</u> (cat owners/non-owners) Chi square test</p>	<p>There was a statistically significant association between cat ownership and opinions about mandatory micro-chipping of cats ($\chi^2 = 6.867, df = 2, p = .032$).</p>	<p>Sample size</p> <ul style="list-style-type: none"> • Cat owners ($n = 2957$) • Non-owners ($n = 190$) <p>Adjusted residual scores >2 or < -2:</p> <ul style="list-style-type: none"> • The percentage of cat owners who reported that they did not support mandatory micro-chipping was higher than expected. • The percentage of non-owners who reported that they did not support mandatory micro-chipping was lower than expected.

Topic and type of test	Result	Additional information
<p><u>Cats per residence: should there be a limit?</u> <u>(cat owners/non-owners)</u> Chi square test</p>	<p>There was a statistically significant association between cat ownership and opinions about the need for a limit on cat ownership ($\chi^2 = 16.010$, $df = 2$, $p < .001$).</p>	<p>Sample size</p> <ul style="list-style-type: none"> • Cat owners ($n = 2954$) • Non-owners ($n = 189$) <p>Adjusted residual scores >2 or < -2:</p> <ul style="list-style-type: none"> • The percentage of cat owners who reported that they did support a limit was lower than expected, and the percentage of cat owners who reported that they did not support a limit was higher than expected. • The percentage of non-owners who reported that they did support a limit was higher than expected, and the percentage of non-owners who reported that they did not support a limit was lower than expected.
<p><u>Cats per residence: what should be the limit?</u> <u>(cat owners/non-owners)</u> Mann-Whitney U test</p>	<p>Owners suggest higher limit for cats per residence than non-owners, and the difference was statistically significant ($U = 124128.0$, $p < .001$).</p>	<p>Mean ranks:</p> <ul style="list-style-type: none"> • Owners: 1399.71 ($n = 2544$) • Non-owners: 793.77 ($n = 176$)
<p><u>Are roaming cats a nuisance?</u> <u>(cat owners/non-owners)</u> Chi square test</p>	<p>There was a statistically significant association between cat ownership and opinions about roaming cats as a nuisance ($\chi^2 = 55.908$, $df = 1$, $p < .001$).</p>	<p>Sample size</p> <ul style="list-style-type: none"> • Cat owners ($n = 2566$) • Non-owners ($n = 179$) <p>Adjusted residual scores >2 or < -2:</p> <ul style="list-style-type: none"> • The percentage of cat owners who reported that roaming cats are a nuisance was lower than expected, and the percentage of cat owners who reported that roaming cats are not a nuisance was higher than expected. • The percentage of non-owners who reported that roaming cats are a nuisance was higher than expected, and the percentage of non-owners who reported that roaming cats are not a nuisance was lower than expected.
<p><u>Responses to roaming cats</u> <u>(cat owners/non-owners)</u> Chi square test</p>	<p>There was a statistically significant association between cat ownership and management responses to roaming cats ($\chi^2 = 35.141$, $df = 1$, $p < .001$).</p>	<p>Sample size</p> <ul style="list-style-type: none"> • Cat owners ($n = 2549$) • Non-owners ($n = 179$) <p>Adjusted residual scores >2 or < -2:</p> <ul style="list-style-type: none"> • The percentage of cat owners who reported that they have taken action regarding roaming cats was lower than expected, and the percentage of cat owners who reported doing nothing about roaming cats was higher than expected. • The percentage of non-owners who reported that they have taken action regarding roaming cats was higher than expected, and the percentage of cat owners who reported doing nothing about roaming cats was lower than expected.



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