

Cat Tracker

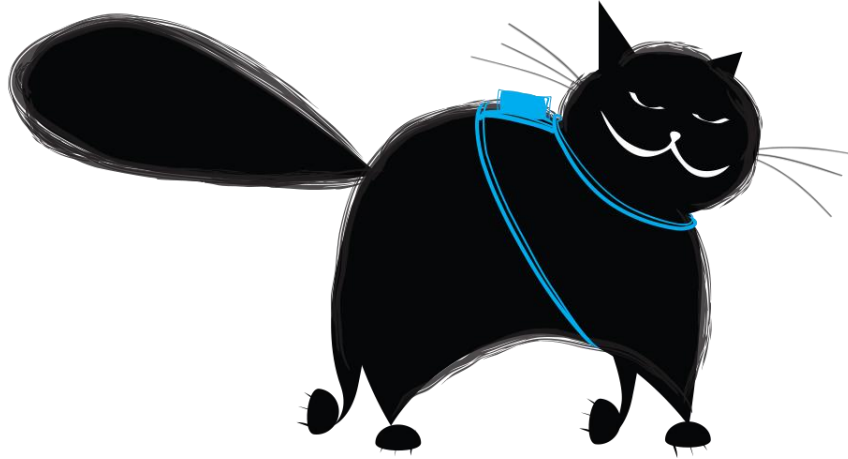
New Zealand

Understanding pet cats through Citizen Science

Public Report: November 2017

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Cat tracker nz

Domestic cats are one of the most popular pets worldwide and they play an important and much-cherished role in the lives of many New Zealanders. The **Cat Tracker** project was designed to help cat owners make informed decisions about the care and management of their pet cats. The **Cat Tracker** project originated in the USA and was launched in New Zealand in February 2015. The project focused on the movement and management of pet cats in New Zealand, 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 this project!

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- [Victoria University of Wellington](#)
- [Wellington City Council](#)
- [WWF New Zealand](#)

Victoria University of Wellington project team

- **Dr Heidy Kikillus** is the research leader of the [Cat Tracker New Zealand](#) initiative. As a researcher, she is interested in citizen science (actively involving the wider community in research projects) as well as how non-native species adapt to new environments. Heidy led the **Cat Tracker** project in New Zealand and contributed to all aspects of the project: research design, developing project resources, data collection, data analysis, and report writing. She has a spoiled indoor-only Ragdoll cat named *Pancho Villa*.



- **Dr Lisa Woods** is a statistical consultant in the School of Mathematics and Statistics at Victoria University of Wellington. She has an interest in Applied Statistics (in all areas of research) and was involved in the statistical analysis of the copious amount of **Cat Tracker** data.

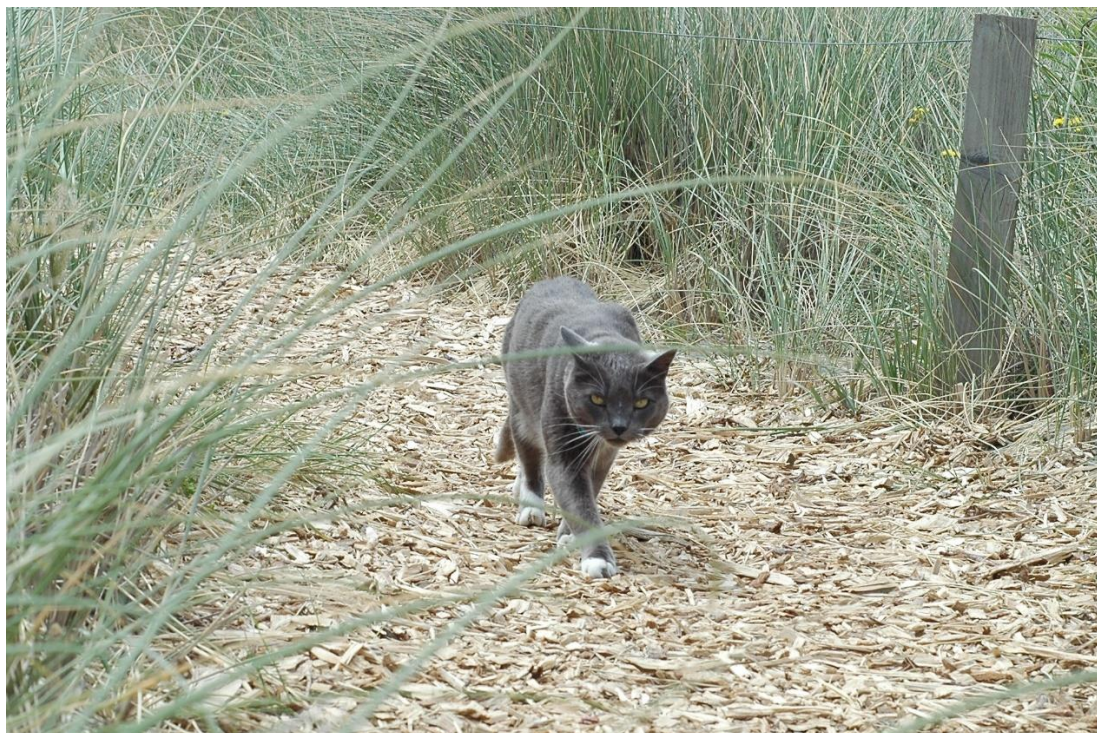


International partners

- **University of South Australia**
Dr Philip Roetman (research leader of the [Discovery Circle](#) initiative) and **Dr Hayley Tindle** ([Discovery Circle](#) project officer) ran 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 Carla Litchfield** is a Lecturer in Psychology, **Dr Belinda Chiera** is a Senior Lecturer in Statistics, and **Gillian Quinton** was an Honours student in 2015. All contributed to the project, especially the cat personality analyses. For the **Cat Tracker** South Australia results, please see: <http://bit.ly/cat-tracker-report-south-australia>
- **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 contributed to the **Cat Tracker** project in the USA, where the GPS tracking of pet cats began: <http://cattracker.org/>
- We would also like to thank Ellen Irwin, Charles Daugherty, Kelly Hare, Amber Bill, Myfanwy Emeny, Illona Keenan, Leon Briggs, Bernard Smith, Anita Benbrook, Tony Stoddard, Nicky Nelson, Megan Sellars, and many others for their advice and support.

Research Approvals

In New Zealand, **Cat Tracker** was approved by the Victoria University of Wellington's Animal Ethics Committee (#2014R11) and Human Ethics Committee (#20164).



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 New Zealanders. 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 New Zealand. 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 project has had two main phases: 1) a questionnaire (survey), and 2) a cat tracking activity.

The *Cat Tracker* questionnaire

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 focused 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 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 residing in the Wellington region who completed the questionnaire were able to nominate themselves (and their cats) to participate in the second phase of the project, the cat tracking. The desire to participate was enormous and unfortunately not all potential participants were able to be accommodated during the project's timeframe. During the cat tracking phase, cat owners used GPS (Global Positioning System) tracking devices supplied by the research team to track their own cats. These tracks are available for public viewing through the [Cat Tracker New Zealand](#) website under the "Meet the cats" section.

Key research questions related to the cat tracking:

1. How large (or small) are the home ranges of pet cats?
2. Are there differences between the day and night home ranges of pet cats?
3. How are cat home ranges related to cat characteristics and cat management?

This report

For analysis, we had a total of **2,610 surveys**, including data about **2,428 individual cats**. At the completion of cat tracking we had successfully tracked **209 cats** in the Wellington region. In this report we present an overview of the results and some analysis of our survey and cat tracking data. 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 = 2610)’ indicates that the responses of 2,610 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.

Statistics: In the results section of this report we use the phrasing “more than expected” or “less than expected”. This refers to the *statistically expected* value. While many of the results may seem intuitive, it is important to quantify whether or not there is a statistically significant difference between compared groups.

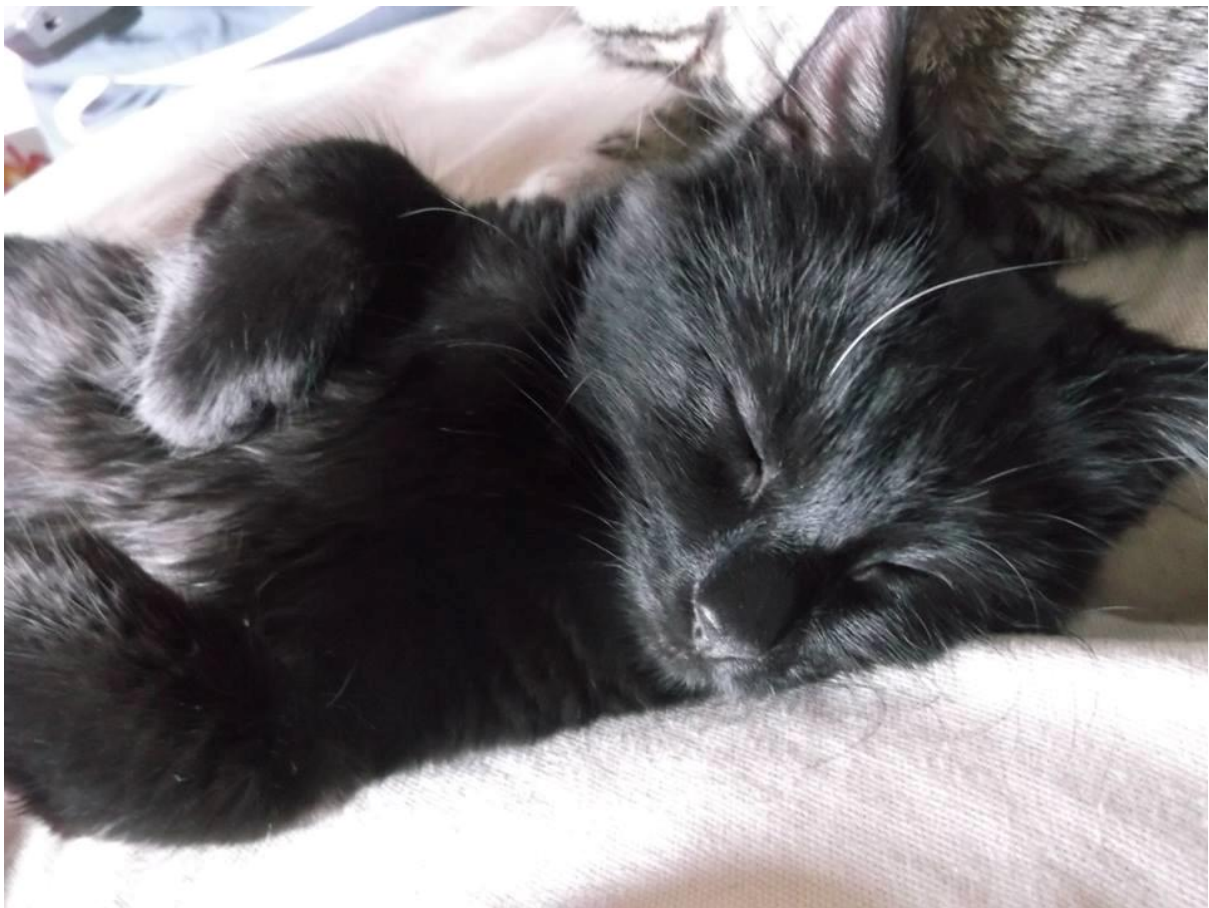
Quotes and photographs: Throughout this report we have presented photographs of cats that we have tracked and quotes from survey respondents. The photographs and quotes are not linked in any way (i.e. the quotes were not submitted by the owners of the cats pictured beside them). Further, where suitable 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 have been lightly edited for readability (e.g. amended spelling).

“Ownership” definition / status: According to the Ministry for Primary Industries’ [Animal Welfare \(Companion Cats\) Code of Welfare 2007](#), the term “owner” is used to describe those who have a pet cat that they provide care for. During the **Cat Tracker** survey, it was brought to our attention by many survey respondents that they preferred terms such as “guardian” or “caretaker”, rather than “owner”. While we acknowledge the usefulness of these synonyms, we have continued to use the term “owner” in this report as it was the term used in the original survey questionnaire and is also the term currently used in legislation in New Zealand.

The Code of Welfare also recognises three categories of cats: “companion”, “stray”, and “feral”. **Companion cats** are defined as those which are fully provided for by humans (i.e., pets). **Stray cats** are provided for either directly or indirectly by humans (e.g., given food and / or shelter), and **feral cats** do not rely on humans for any aspect of their survival. This report deals primarily with companion cats (pets), but some survey questions do refer to the other categories of cats (also sometimes referred to as “unowned” or “semi-owned” cats).

Cats in New Zealand

Cats can cause problems in New Zealand. As there are no native land mammals here (aside from bats), native New Zealand wildlife – comprised primarily of insects, lizards, and birds – have few strategies to avoid predation by introduced mammals. The impact of introduced predatory mammals (including rodents, possums, cats, and mustelids) is considered to be one of the most significant conservation issues in New Zealand. Cats are, in part, responsible for the extinction of the Stephens Island wren and the decline of many native reptile populations ⁽¹⁾. 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 that they provide.



Meet the cats

The cats of *Cat Tracker*

In this section, we provide information from the survey about **2,428 New Zealand cats**. Note that not all participants provided a response to every question, and in these cases the number of responses will be less than 2,428.

Popular cat names

Respondents were asked the names of their cats. There was great diversity in cat names, with 704 unique names for male cats and 796 unique names for female cats. The most common names are presented below.

Most popular male cat names		
<i>Ranking</i>	<i>Cat name</i>	<i>Frequency (# of cats)</i>
1	Charlie	14
2	George	9
	Monty	9
	Tiger	9
3	Buddy	8
	Max	8
4	Basil	7
	Fred	7
	Harry	7
	Merlin	7
5	Archie	6
	Felix	6
	Jack	6
	Leo	6
	Ollie	6
	Sylvester	6
	Toby	6
6	Alfie	5
	Bob	5
	Colin	5
	Frankie	5
	Jasper	5
	Smudge	5
	Tigger	5
	Zeus	5

Most popular female cat names		
<i>Ranking</i>	<i>Cat name</i>	<i>Frequency (# of cats)</i>
1	Bella	18
2	Lucy	16
	Poppy	16
3	Molly	15
4	Millie	11
5	Cleo	8
	Daisy	8
	Lily	8
	Luna	8
	Olive	8
6	Minnie	7
	Missy	7
	Pixie	7
	Ruby	7
	Sophie	7
	Stella	7
	Willow	7
7	Polly	6
	Tiger	6
	Tilly	6
	Tui	6
8	Chloe	5
	Lulu	5
	Maggie	5
	Midnight	5

Some of the less common cat names were: d'Artagnan Rumblepurr, Kittysaurus Rex, Tatty Bogler Humphries III, Lemon Squeezy, Evil, Bugalugs, Timothy Finnigan Twoshoes Gullett, Chub tub, #CuddleUnit5, The Little Black Cat, Plasma, Terabyte, Scsi, Megatron Jellybean A-Flock-Of-Seagulls Houdini Bryant, Cuddlebum, Sea Swirl, Rabies, Shit Cat, Greyskull, Hey Diddle, Toot!, The Grey Mop, Tricera Cat, Odd socks, Op Shop, and Plutonium.

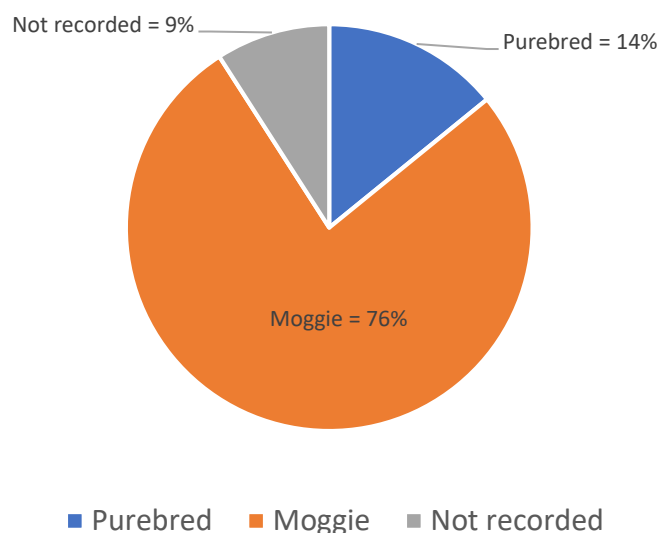
Many cats shared their names with various foods and beverages, including: Waffle, Pickle, Pinot, Merlot, Wonton, Taco, Champers, Marmite, Gurnard, Cazador, Spikelet the Pikelet, Whisky, Noodle, Pretzel, Ouzo, Satay, Tamari Almond, Nacho, Jäger, Cornflake, Muesli, Gin, Olive, Caper, Bean, Mocha, Cookie, Raspberry, Candy, and Milkshakes.

Some cats were named after historical figures or celebrities (sometimes with a pun), including: Mr. Meowgie, Winston Purrchill, Richie Mclaw, Miranda Purr, Graham West, Marsellus Wallace, Mike Pero, Baby Jesus, Smokey Stone Cold Steve Austin the Second, Joey Tribbiani, (Silent) Bob, and Chairman Meow.

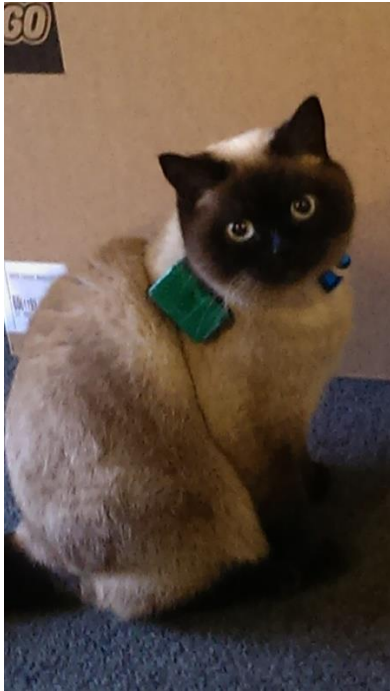
Cat demographics

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.** In this case, “moggie” refers to a “typical” cat, i.e., one that is not purebred.

Breed of pet cats (n = 2428)



Purebred breeds included: Abyssinian, Bengal, Birman, Burmese, British Blue, British Shorthair, Devon Rex, Exotic, La Perm, Maine Coon, Mandalay, Manx, Norwegian Forest Cat, Persian, Ragdoll, Russian Blue, Siamese, Tonkinese, and Turkish Van.

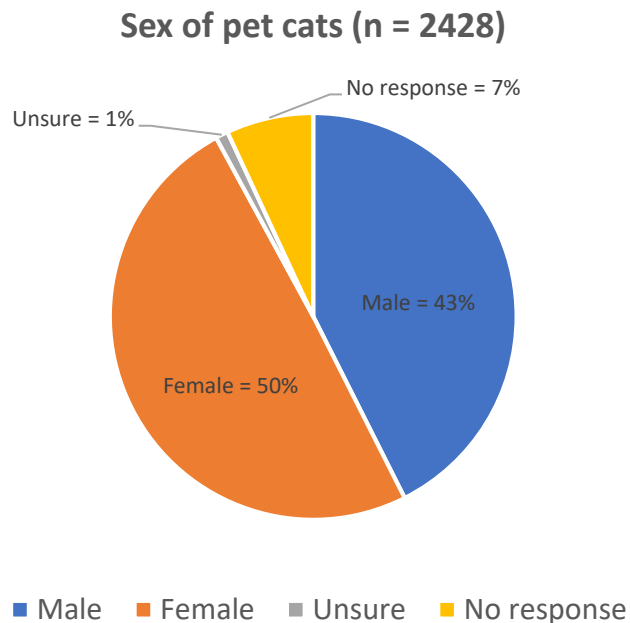


“Owning a purebred cat made me think a lot more about ownership, and his breeder was very strict about her rules before she would agree to sell him to me”

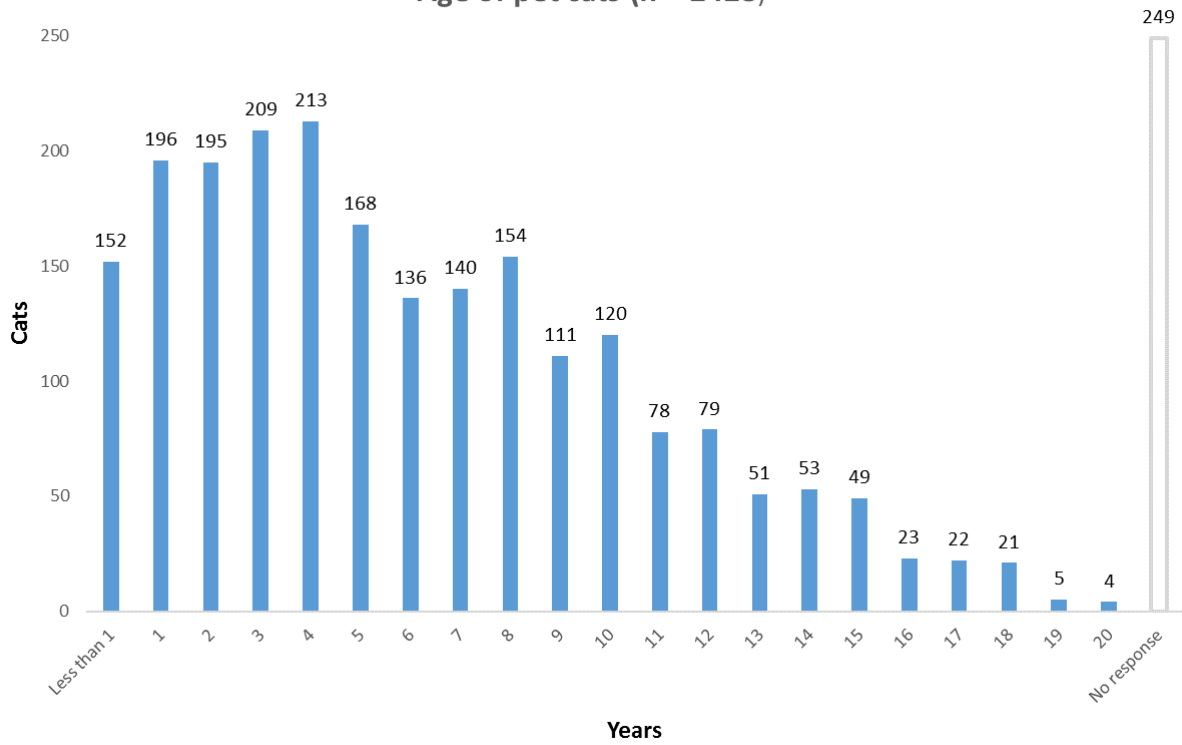
“We have never had 'fancy' cats, just moggies”

“I had intended to get a kitten from the SPCA but mistakenly went to see a Birman breeder just for fun and fell in love with her. I still feel guilty for having a fancy breed cat, but she is amazing”

The charts below and on the next page present the responses to questions about the sex and age of pet cats. Survey respondents reported owning **slightly more female cats than male cats** and a wide range of cat ages. The median age for pet cats (where participants provided this information) was **5 years old**.

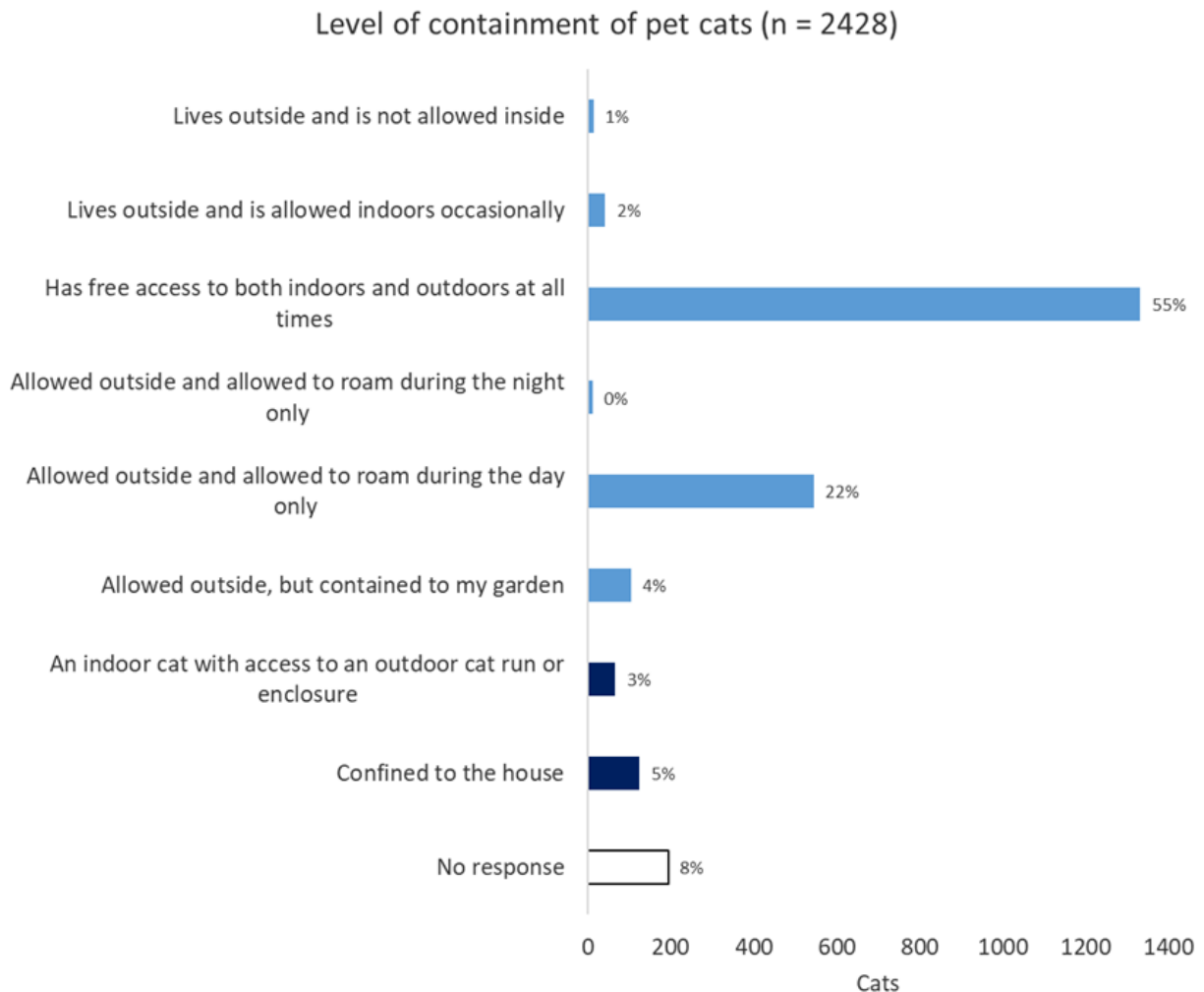


Age of pet cats (n = 2428)



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 (84%) are shaded in a lighter blue colour. Cats considered indoor cats (8%) are shaded in a darker blue. **Most cats were outdoor cats.**

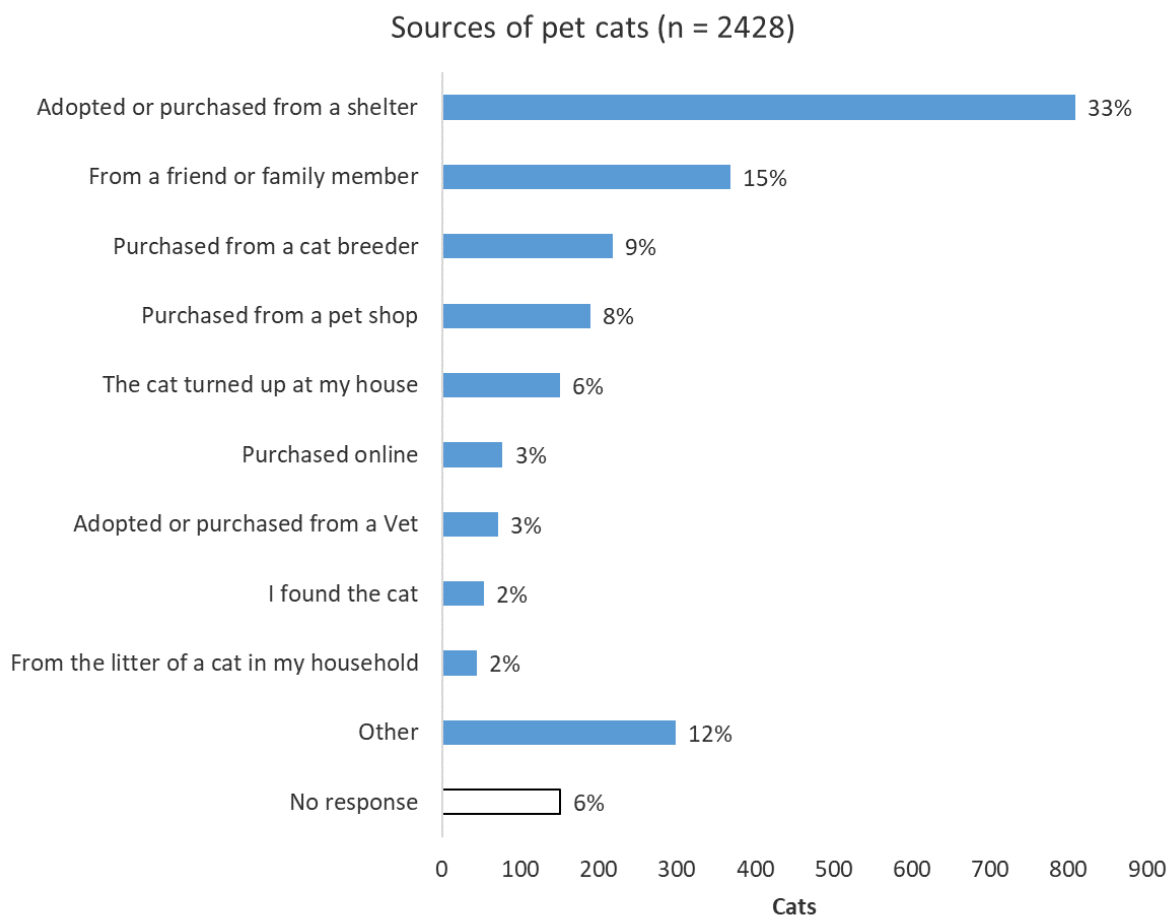


“Both our cats are free to roam our house and neighbourhood as they please. One does bring back the odd bird, but usually it is when we go away and they are rarely native. When we lived in the country he caught rabbits all the time and was very good at it - he helped keep the population down. Many cats are responsible in this area for keeping pest populations down. I believe it would be cruel to keep [our cats] inside for even a few hours - they love being outside and so do we. Why would we want to take that away from them?”

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, or a family member.**

The “other” category included situations such as: foster kittens that stayed, cats advertised in the local paper, taking in abandoned cats, birthday gifts, from an op shop, and marrying the cat’s owner.



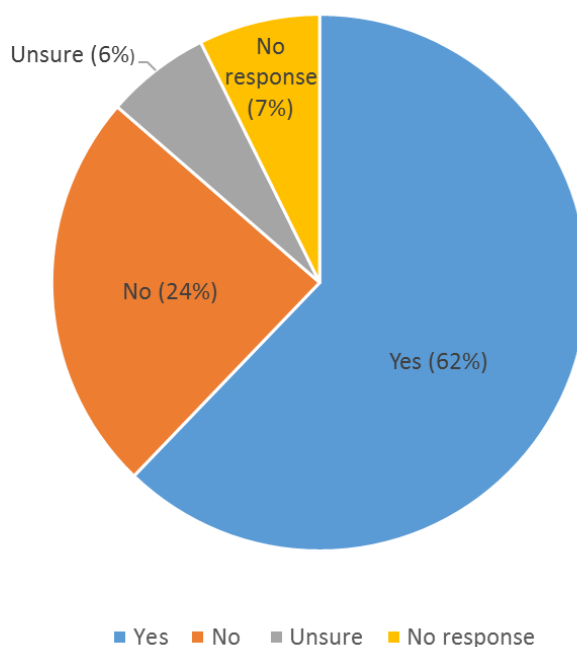
“We bought [our cat] from the Cat Protection League. She was a bit shy at first, but she had developed confidence and even though she is not a highly affectionate cat, she readily sits on our lap in the evenings”

“I have always had cats - they usually just turn up but the last two we got from the SPCA”

Prey seen by owners

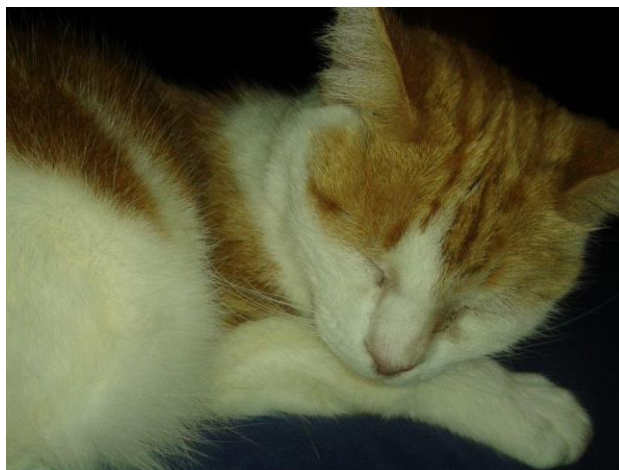
The chart below presents the responses to the question “Does [your cat] catch prey indoors or outdoors (e.g. mice, birds, insects, reptiles)?” **Most survey respondents reported that their cat caught prey.** Please note that these data only include prey that has been seen by the cats’ owners. Owner-reported “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 of cat hunting behaviours used small video cameras on cats and found that 23% of prey was taken back to the cat’s home, whereas the other 77% of prey was not likely to be seen by the owner (it was left behind or consumed on site) ⁽²⁾.

Does your cat catch prey? (n = 2428)



“Cats also eat rats and mice...to some extent they must control their populations, so by eliminating the cats, you may end up with a major bloom in rats and mice...”

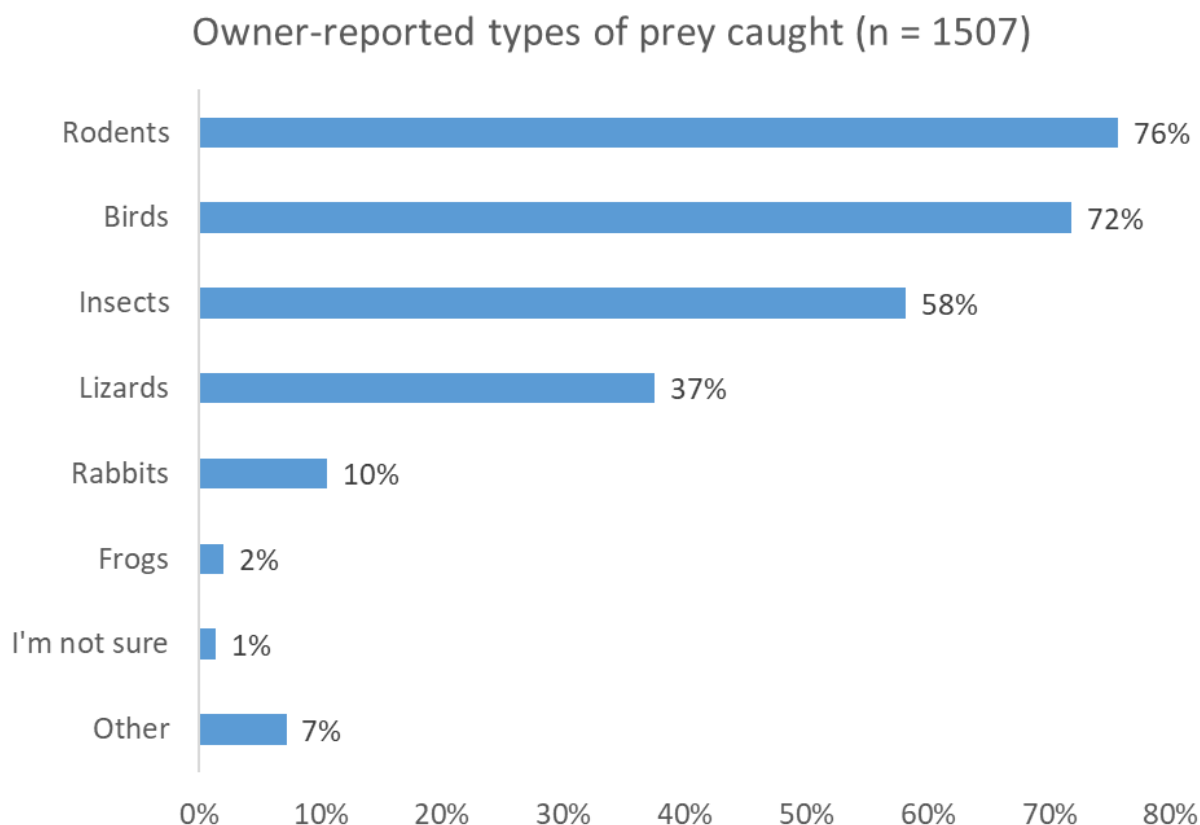
“It is not the cats' faults that they hunt the wildlife; it is in their nature to do this. It is our responsibility to prevent it continuing and to do so humanely as we have introduced the cats in the first place”



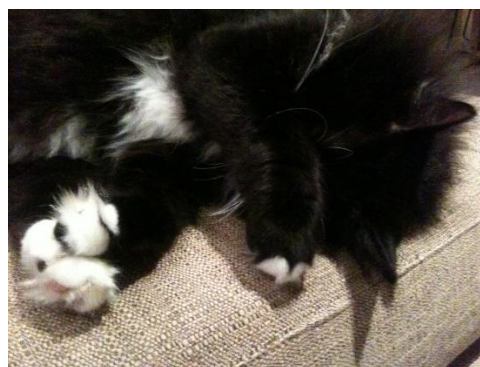
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Cat prey

When asked “*What types of prey has [your cat] caught?*”, 62% of cat owners provided responses, which are presented in the chart below. **Rodents, birds, and insects were the most common prey items reported.** The “other” category included items such as: stoats, crayfish, eels, a chicken, dog toys from next door, half a peach, stolen clothing from neighbour’s yard, leaves, missing nerf gun pellets, the neighbour’s toast, socks, a huge goldfish, toilet paper rolls, and weasels.

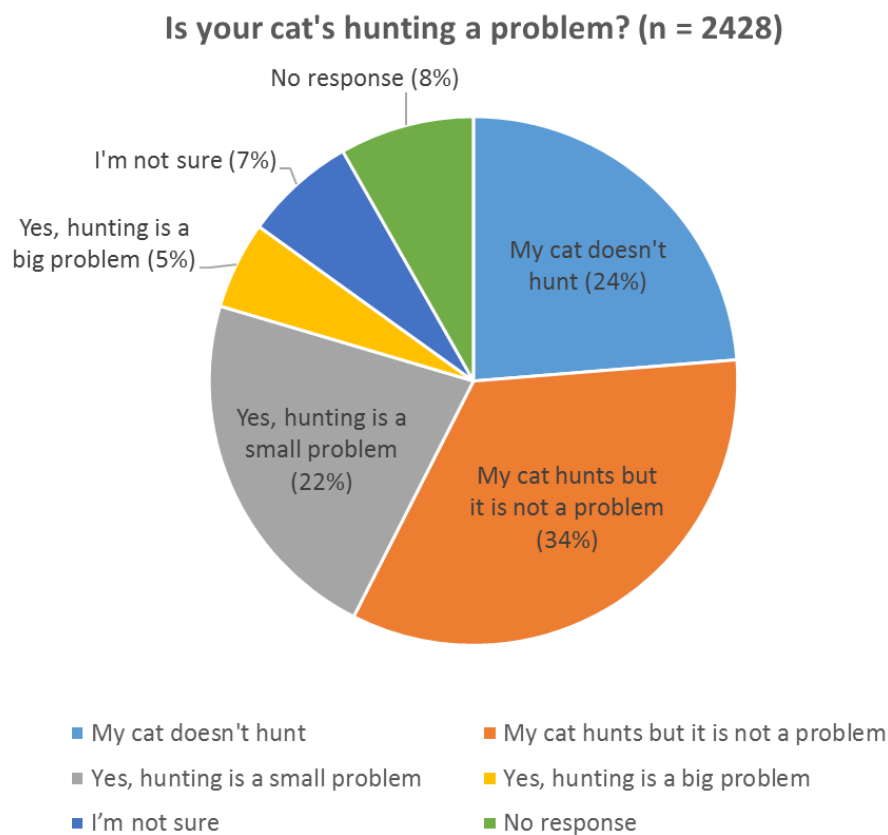


“I'm not too bothered about cats catching imports such as sparrows, mice, or blackbirds. However, if our cat came home with a native in its mouth, I'd turn it into slippers (the cat that is)”



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 (please 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 (27%), or that their cat did not hunt (24%).** 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 (7% of the respondents).



“...she still disappears outside for hours each day, bringing back many skinks, wetas, and the odd worm or spider that she lets loose in the house. (It hurts to stand on half a weta when walking around in the dark)”



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Cat care

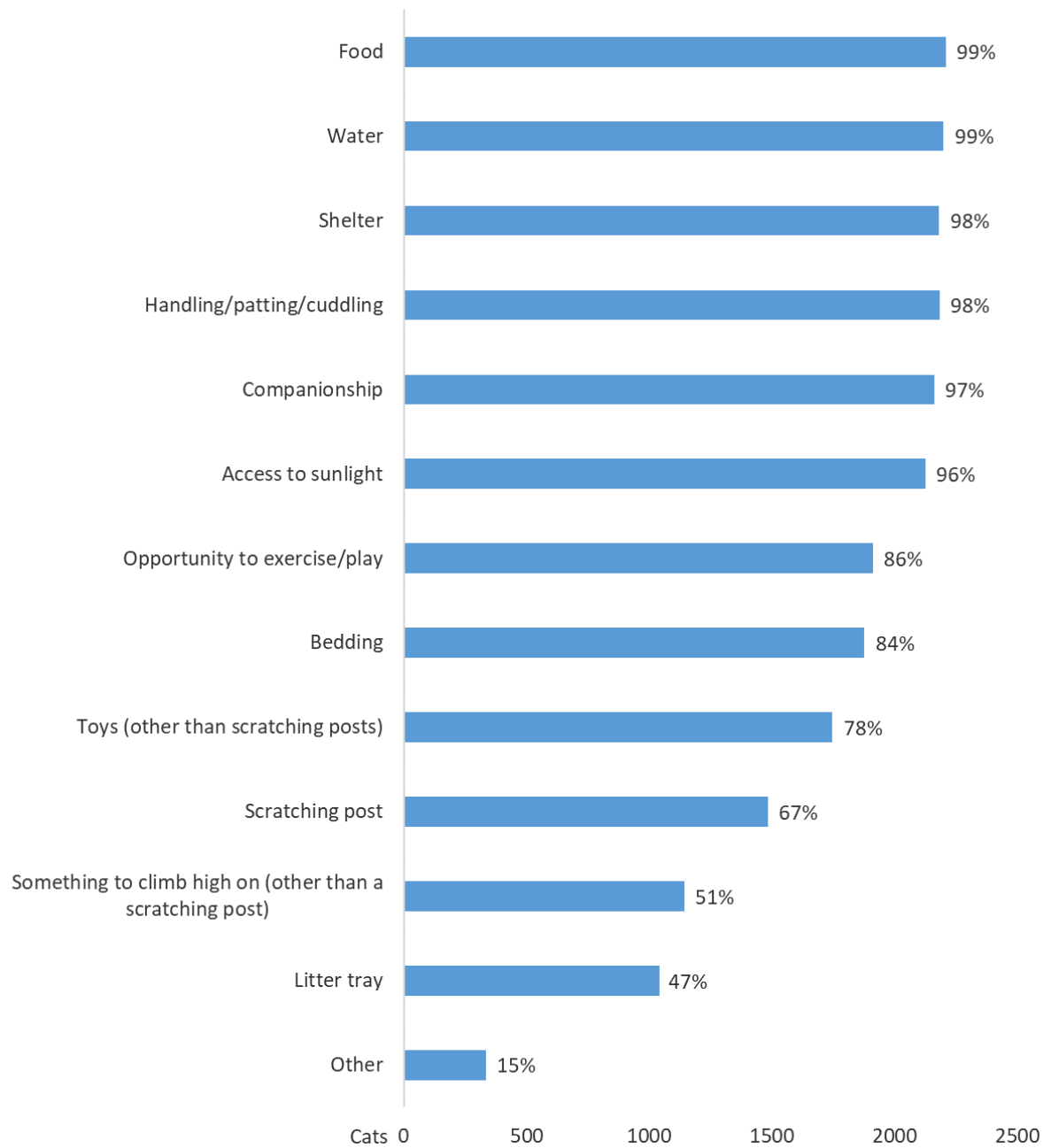
Provision for cats

The chart below presents 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 food, water, shelter, handling, and companionship.** Cat owners did not provide responses to this question for 202 cats, which equals 8% of the total cat sample group.

The “other” category included items such as: other pets (such as dogs) to play with, 9,500+ fans on Facebook, a large wilderness gully section, a lovely lounge suite to rip to shreds, adoration, a door opening-and-closing service, whatever she needs, cat flap, catnip, classical music, grooming, strawberry yoghurt, a heated bed, medication, an iPad to play games on, pet insurance, and unconditional love.



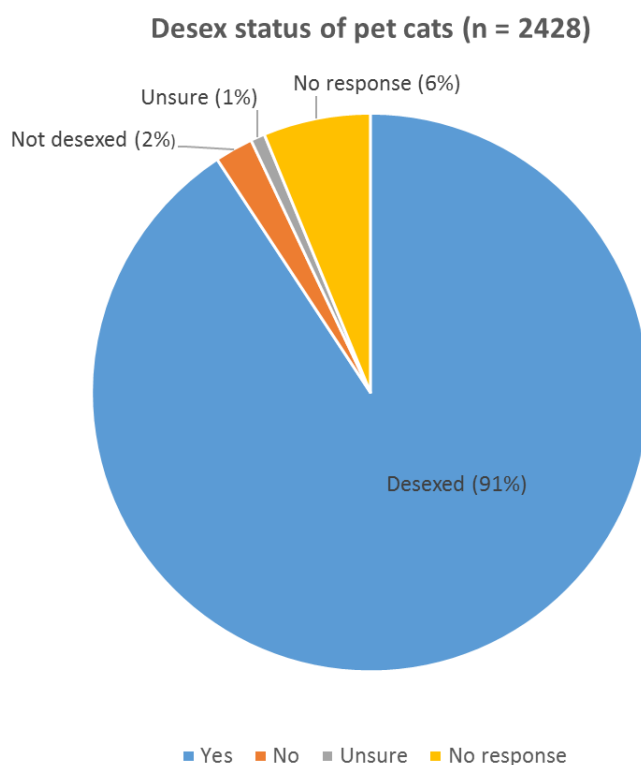
What cat owners provide for their pet cats (n = 2226)



Cat health care

Neuter status of cats

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



Reasons given why cats were not desexed included: animal rights, too old, too young, cost, currently pregnant, breeding queen, and will be a mum or dad.

Regular health treatments

The table below presents the responses to questions about regular health treatments for pet cats. Specifically, cat owners were asked if their cats were regularly wormed, treated for fleas, vaccinated, and checked by a veterinarian (n = 2428). **Approximately 80% of cat owners reported that their cats were regularly wormed and flea treated, while approximately two-thirds of cat owners reported that their cats were regularly vaccinated and checked by a veterinarian.**

	Wormed	Flea treated	Vaccinated	Checked by a vet
Yes	80%	83%	65%	67%
No	11%	8%	24%	22%
Unsure	2%	1%	3%	2%
No response	7%	8%	8%	9%

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 may benefit from places to hide. Also, an understanding of an animal's personality might help zookeepers 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, such as 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 that their pet is healthy and happy.

Researchers in the UK and the USA (Marieke Gartner, David Powell, and Alexander Weiss)⁽³⁾ 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 New Zealand and South Australia. The large number of cats has allowed us to analyse pet cat personality like never before! We performed an analysis 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

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 that you seek professional advice from your veterinarian 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 out 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.

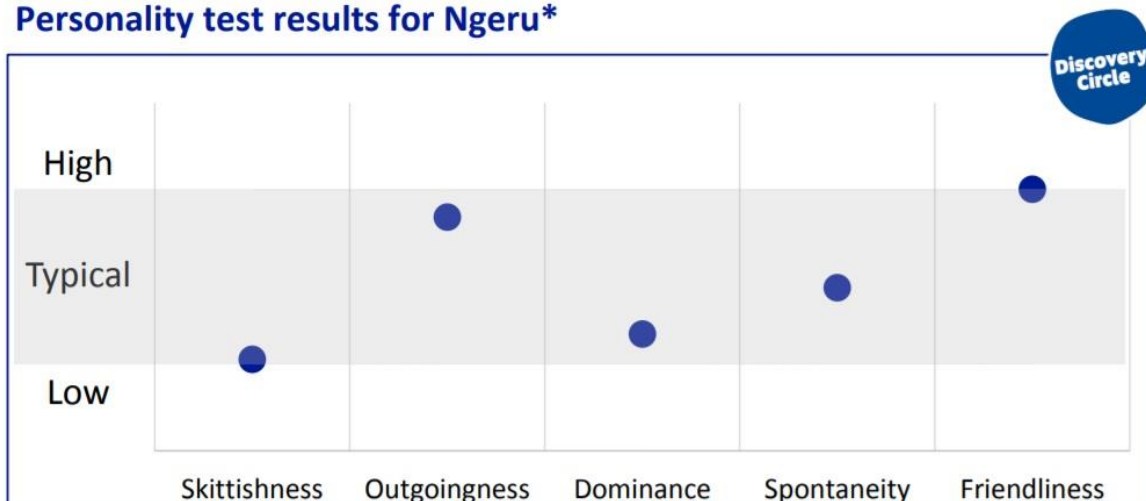
Friendliness

- 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 cats' 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.

Personality test results for Ngeru*



*Please note: if this cat is under one-year of age their personality may still be developing.

"I have always grown up with cats and have loved their different personalities and the way they fit into family. Some cats are better than others on picking up human emotions than others and are there to be affectionate to help you feel better if needed"

Indoor and outdoor cats

Considering that cat personalities may change over time, we thought that 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 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 that 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).

Further resources

- If you'd like to read more about our cat personality research, please see: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0183455>
- If you'd like to learn more about the human 'Big Five' personality factors, please see: <https://www.123test.com/big-five-personality-theory/>
- If you'd like to fill out a personality test for your cat and receive a personalised report, please contact discoverycircle@unisa.edu.au.



"I have lived with cats all my life. Most of them have been affectionate creatures, each with their own distinct personality"

"Cats are a very important pet and can provide friendship and love - depending on their personality!"

"We have had a few cats over the years and they have all had very different personalities"

"She has a lively and quirky, affectionate personality and we love her a lot. At 11 she still looks and acts like a kitten and is very playful with string toys. It does us all good to play with her and cuddle up with her. She is a purr factory!"



Attachment to cats

Cats play a much-cherished role in the lives of many New Zealanders, 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 used the **Lexington Attachment to Pets Scale** ⁽⁴⁾, 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 from 4,084 cats (from both New Zealand and South Australia, 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 this data is needed and more detailed results will be published separately.



“He was an important part of a happy childhood, taught me about responsibility for caring for another creature, about love and grief. I still love cats, and see people on their own, often elderly people, whose lives have great meaning and are enriched by owning and loving a cat, their cats are hugely important for good mental health and giving a reason to live, the benefit of having cats as friends outweighs the occasional trouble they cause”.

“Our cat is my husband's pride and joy. He takes 100s of pictures of the cat, and spends many hours each week playing with him. The cat sleeps in his own bed, but cuddles up with my husband early each morning prior to breakfast”.

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 focused on very few cats. For example, Roland Kays and Amielle DeWan ⁽⁵⁾ 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 ^(6,7,8,9). Most of 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 size 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 or hand-delivered GPS tracking units (i-gotU GT-120s) with harnesses to domestic cat owners in the Wellington region. Cat owners fitted the harnesses and GPS units to their cats to track their pets' movements 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 that the cat was accustomed to wearing the equipment before tracking commenced. The GPS units were programmed to cease tracking after one week. Participants then returned the equipment 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 [Cat Tracker New Zealand](http://www.cattrackernz.org) website (see an example on the next page). In total, we tracked **209 cats** in the Wellington region.



An example of the type of information collected by the **Cat Tracker** project. Cat maps can be found at www.cattracker.nz under the “Meet the cats” section.



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 ⁽¹⁰⁾. 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 is usually reported in hectares.

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

- **Eight Olympic-sized swimming pools** (these pools are typically 50 meters long and 25 meters wide)

As a comparison, the entire grassy area of Wellington’s Basin Reserve is approximately 1.6 hectares.

Tracking data were processed by the research team using optimisation software supplied with the GPS units, plus speed filters and manual checks in **Movebank**. We used an online infrastructure called **ZoaTrack** (<https://zoatrack.org/>) to calculate home ranges. ZoaTrack uses the statistical software ‘R’ and the **adehabitatHR** package to calculate home ranges ⁽¹¹⁾. 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.

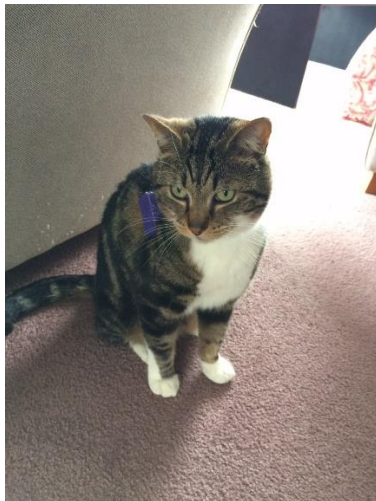
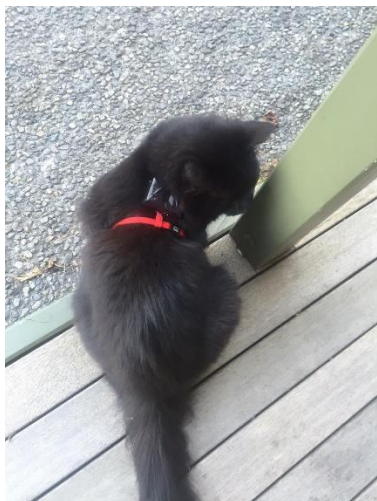
The **Cat Tracker** project was deliberately established to track a large number of cats. We used readily-available GPS units that were able to track cats for one week. Cats may vary their home ranges in different seasons and in response to changing competition (i.e. from other cats) or the availability of mating partners, food, or other resources. We therefore consider our home range calculations to be a 'snapshot' into the lives of the cats that 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.

During the project, GPS loggers were deployed 291 times. Of these deployments, 209 were successful. Reasons why a deployment was unsuccessful included: the cat was not happy wearing the logging equipment (therefore we advised the owner removed harness early), participant changed their mind, equipment failure / flat battery, owner forgot, and lost tracking units.

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 by our Australian collaborators where it was ascertained that the median home range levelled-off after that number of days. For the New Zealand cats included for further analyses we had 28,627 data points. The median number of data points per cat was 125. Some samples of home ranges are provided on the following page.



The home ranges of ten cats tracked in southern Wellington City (Island Bay, Berhampore, Houghton Bay, and Lyall Bay).

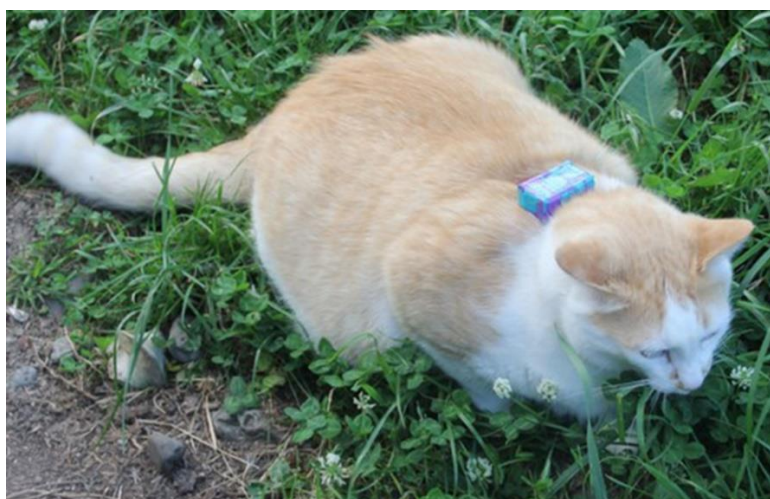
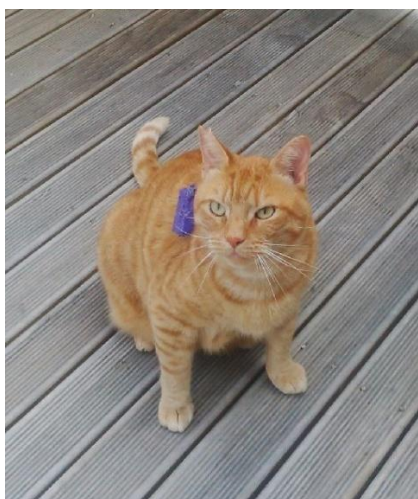


Cat travel statistics

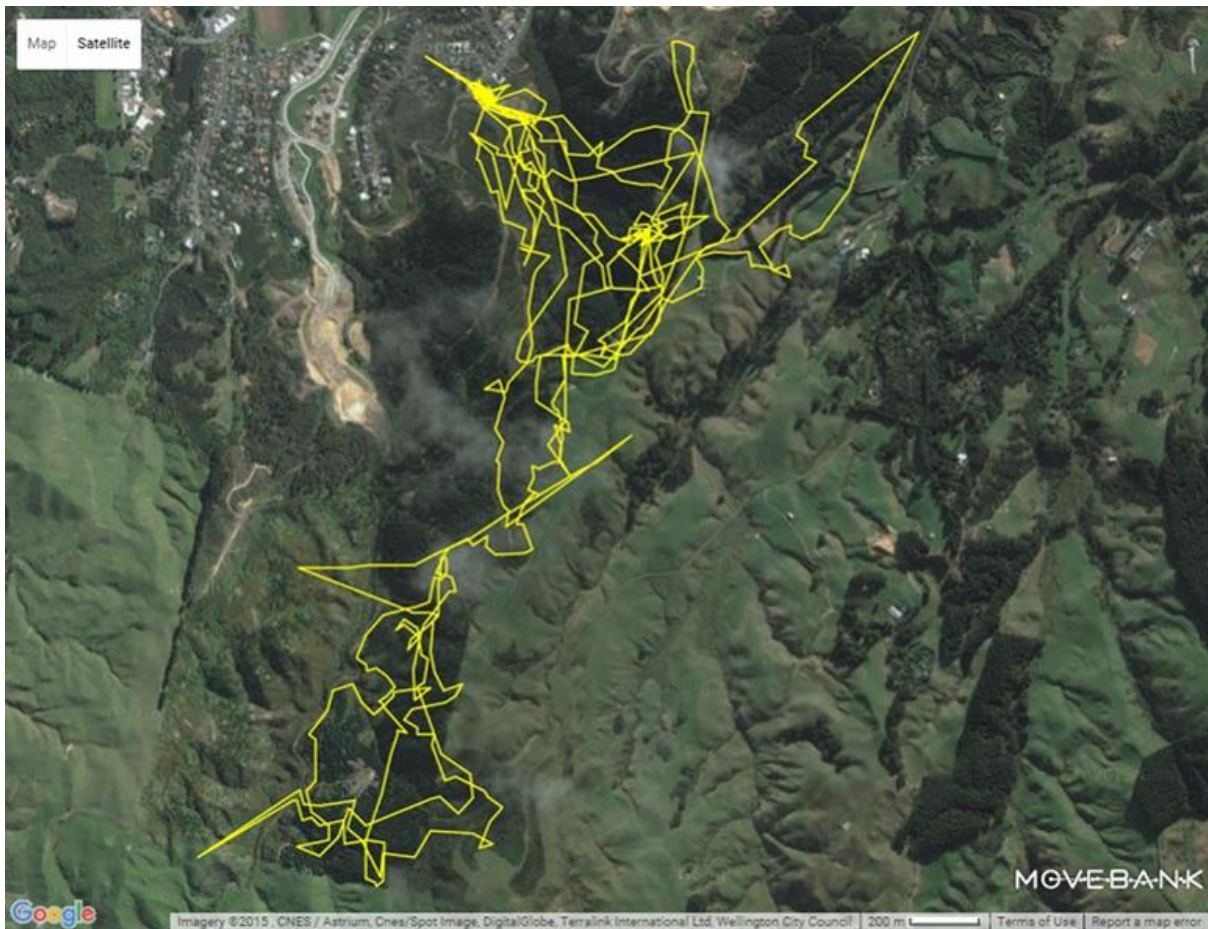
We calculated the home ranges and other descriptive statistics of 209 cats. The descriptive statistics are provided in [Appendix 1](#). We then conducted statistical tests to determine whether the sizes of the cats' home ranges were significantly different for cats in various groups. The first groups 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 included the breeds of cats (moggies vs. purebreds). 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 3.28 hectares (about twice the size of the grassy area of the Basin Reserve). 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 were smaller than the median). **The median home range size was 1.3 hectares**, about half of the average size (slightly less than the size of the Basin Reserve). The reason that the average home range size was higher than the median home range size was that most cats (70 %) had a home range under 2 hectares, while a few cats had much larger home ranges – with our most mobile cat covering over 200 hectares (almost the size of ZEALANDIA sanctuary) *and more than 5 times the range of any other cat tracked in the study!* (See below for *SuperCat's* map). The average of any data set 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 value to represent a typical case.



The map of the most-mobile cat tracked in the study. *SuperCat* had a home range of 214 hectares - *more than 5 times the range of any other cat tracked in the study!*



Roads crossed per day

We calculated the number of roads crossings made by each cat while it was tracked. We then divided the number of roads crossed by the number of days that the cat was tracked in order to determine the road crossings per day. The 209 cats crossed between zero and 25 roads per day. **The average number of roads crossed per day was 4.2 and the median was 3.4.**

Male and female home ranges

- **Male cats had larger home ranges than female cats, and the difference was statistically significant.**
- This test included 94 male cats and 115 female cats. Further details regarding the statistical testing are presented in [Appendix 2](#).

Home range and neuter status

Almost all cats (n = 207) were reported as desexed. Two cat owners did not provide this information. **Therefore, we are unable to conduct robust statistical analyses to see if there is a difference in the home ranges of desexed and undesexed cats in this instance.**

Home range and breed

- **There was no statistically significant difference in the size of cats' home ranges between moggie and purebred cats.**
- This test included 182 moggie cats and 24 purebred cats. Three respondents did not provide this information so were excluded from the analysis. Further details about the statistical testing are presented in [Appendix 2](#).



Sedentary vs. Wandering cats

We separated the tracked cats into two groups: **Sedentary cats** and **Wandering cats**, based on the sizes of their home ranges. We based our “cut off” point on previous work in this area ^(9,12,13).

Sedentary cats (n = 92) had a home range of **one hectare or less** (95% MCP), while **Wandering cats** had a home range of **more than one hectare** (n = 117). We identified several variables of interest and analysed them in relation to Sedentary and Wandering cats. As not all cat owners answered every survey question, the numbers of Sedentary and Wandering cats varies for each analysis listed in the table below.

Variable (further details about these variables are in Appendix 1)	Classification	Number of cats fitting this description	Average scores	Median scores
Roads crossed per day	Sedentary	92	3 roads per day	2.23 roads per day
	Wanderer	117	5.1 roads per day	4.14 roads per day
Fight frequency	Sedentary	90	4 (corresponds to the category “Yearly”)	4 (corresponds to the category “Yearly”)
	Wanderer	117	3.95 (corresponds very closely to the category “Yearly”)	4 (corresponds to the category “Yearly”)
Prey caught	Sedentary	62	5.1 (corresponds very closely to the category “4 items of prey per month”)	3 (corresponds to the category “2 items of prey per month”)
	Wanderer	83	5.2 (corresponds very closely to the category “4 items of prey per month”)	3 (corresponds to the category “2 items of prey per month”)
Time spent inside	Sedentary	87	13 hours per day	12 hours per day
	Wanderer	113	11.8 hours per day	12 hours per day
Age*	Sedentary	87	4.9 years	4 years
	Wanderer	115	4.9 years	4 years
Provision for cat	Sedentary	90	9.95 (indicates that, on average, the cats tracked were provided with approximately 10 of the 12 items in the list of provisions in Appendix 1)	10 (indicates that the cats tracked were provided with 10 of the 12 items in the list of provisions in Appendix 1)
	Wanderer	117	10.1 (indicates that, on average, the cats tracked were provided with approximately 10 of the 12 items in the list of provisions in Appendix 1).	10 (indicates that the cats tracked were provided with 10 of the 12 items in the list of provisions in Appendix 1).
Time spent with owner	Sedentary	89	2.7 (indicates an average between categories 2 and 3, which correspond to 1 – 10 hours and 10 – 20 hours per week)	3 (corresponds to 10 – 20 hours per week)
	Wanderer	116	2.7 (indicates an average between categories 2 and 3, which correspond to 1 – 10 hours and 10 – 20 hours per week)	3 (corresponds to 10 – 20 hours per week)
Owner-estimated distance cat travels	Sedentary	39	2.2 (corresponds very closely to the category “100 m beyond my property”)	2 (corresponds to the category “100 m beyond my property”)
	Wanderer	48	2.3 (corresponds very closely to the category “100 m beyond my property”)	2 (corresponds to the category “100 m beyond my property”)

*Age analysed was the owner-reported age of cat at the time they took the **Cat Tracker** questionnaire; cats were tracked later (some several months later).

We then conducted statistical tests to determine the statistical significance of differences between sedentary cats and wandering 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 92 Sedentary cats and 117 Wandering cats; further details about the statistical testing are presented in [Appendix 2](#).

Cat fights

- **There was no statistically significant difference between Sedentary and Wandering cats and the frequency of which they showed signs of being in fights with other cats.**
- This test included 90 Sedentary cats and 117 Wandering cats (2 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 does *your cat* shows signs of being in a fight with cats that are not your cats?”).

Prey

- **There was no statistically significant difference between Sedentary and Wandering cats and the frequency of which their owners reported that they saw them with prey.**
- This test included 62 sedentary cats and 83 wandering cats (64 owners did not report how much prey they saw); further details about the statistical testing are presented in [Appendix 2](#).
- Please note that 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 equally 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 87 sedentary cats and 113 wandering cats (9 owners did not report how much time their cats spent inside); further details about the statistical testing are presented in [Appendix 2](#).

Age

- **There was no statistically significant difference between Sedentary and Wandering cats and their ages.**
- This test included 87 sedentary cats and 115 wandering cats (7 owners did not report the age of their cats); further details about the statistical testing are presented in [Appendix 2](#).
- Please note that the values analysed are the ages of cats reported at the time the survey was taken, not necessarily the age at which the cats were tracked (i.e., we did not affix GPS units to young kittens).

Provision for cats

- **There was no statistically significant difference between Sedentary and Wandering cats and the number of provisions types provided for them by their owners.**
- This test included 90 sedentary cats and 117 wandering cats (2 owners did not report what they provided for their cat); further details about the statistical testing are presented in [Appendix 2](#).



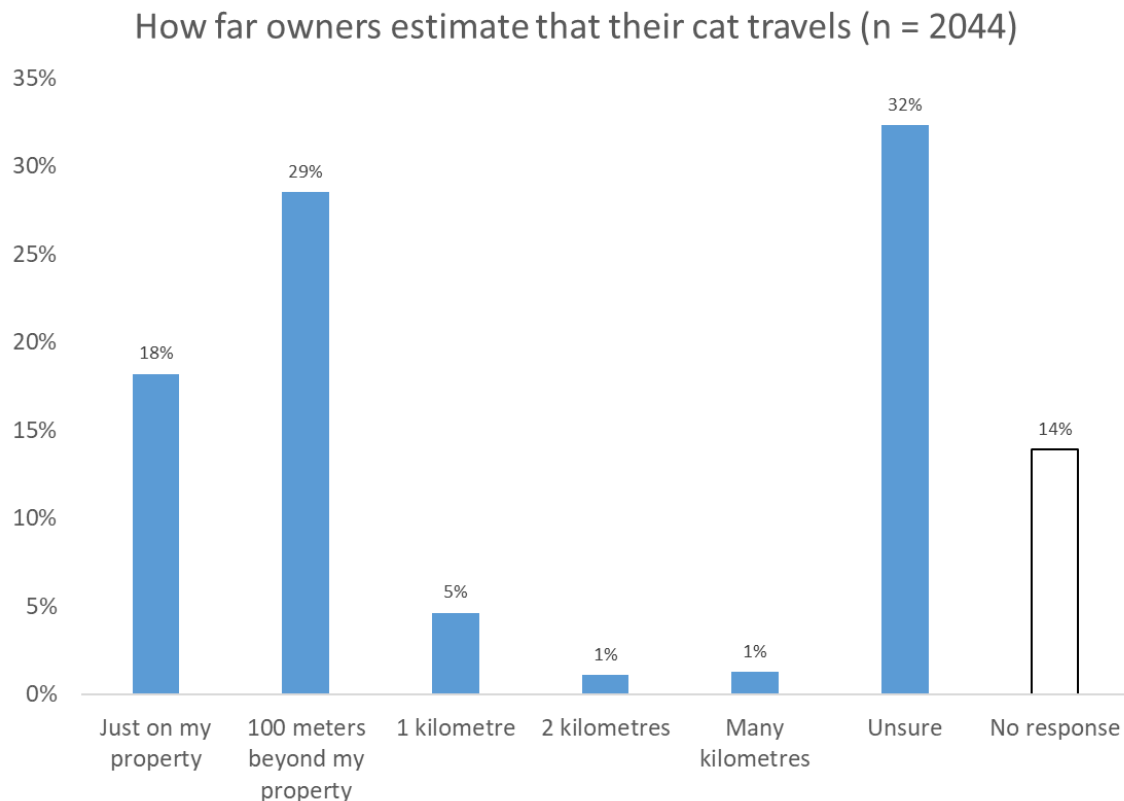
Time with owners

- Regarding time spent with owners, there was **no** statistically significant difference between sedentary and wandering cats.
- This test included 89 sedentary cats and 116 wandering cats (4 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** survey estimated that their cats stayed very near or on their property (47%) or were unsure of how far their cats travelled (32%). 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 209 cats we tracked and have included in further analyses, 87 (42%) of the owners estimated how far their cats travelled from home (prior to tracking). Most of the cat owners whose cats we tracked (n = 122) (58%) did NOT estimate how far from home their cats travelled.

- There was no statistically significant difference between cat owners' estimation of how far their cat travelled from home and whether the cats were classified as **Sedentary or Wandering**.
- This test included 39 sedentary cats and 48 wandering cats (122 owners did not estimate how far their cats travelled); further details about the statistical testing are presented in [Appendix 2](#).

“I was staring aimlessly out the upstairs bathroom window one sunny day, when I saw [my cat] walking up the neighbour's roof towards their open bathroom window. He proceeded to calmly and nonchalantly jump through the open window and he was gone. I was a somewhat shocked as I never would have thought he'd go into someone else's house. I wondered if he was sitting in their bath miaowing for the tap to be turned on like he does at home. I never saw him come out, and when he came home he never mentioned it.”



“Cats are not like dogs in their willingness to follow commands, so their movements are much harder to control”

Day cats versus Night cats

We separated the movement data into day-time and night-time datasets based on the sunrise and sunset times on the days that cats were tracked. We then calculated day-time and night-time home ranges for each cat. When all tracked cats were included in the analysis, we found that 99 cats had larger day-time home ranges, 99 cats had larger night-time ranges, and 11 cats showed no difference between their day-time and night-time home ranges.

Variable	Description	Number of observations	Minimum – Maximum	Average (mean)	Median
Day-time home range (95% MCP)	Based on GPS cat tracking and home range calculations	209	0 – 117.3 hectares	2.14 hectares	0.7 hectares
Night-time home range (95% MCP)	Based on GPS cat tracking and home range calculations	209	0 – 127.4 hectares	2.12 hectares	0.8 hectares

Daytime versus night-time home ranges

Sixty-five participants (31% of cats tracked) reported that their cats were confined at night, 2 cats were reported to be confined during the day and allowed to roam at night, and 2 cat owners did not provide this information. When the analysis was run with the 140 cats that were reported to have 24-hour access to the outdoors, we found that 44% of cats had larger day-time ranges, 52% had larger night-time ranges, and 4% showed no difference between their day-time and night-time home ranges.

Statistical tests (**Wilcoxon Signed Ranks Test**) were conducted to determine whether the difference in the sizes of cat’s 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.

- **There was no statistically significant difference in daytime and night-time home ranges for cats that had 24-hour access to the outdoors.** 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. Of the 65 tracked cats that had been classified by their owners as “**Allowed outside and allowed to roam during the day only**”, 23 had larger night-time home ranges than day-time home ranges – and of these, 14 had night-time home ranges over one hectare in size. Thus, **over 20% of the cats that owners considered to be indoors at night had home ranges after sunset that were large enough to classify the cats as wanderers during the night.**

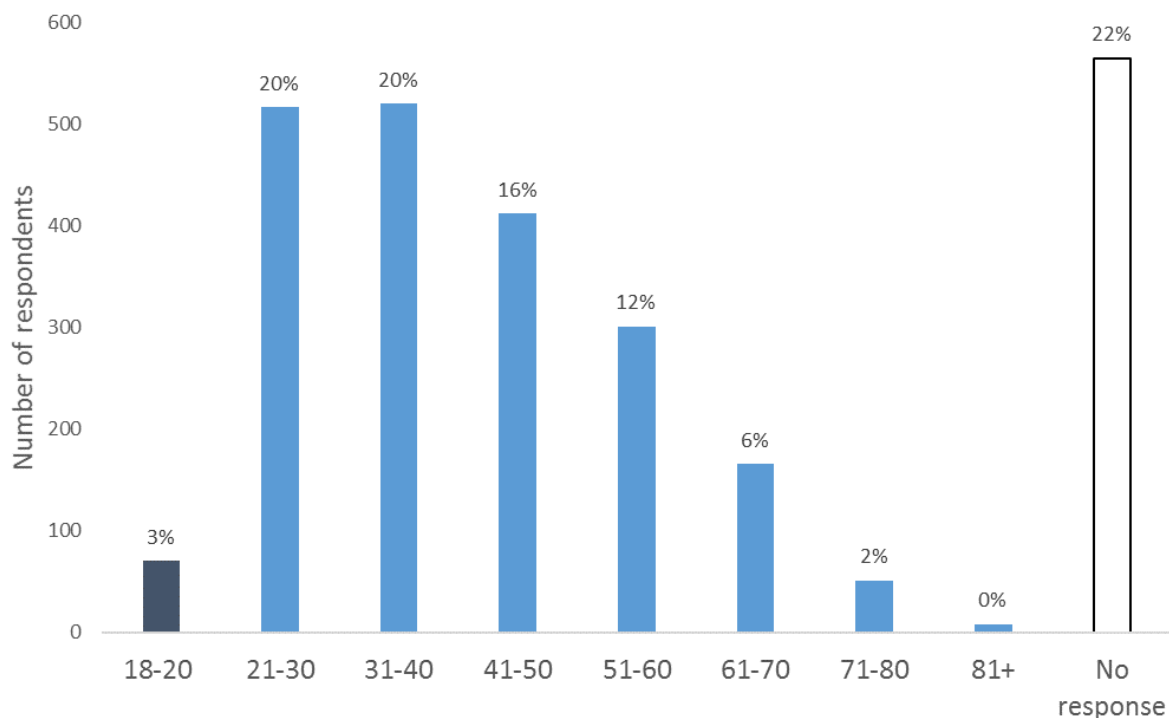
Meet the people

At the completion of data collection, we removed duplicate and spurious surveys. After data cleaning, we had a total of 2,610 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.

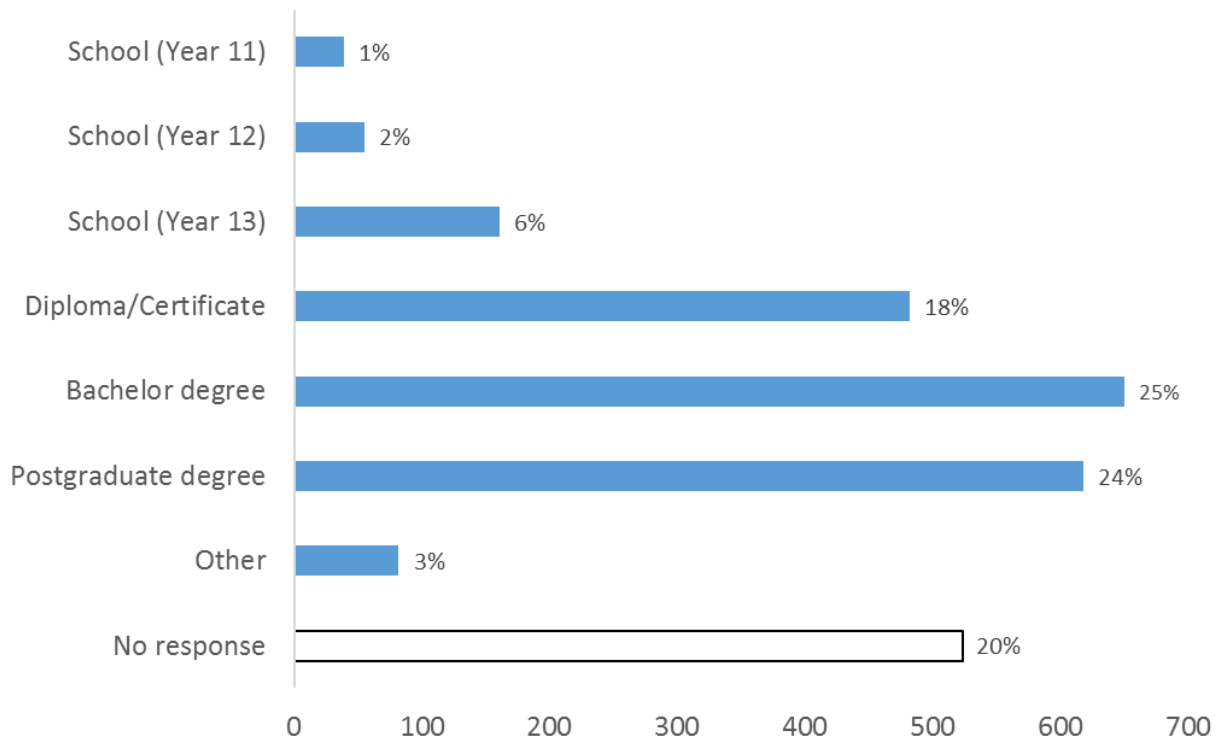
Respondent demographics

Survey respondents were mostly female (65%, n = 1,704), with 381 males (15%) and 525 (20%) people who did not respond to the question about gender. It was brought to our attention that several survey respondents would have preferred an option to state that they did not affiliate with a particular gender. In most 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 findings 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 (shaded darker) bar represents a smaller age group (2 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 **31-40 years old** and the median level of education was a **bachelor degree**, for those who provided this information.

Age cohorts of survey respondents in years (n = 2610)



Level of education of survey respondents (n = 2610)

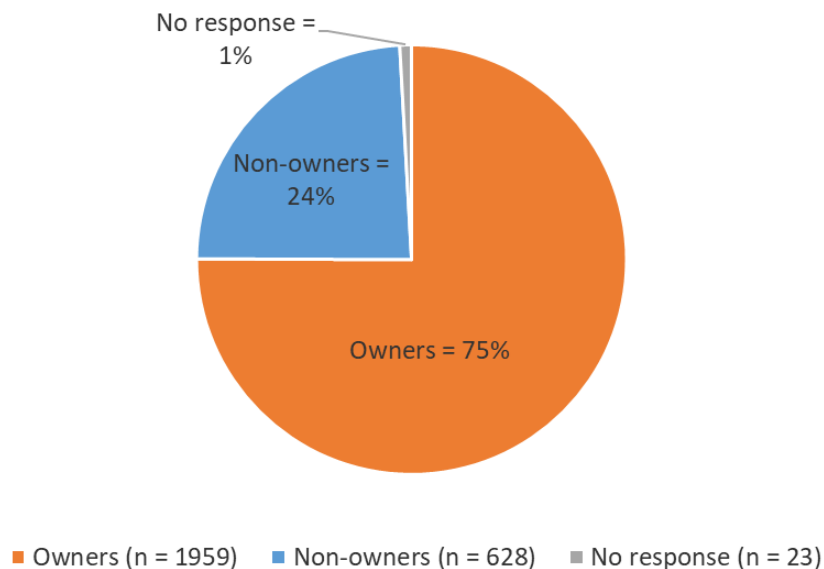


Cat ownership

Cat owners and non-owners

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

Survey respondents: Cat ownership (n = 2610)



“You can’t escape cats, they are everywhere. People have the option to own them but there doesn’t seem to be the option of not having them!”

“I adore cats and they have given our family so much love and entertainment...They are mysterious and quirky and stunning”

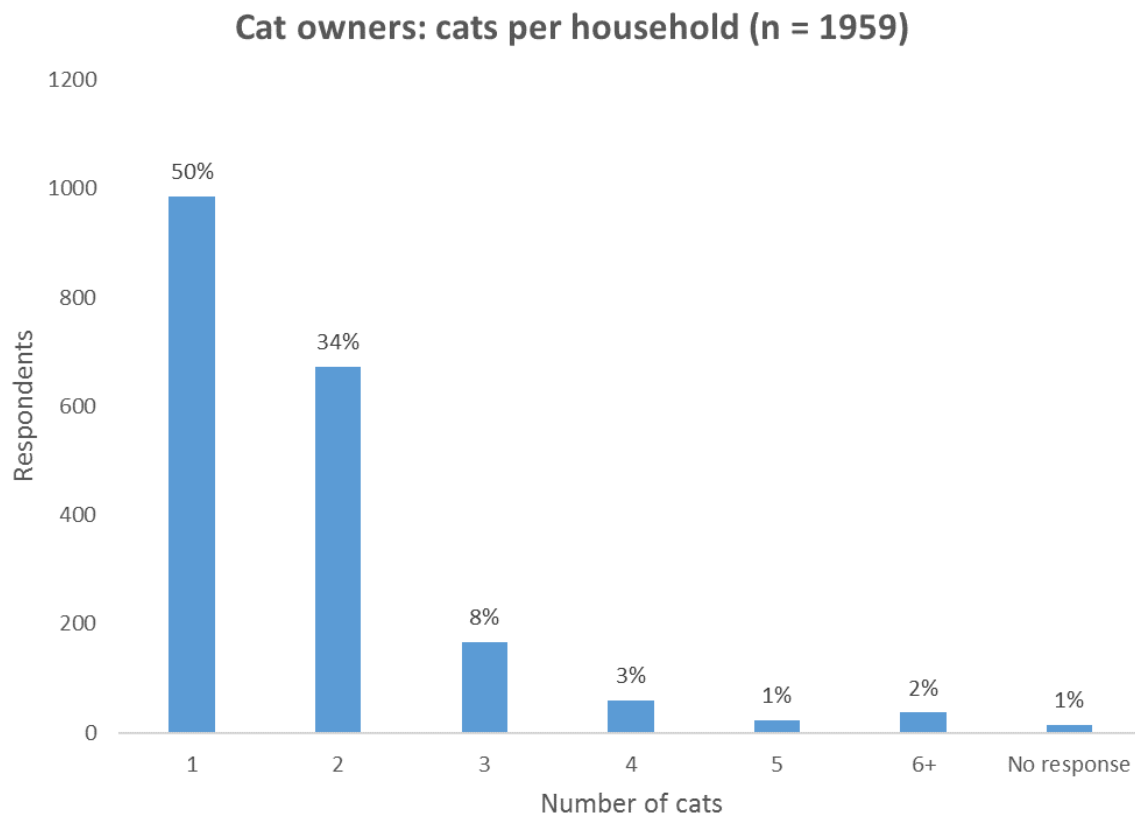
“I hate them. I will never own another cat in my lifetime again. They all buggered off on me and went wild/feral”

“My cats are my family. And without them there would be no reason for facebook :)”



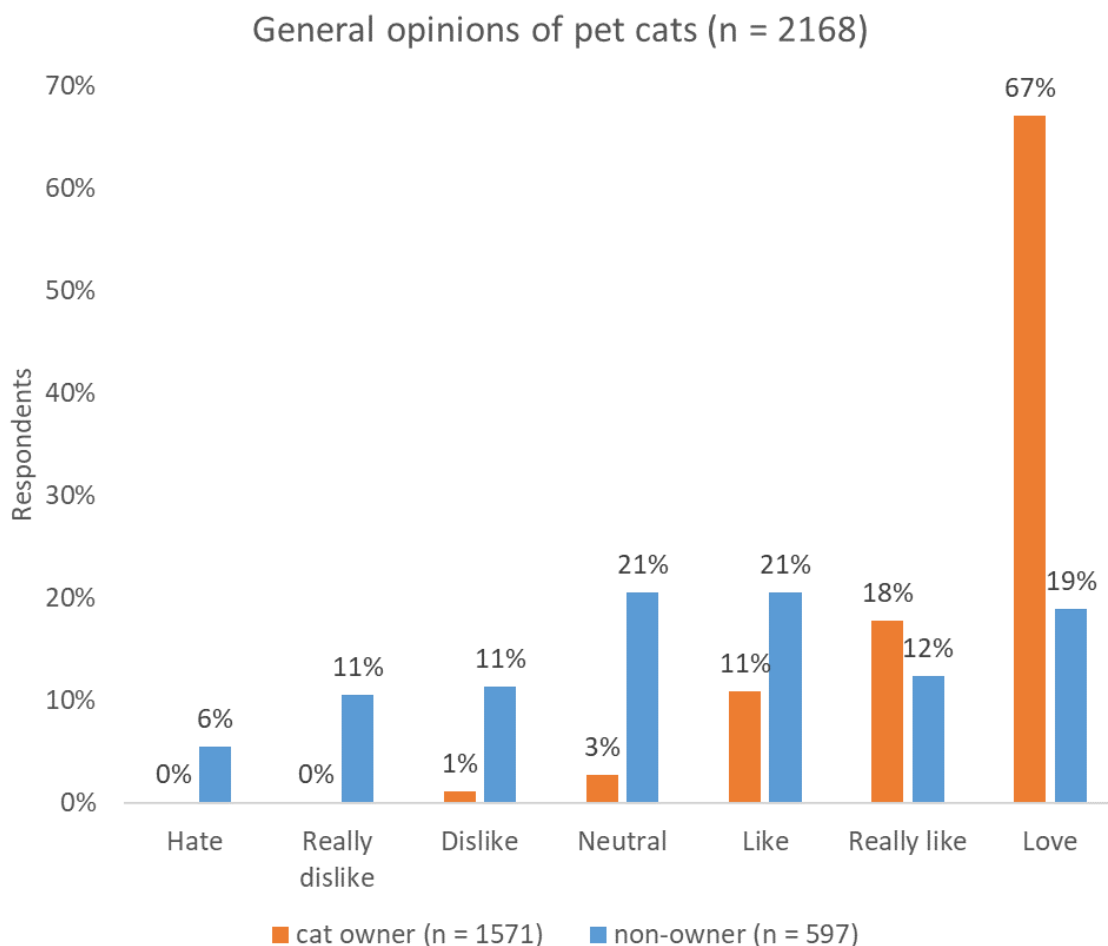
Cats per household

The average number of cats per household was 1.78 and the median was 1 cat per house (for the 1,959 *Cat Tracker* survey respondents that were cat owners). The chart below presents the responses to the question “How many cats are owned by members of your household?”



Opinions about cats

The chart below presents the responses to the question about “*My general opinion of pet cats*”. The graph below shows the responses to this question from 1571 cat owners and 597 non-owners (n = 2168). **Cat owners reported significantly more positive general opinions of pet cats** (see [Appendix 2](#)). Non-owners reported a fairly even spread of views.



“I love cats more than anything else in the world. Cats are better than all people, and I have never met a cat I didn't love”.

“I hate cats. Humanely kill them all”

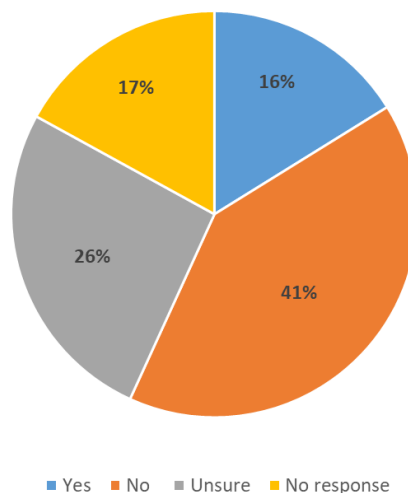
“I love cats, I am aware they are death machines and should be kept out of nature reserves and national parks as much as possible. However, they didn't ask to be imported into New Zealand, Humans brought them here. We should remember this and treat them with compassion because it's not their fault they're alive. I enjoy having cats around, they are very therapeutic companion animals”

Cat management

Cat management laws

We found that 16% of survey respondents thought they knew the laws about cats in their area. **Most respondents reported that they did not know or were unsure about 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?”

Knowledge of cat laws (n = 2610)



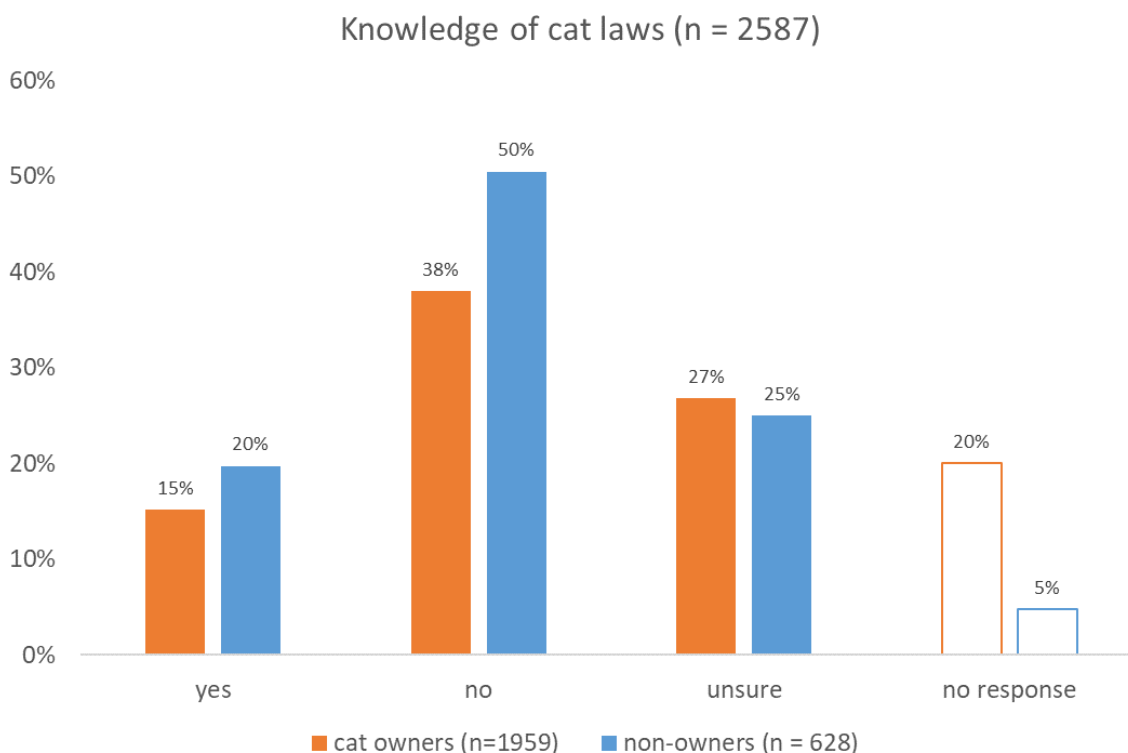
Since the **Cat Tracker** survey was conducted, the Wellington City Council has passed a [bylaw](#) requiring all pet cats to be microchipped. This bylaw will come into effect in early 2018.

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 (23 responses were excluded as some respondents did not provide this information). **Most respondents from both groups (cat owners and non-owners) either did not know the laws about cats in their area or were unsure.**

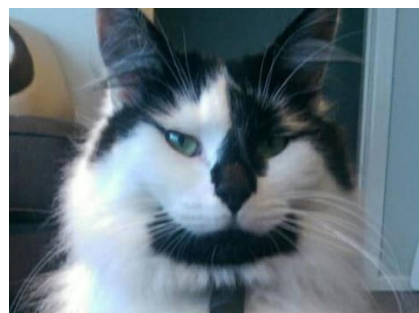
We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their knowledge of cat laws. We found a statistically significant association. The tests revealed that a higher percentage of non-owners reported that they did not know the cat laws than would be expected, and a higher percentage of cat owners reported that they were unsure about the cat laws than would be expected (if there was no association). Further details about statistical testing are presented in [Appendix 2](#).

“There are none. What a dumb question to ask”

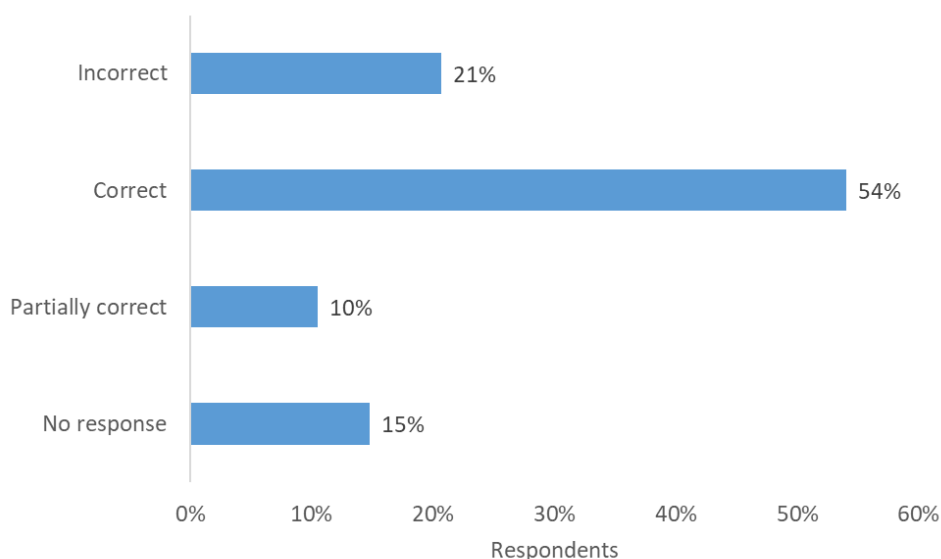


We then asked respondents who stated that they knew cat laws, to describe those laws (respondents could write about as little or as much as they wanted in an open-ended response). We then compared what each respondent had written to the actual cat laws in their local government area. We scored each respondent for if they were correct (including correctly stating that there were no cat laws in their particular area), incorrect (e.g., stating a limit of the number of cats per household in an area that had none), or partially correct (e.g. stating that cat registration was mandatory but that there were no laws regarding containment). We found that slightly more than half of respondents that stated that they knew the cat laws were correct in their knowledge. Many respondents were aware that in most areas in New Zealand the only laws regarding cats are covered by the Animal Welfare Act and nuisance bylaws.

“There appears to currently be no real enforced restrictions on how many cats one could have nor any laws to protect wildlife from cats”



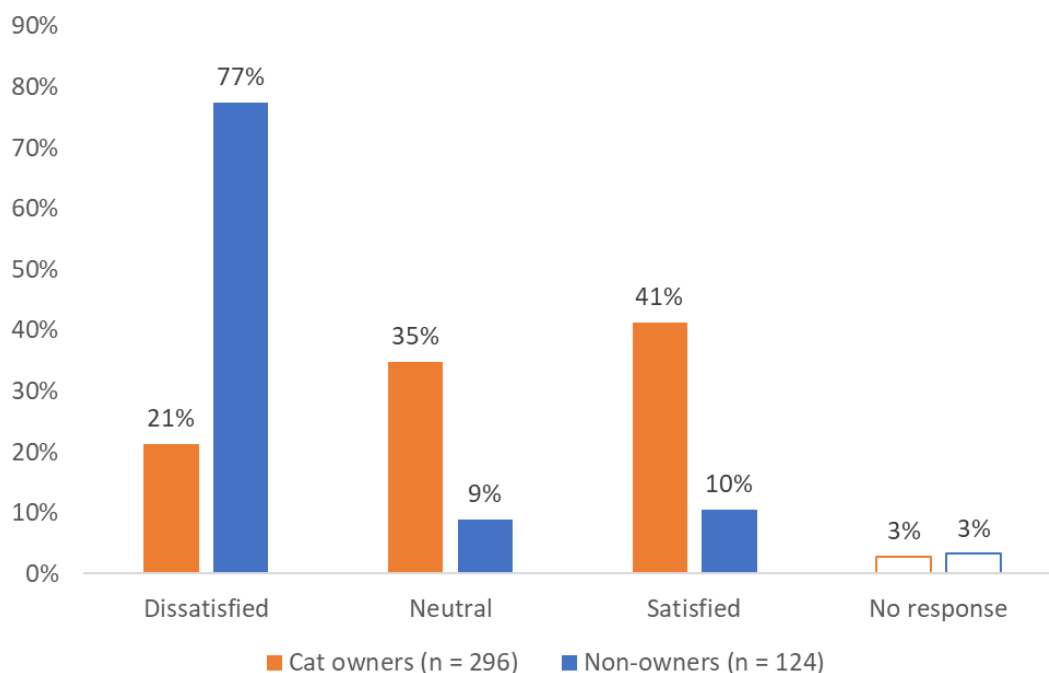
Comparison: Respondents' understanding of cat laws versus actual cat laws (n = 420)



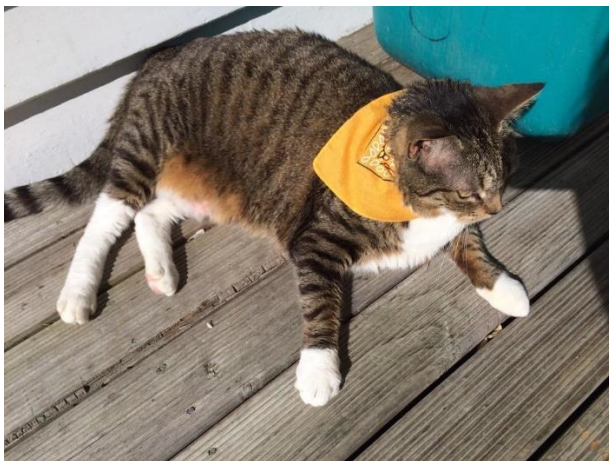
Satisfaction with cat management laws

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 non-owners had significantly higher dissatisfaction with cat laws than cat 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?”

Satisfaction with cat laws (n = 420)

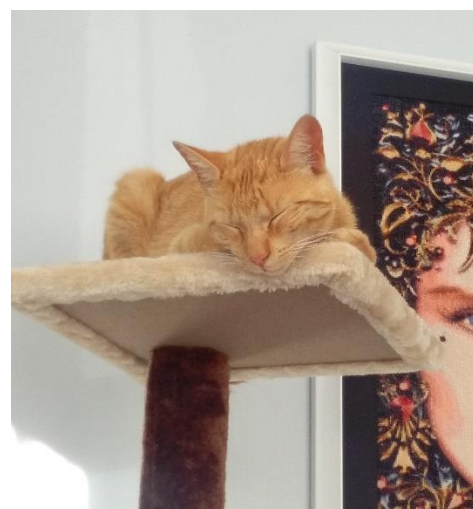


"I do think councils need to be consistent with the laws that exist for the control of cats in urban environments, where they are a serious threat to small wildlife, such as birds and lizards. The lack of legislation and local government controls on cats, such as registration, compulsory microchipping and limiting the numbers of cats than people can own, has led to irresponsible ownership, and a laissez faire attitude on the environmental damage that cats cause"



"I'm not a cat lover, but I can see why people enjoy their company. I don't understand why cats are treated so differently to other pets - allowed to roam free in the neighbourhood, people feeding cats they don't own, and no need to register them with the local authorities"

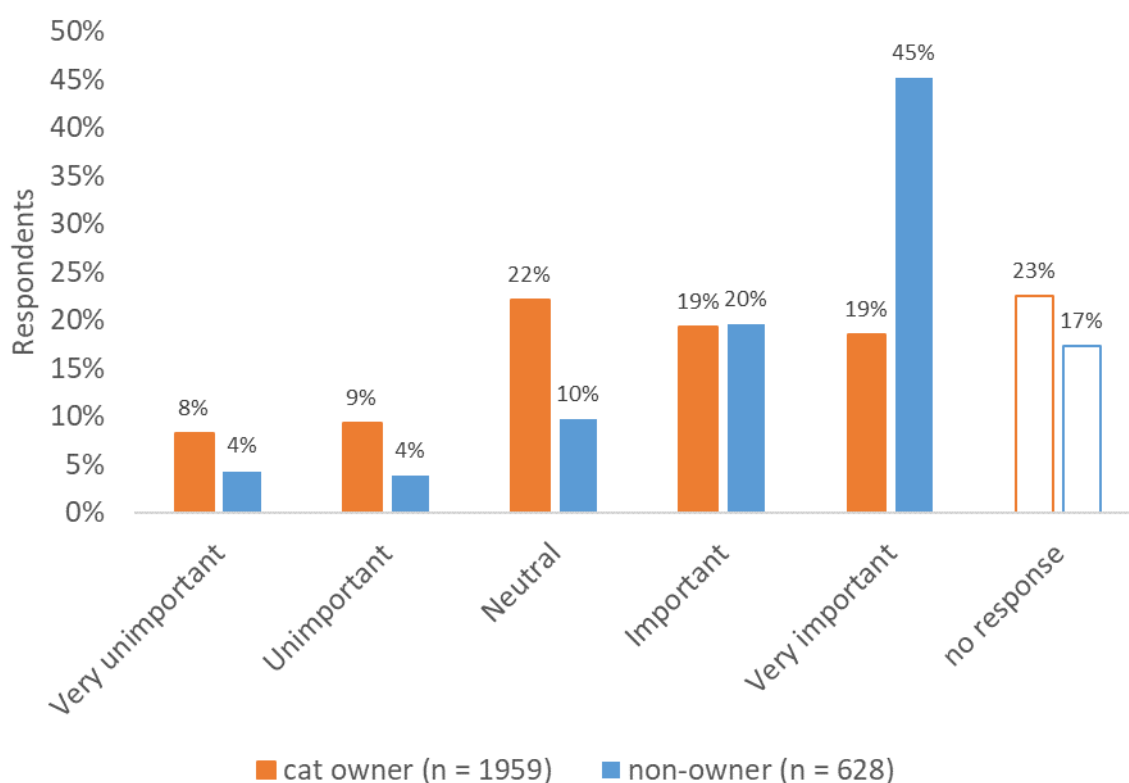
"I believe that cats deserve the environment and care which allows them to be as healthy, happy and 'natural' as feasible within the bounds of our societies' restrictions. To that end, I consider it is important that any legislation and education should reflect this"



Cat containment

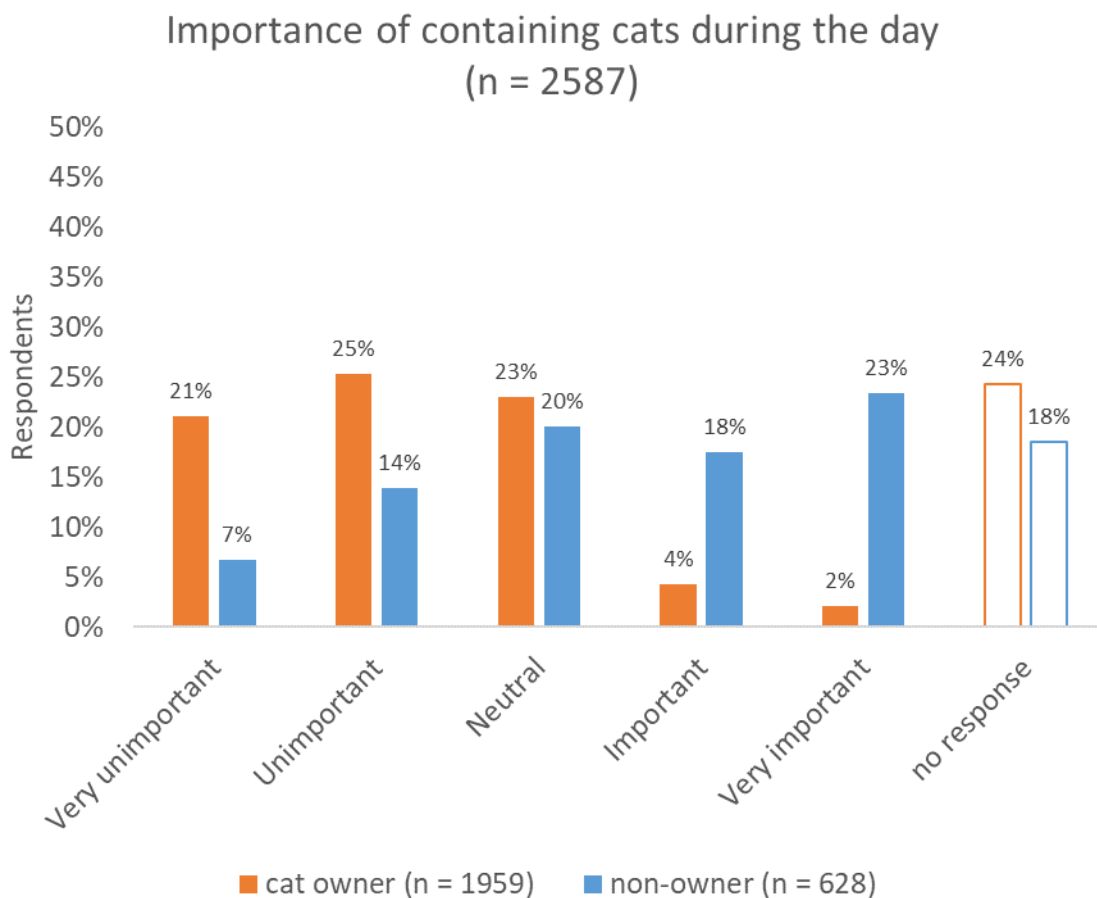
Respondents were asked “Please indicate how important you think it is to contain a cat (e.g. keep the cat inside a house or cat run)?”. Respondents could indicate how important they felt it was to contain cats during the day and at night, from very unimportant, through neutral, to very important. The results are presented in two charts on the next page. The majority of non-owners reported that they thought it was very important (45%) or important (20%) to contain cats at night. There was a more even spread amongst opinions of cat owners. It should be noted that more cat owners were neutral about containment at night, and that non-owners placed a significantly higher importance on containing cats during the night than cat owners (further information about our statistical testing is presented in [Appendix 2](#)).

Importance of containing cats during the night
(n = 2587)



“For several years I bred Burmese, Siamese and Tonkinese. I insisted that the people who purchased kittens, (they were all desexed before sale) promised to keep them in at night. They didn't. I gave up breeding these lovely cats because I was not prepared to carry on when so many were being run over at night and then they would ring me in tears, to see if I had any more kittens. The old "Goodnight Kiwi" has a lot to answer for!”

Regarding the containment of cats during the day, the results are quite different. **Many cat owners thought it was unimportant (25%) or very unimportant (21%) to contain cats during the day. Conversely, over 40% of non-owners thought it was important or very important to contain cats during the day.** Interestingly, almost as many cat owners reported that they were “neutral” on the subject (23%) as those who thought it was unimportant or very unimportant. The percentage of non-owners that reported that they were “neutral” on the subject was also similar (20%). 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](#)).



“Cats have no place in New Zealand. They are as bad as rats, stoats, ferrets and possums”

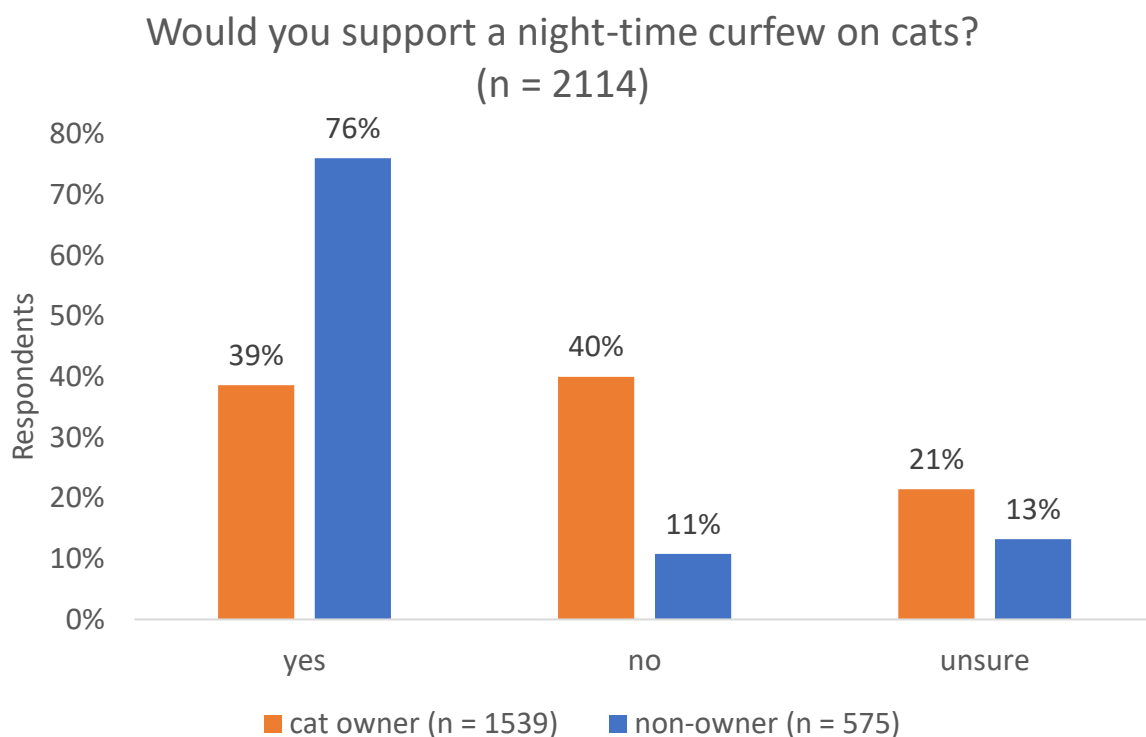
“All have been pampered mates. All have been kept in at night and none of them have been allowed to consume wildlife. They have all been characters and have afforded us great pleasure”



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)?*” **The majority of non-owners (76%) stated that they would support a night-time curfew on cats, whereas cat owners that provided a yes-or-no response were almost evenly split on the subject.** Four hundred and seventy-three survey respondents did not provide a response to this particular question.

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. Further details about statistical testing are presented in [Appendix 2](#).

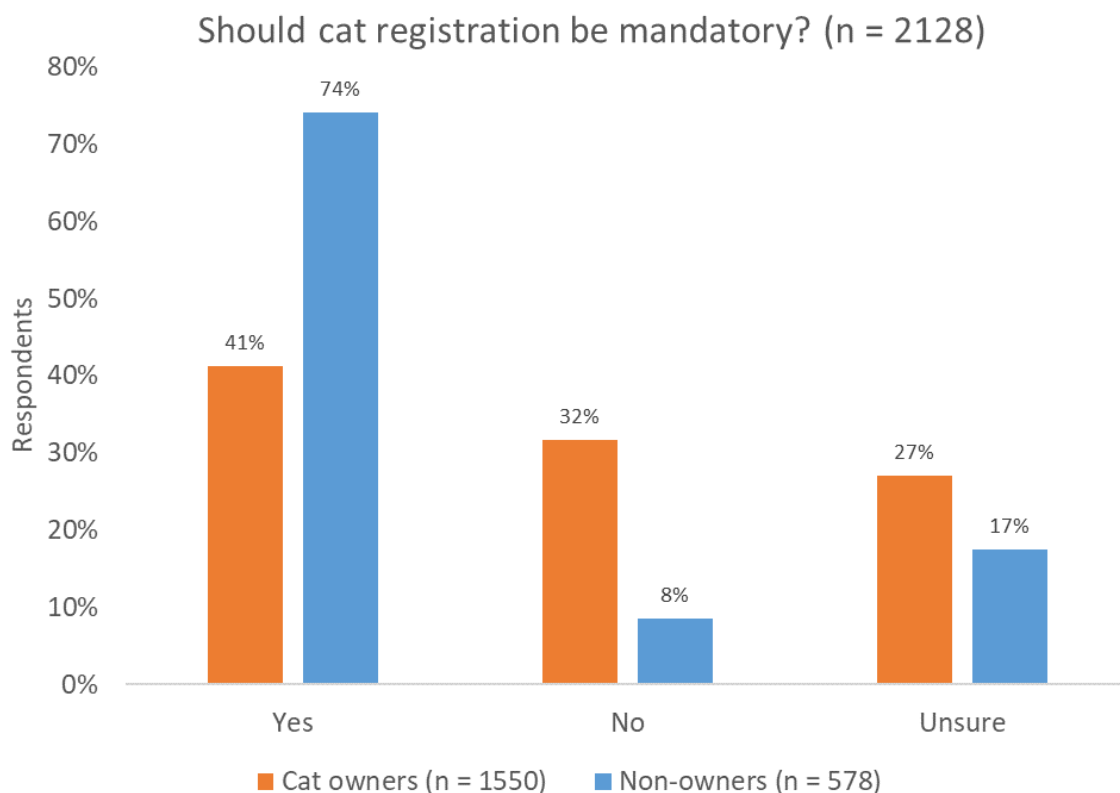


***“[My cat] is not quiet and would be a nightmare to lock inside all night...
I know because I have tried”***

Cat registration

The chart below presents responses to the question “Do you think that cat registration should be mandatory?”. **Overall, 50% of respondents to the survey responded in the affirmative**, that cat registration should be mandatory. This included over 40% of cat owners and almost three-quarters of non-owners; Four hundred and fifty-nine survey respondents did not provide a response to this particular question.

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](#).

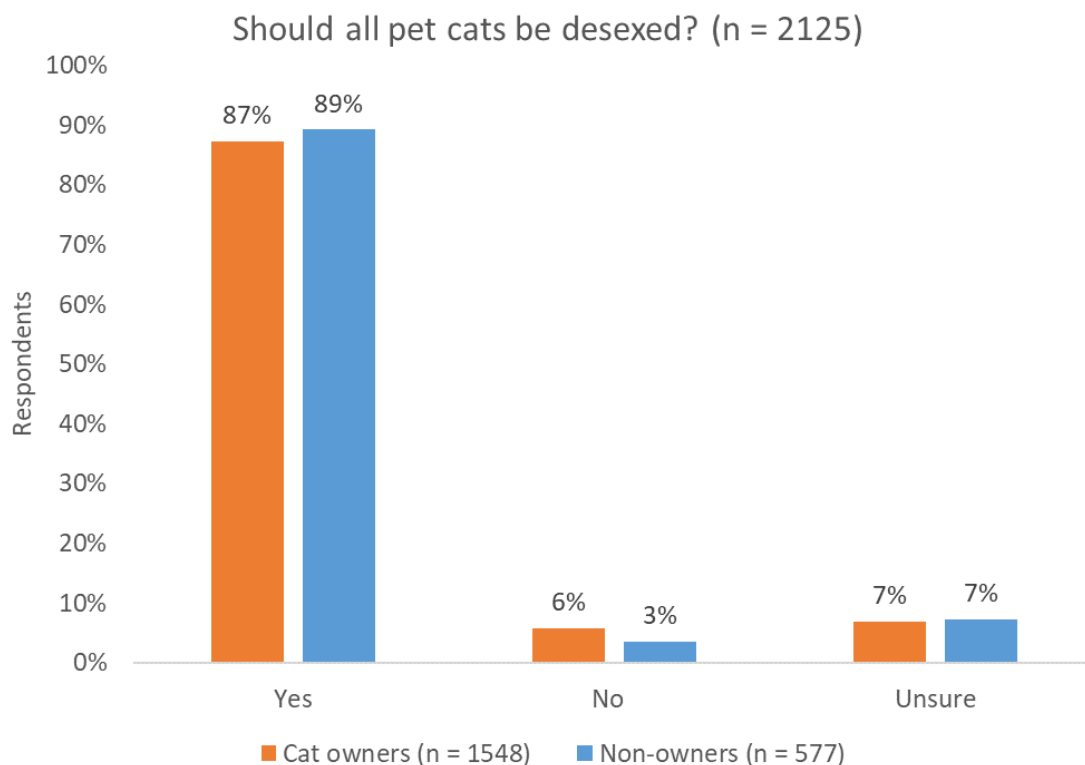


“Do you have any idea how many cats there are? It will end up being another revenue gathering exercise”

“...Dog registration is [mandatory] and people should be made to look after and contain their cats the same as dogs”

Mandatory desexing

The chart below presents responses to the question “Do you think that all cats should be desexed (with some exceptions for registered breeders)?”. **Almost 90% of both cat owners and non-owners responded in the affirmative**, that pet cats should be desexed. Four hundred and sixty-two survey respondents did not provide a response to this particular question. Additionally, we found no significant association between cat ownership and opinions about mandatory desexing (i.e. both owners and non-owners responded similarly). Further information about our statistical testing is presented in [Appendix 2](#).



“I would love for cat registrations to be compulsory, especially desexing”

“I would like to see a reduction of wild cats and feel most cats should be sterilized. I support the SPCA mobile vet clinic helping lower income communities sterilize their pets. I would like to see funding to increase this programme”

“Convincing people to register/contain cats when the desexing message still doesn’t get through will be a struggle”

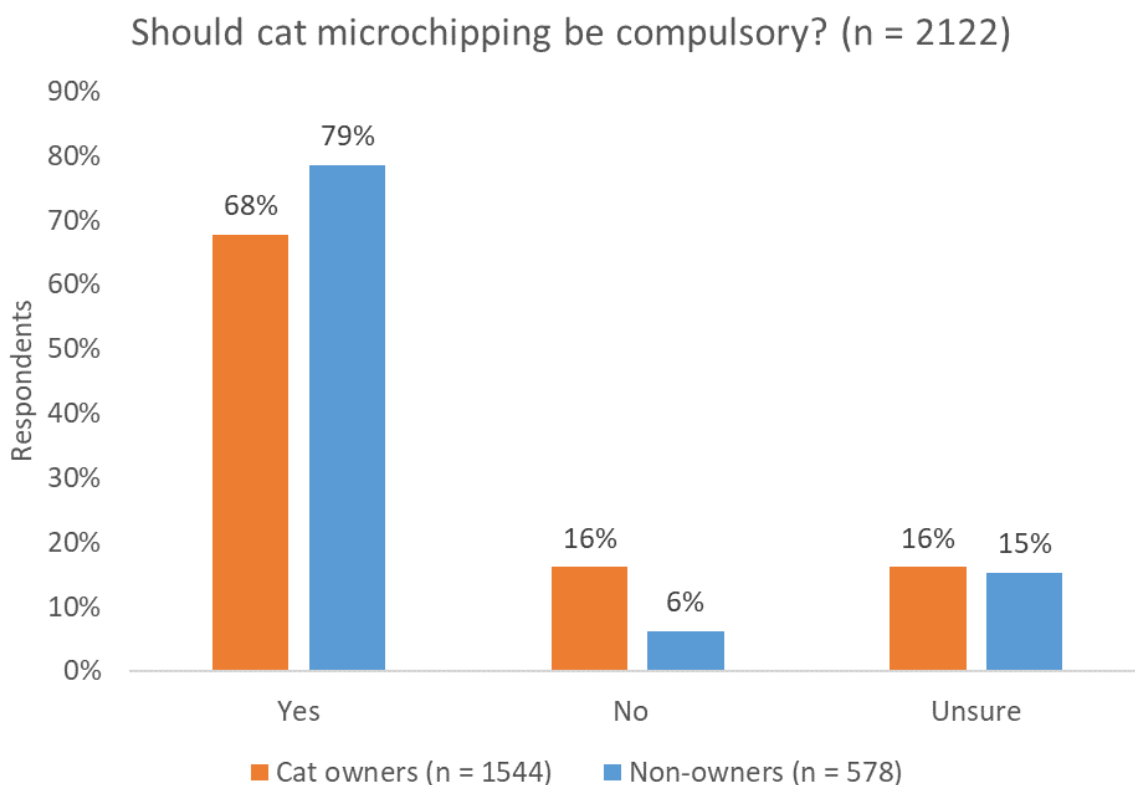


57

Mandatory Microchipping

The chart below presents responses to the question “Do you think that microchipping for cats should be compulsory?” **The majority of both cat owners (68%) and non-owners (79%) responded in the affirmative**, that cats should be microchipped. Four hundred and sixty-five survey respondents did not provide a response to this particular question.

We used statistical tests to look for an association between the two groups (cat owners and non-owners) and their opinions about compulsory microchipping of cats. We found a statistically significant association. The tests revealed that more cat owners were negative about mandatory microchipping 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 microchipping**. Further details about statistical testing are presented in [Appendix 2](#).



Reminder: The Wellington City Council has passed a [bylaw](#) requiring all pet cats over the age of 12 weeks to be microchipped. This bylaw will come into effect in February 2018. If your cat isn't microchipped yet, contact your vet or the [Wellington SPCA](#) for more information. Also, keep in mind that microchips are only as useful as the information on them. Be sure to keep your microchip contact details up to date with the [New Zealand Companion Animal Register](#).



"It is cruel to shove a microchip into your cat without their permission"

"I donate monthly to SPCA & hope that registration & microchipping is compulsory so less cats are mistreated & abandoned"

"Not micro-chipping a cat does not harm other cats or people. It is a choice for you and your cat. Like circumcision"

"[My cat] left, never to be found again. I still wonder if he is out there somewhere in a loving and caring family or if he perished :(The uncertainty is the worse part. I've regretted not micro-chipping him ever since. I will never make the same mistake again. Had we micro-chipped him, we might have been re-united. He was a very nice cat"

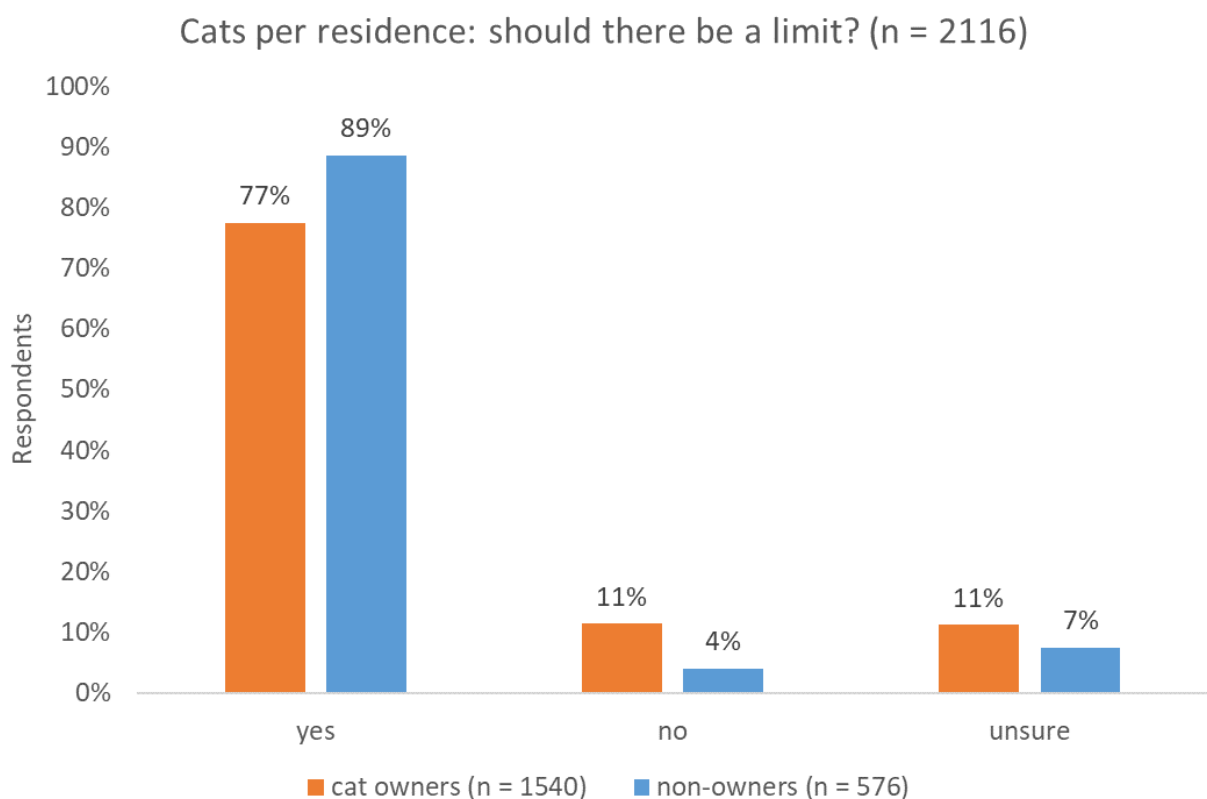
"[It] is an added expense for some people who want the companionship but don't have the extra money"



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, 80% of respondents to the question agreed that there should be a limit to the number of cats per household.** This included more than three-quarters of cat owners and almost 90% of non-owners. Four hundred and seventy-one survey respondents did not provide a response to this particular question.

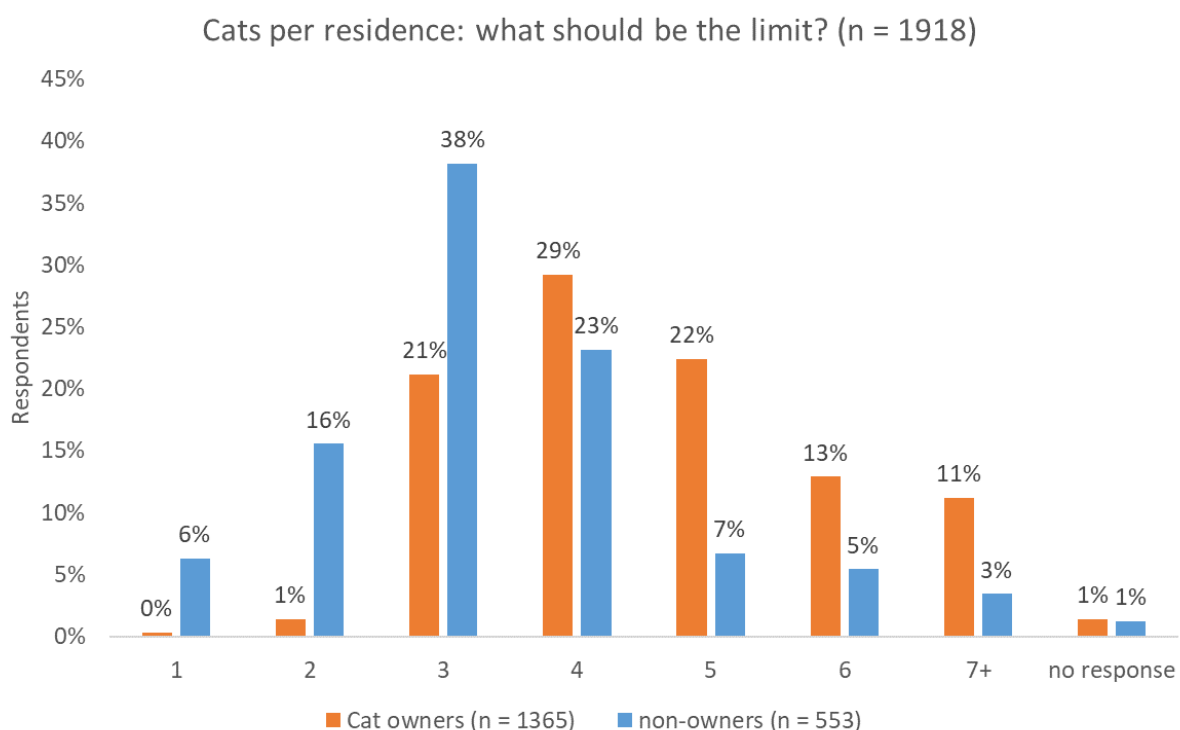
We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and their opinions about a limit on the number of cats per premises. We found a statistically significant association. The tests revealed that more cat owners were negative about a limit 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.** Further details about statistical testing are presented in [Appendix 2](#).



“I think that limiting cat numbers is extremely dependant on the property that they reside and the condition of living for the animals”

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 residential premises?”. **For these survey respondents (n = 1918), the average response to this question was 4.3 cats per house and the median was 4 cats per house.** We found a statistically significant difference between owners and non-owners. The average response for cat owners was 4.7 cats per house and their median response was 4 cats per house. The average response for non-owners was 3.4 cats per house and their median response was 3 cats per house. The chart below presents the responses. Further information about our statistical testing is presented in [Appendix 2](#).



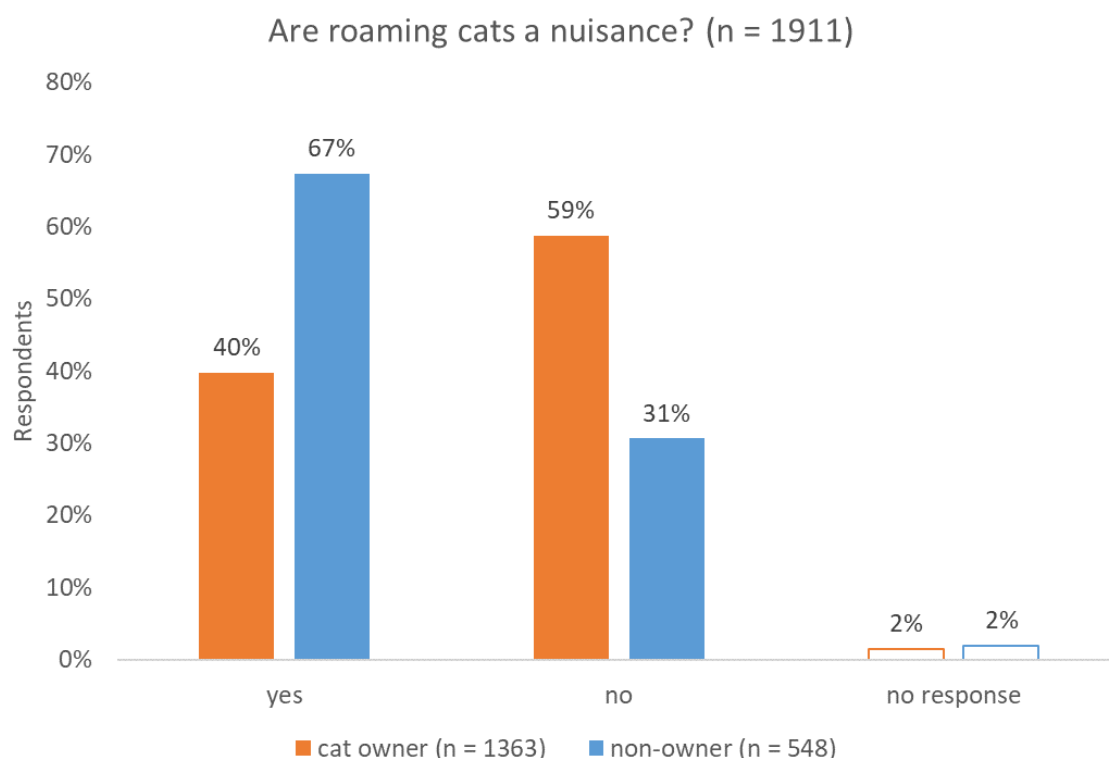
“I do not think there needs to be a limit on the number of cats IF and only if, the owner takes good care of them: food & healthwise, and keeps them safe inside at night”

“How many cats does one person need? Seriously? People need to start thinking more responsibly about these things”

Roaming cats

Respondents were asked “Do you have cats that roam in your neighbourhood (they could be owned or un-owned cats)?”. Overall, **73% 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, **responses were evenly split**, with 48% of respondents to this question reporting that roaming cats were a nuisance and 51% reporting that roaming cats were not 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](#).



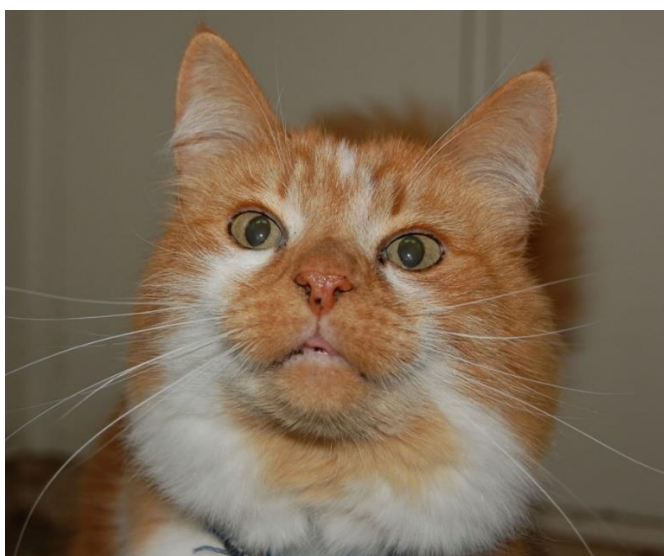
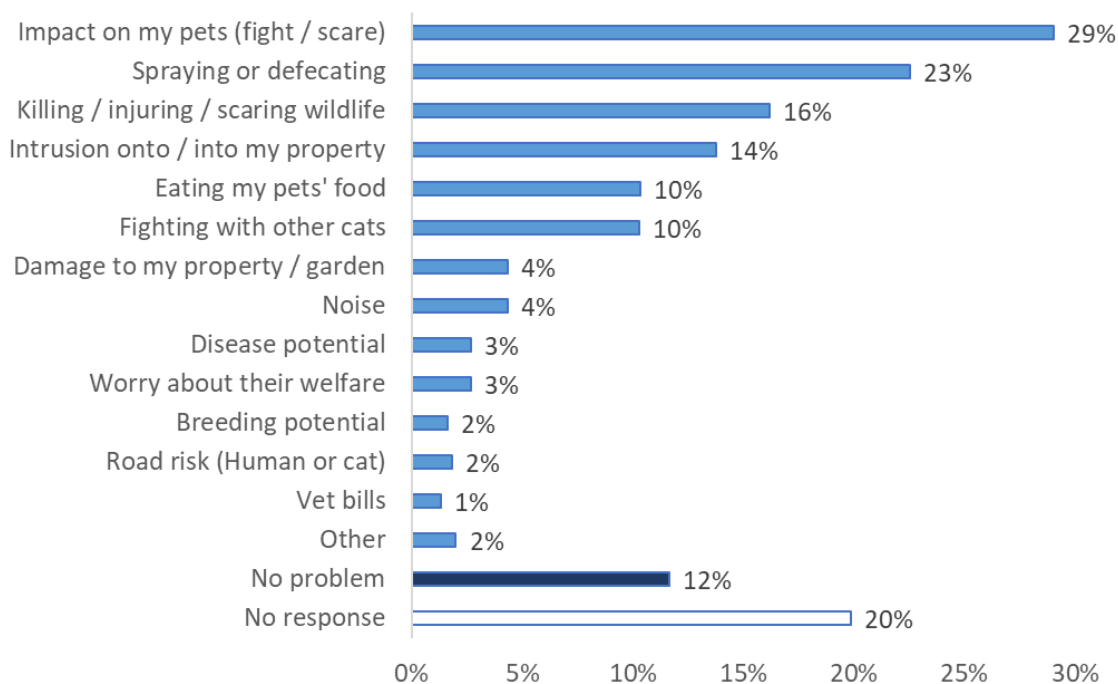
“There is a cat version of Fight Club that somehow finishes into an orgy about every night on my lawn”

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 their impact on wildlife.

Please note that percentage values add up to over 100% as respondents were able to provide an open-ended answer; Many respondents listed more than one issue.

Issues with roaming cats (n = 1911)



“No issues! they are lovely, give me cuddles”

“[Our cat] does suffer from depression due to wild cats...”

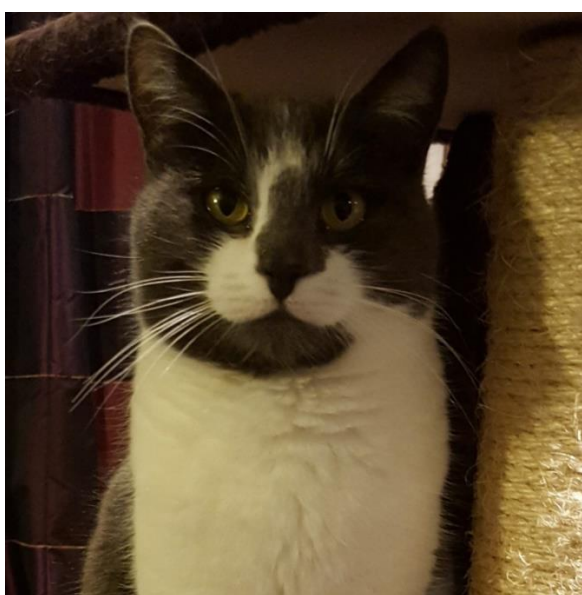
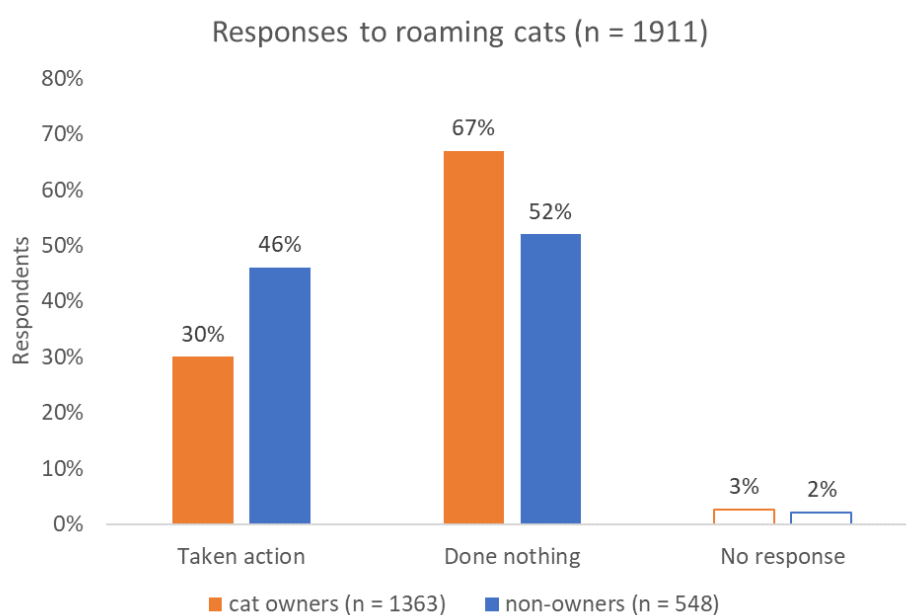
“I used to be so scared of cats... but after my neighbour’s cat who often visits us that is so sweet and cuddly, I fell in love with cats and got my own! Weird, but I’m not scared of cats anymore”

“Their squawling at night can be a bit scary especially when I’m hormonal and think it is a baby”

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 almost half of respondents reported that roaming cats were a nuisance, only 35% had taken action** regarding the roaming cats.

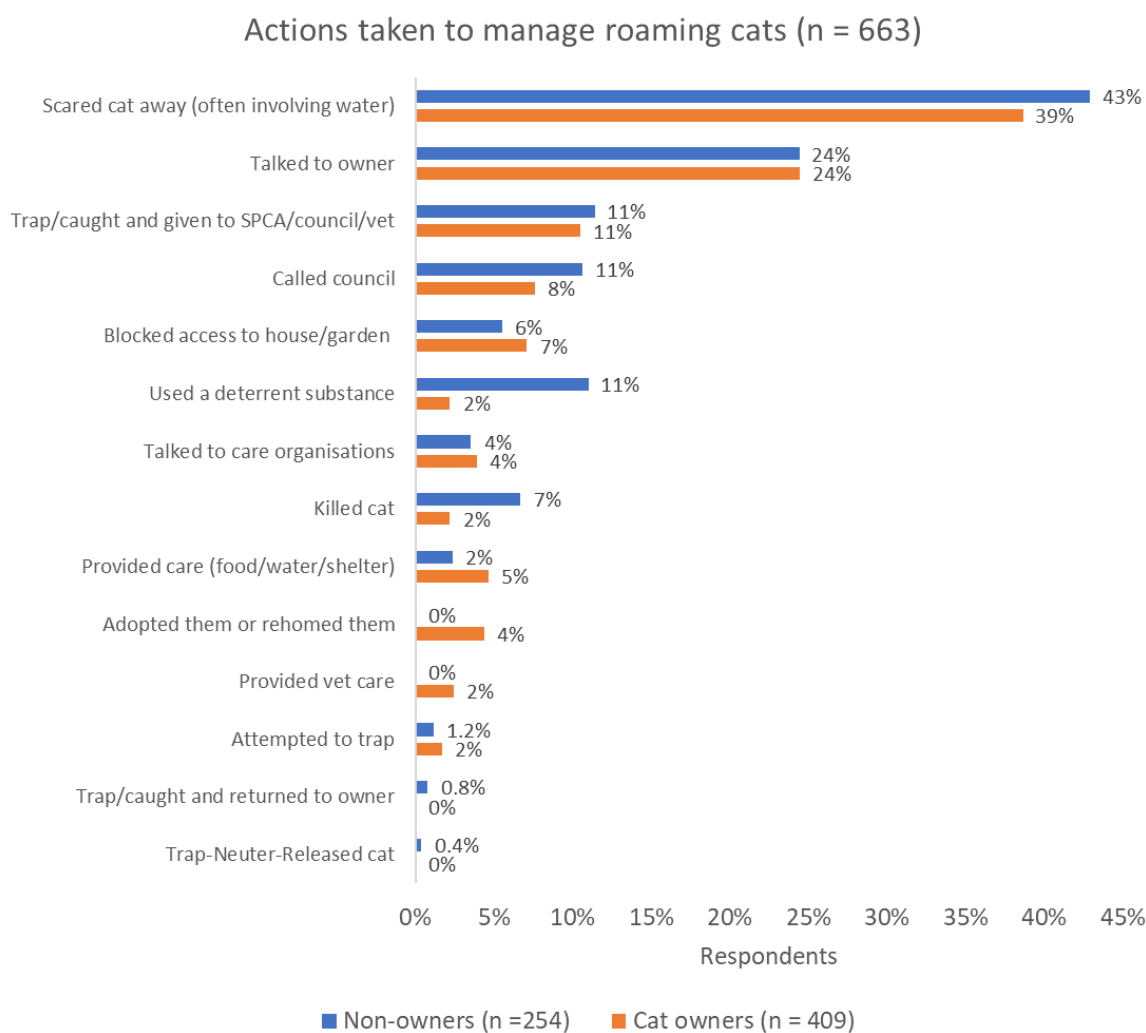
We used statistical tests to look for an association between the two groups of respondents (cat owners and non-owners) and reported responses to roaming cats. We found a statistically significant association. The tests revealed that more cat owners took no action than would be expected (if there was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



“I find it extremely frustrating that neighbours who own cats seem to be oblivious and uncaring that their decision to own a cat seems to over rule my decision to not have a cat. It seems very unfair to me. I feel like I am unable to express these opinions without being seen as the villain. It's very distressing to me. Should I not have the freedom to my right to not have a cat on my property as well? I feel like a second-rate citizen”

Roaming cats: taking action

We then asked respondents who reported having taken action against 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 and talking to the owner of the cat.** Please note that percentage values add up to over 100% as respondents were able to provide an open-ended answer; Many respondents listed more than one action taken.



“We took the step of ordering a humane cat trap online and periodically set it at night with bait and any cats caught get a dowsing with the garden hose before being released. This is done in an attempt to educate those cats not to come on our property. If we see a cat on our property during the daytime we run outside and physically chase it off the property, again in an effort to dissuade them from coming on our property. Both these practices have led to a reduction of cats venturing onto our property”

“All our animals get Xmas presents as well and we celebrate their birthdays”

“She makes our house happy and is a member of our family”

“I loved him so very much, he was more like a brother than just a cat”



“...Gareth Morgan is a psychopath and should be shot. His attitudes about other living creatures is sickening”

“I support Gareth Morgan in regard to cats. He deserves a medal or a knighthood”



“Cats have great value as pets - provided they are well cared for and breeding is well controlled. I have had many wonderful cats over the years; have used them to teach empathy to many children; they are lovely animals”

“I grew to dislike cats over time and much prefer dogs who are always pleased to see you. I especially dislike cats after watching a documentary tracking household cats and how many birds they kill a night”



Semi-owned cats

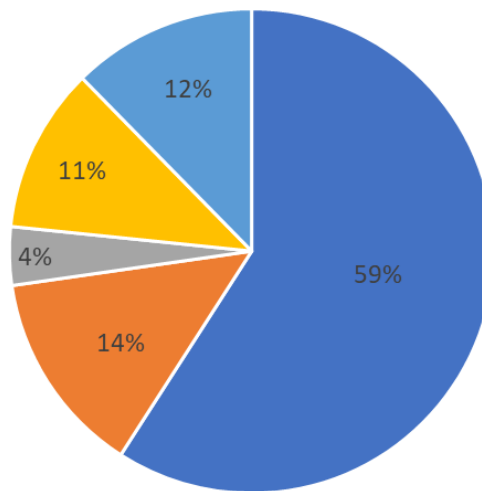
“Semi-owned” cats (also sometimes referred to as “unowned” or “community” cats) are cats that are intentionally provided with food, medical treatment, or shelter, but are not considered to be officially owned by anyone.

Survey respondents were asked “Do you provide care (e.g. food / shelter / other) for any semi-owned cats?”. A total of 2,110 people responded to the question, with **154 people (7.3%) 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 the responses to the question “How many semi-owned cats do you care for?”.

How many semi-owned cats do you care for? (n = 154)



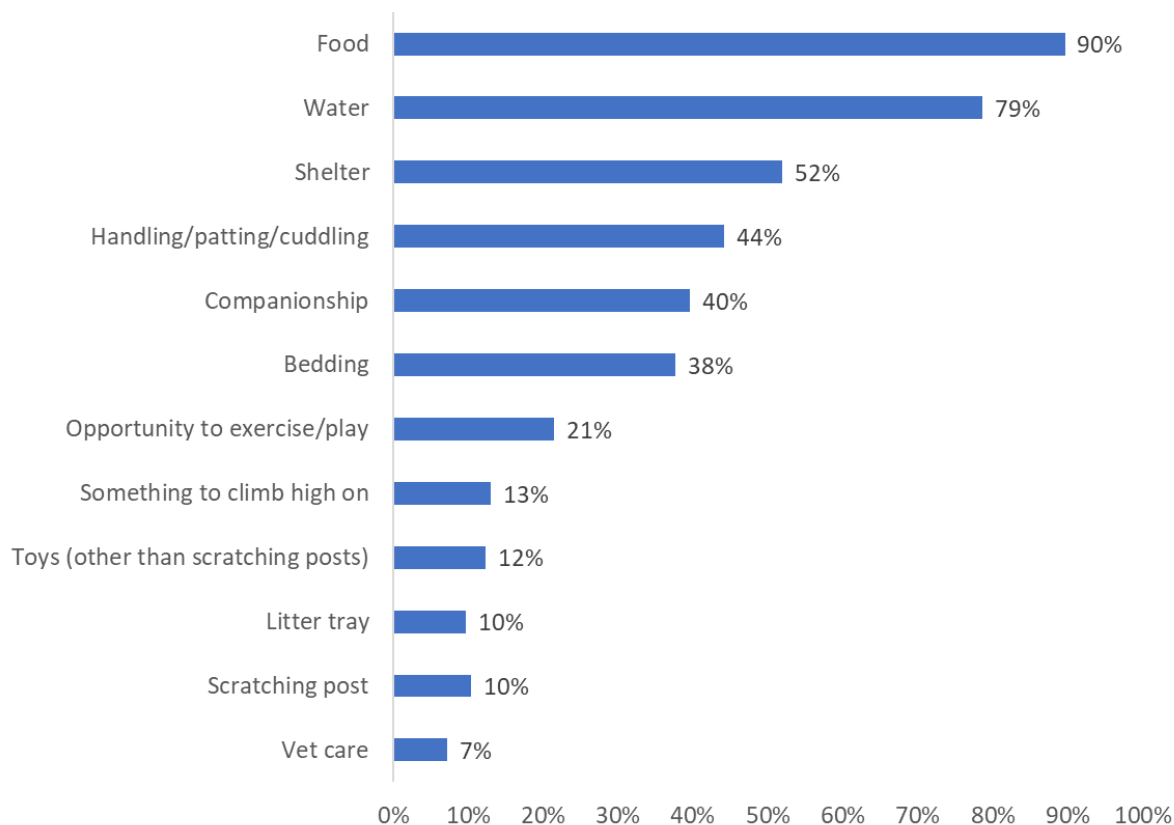
■ 1 ■ 2 ■ 3 ■ 4+ ■ no response



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 reported providing veterinary care (including flea / worm treatments) (7%).**

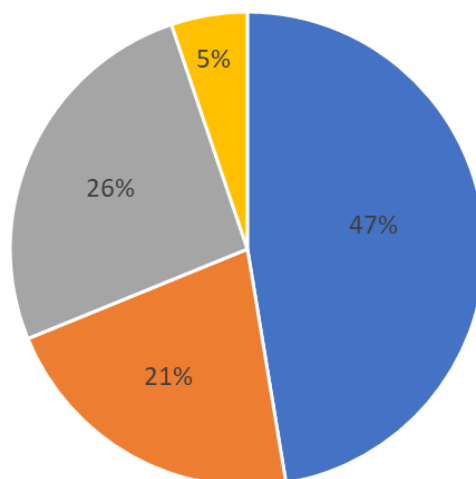
What respondents provide for semi-owned cats (n = 154)



Desexing 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 desexed?*”. There was a mixed response, and more than a quarter of respondents were unsure.

To the best of your knowledge, is the semi-owned cat desexed? (n = 154)



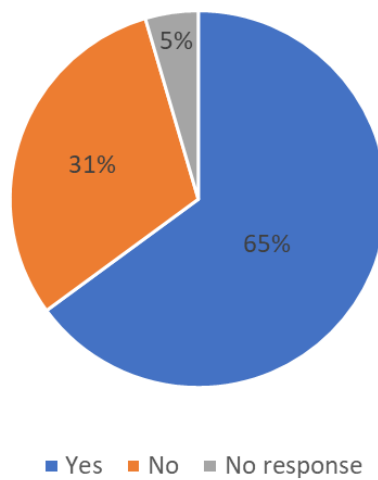
■ Yes ■ No ■ I'm not sure ■ No response



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 154 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.**

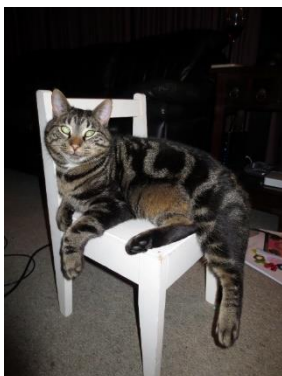
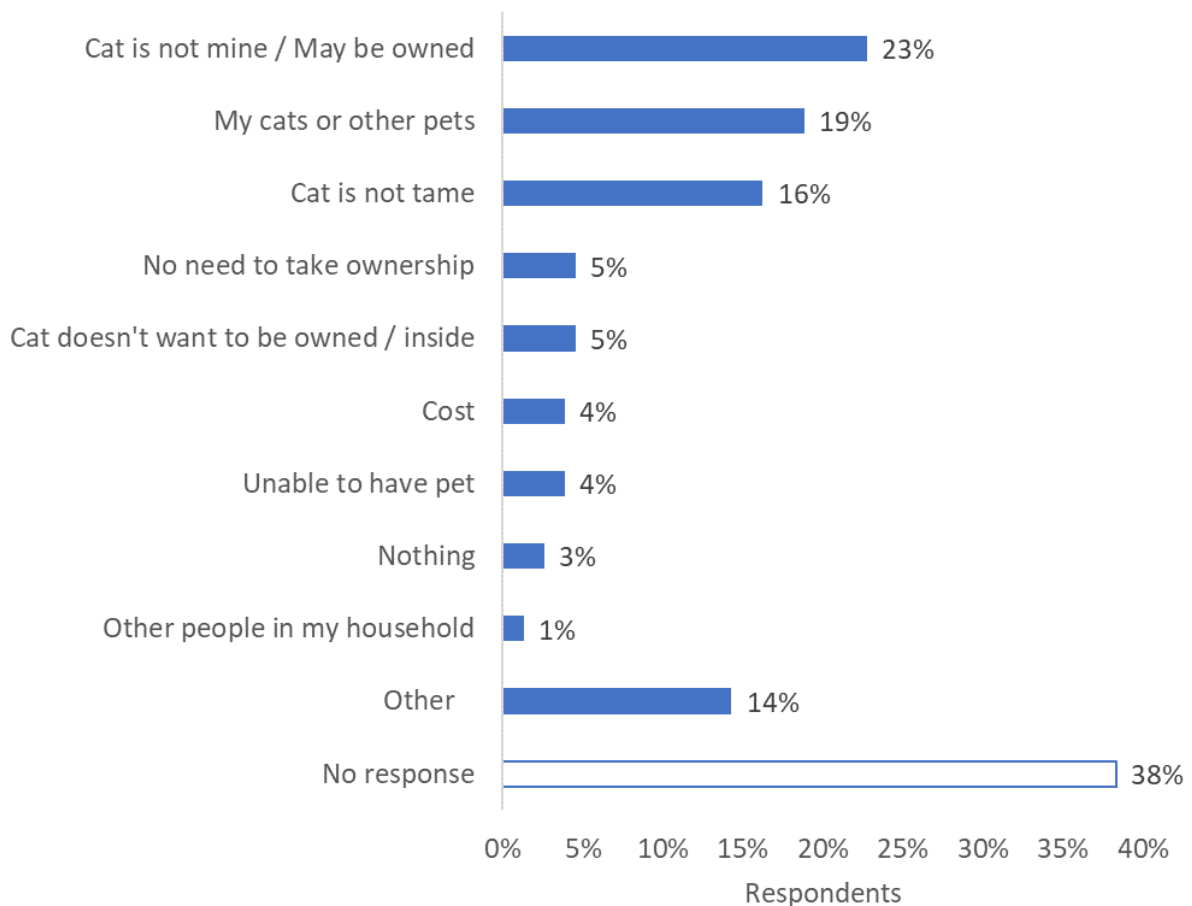
Would you consider taking ownership of a semi-owned cat that you care for? (n = 154)



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. Please note that percentage values add up to over 100% as respondents were able to provide an open-ended answer; Many respondents listed more than one barrier. **The most common barriers to taking ownership of semi-owned cats were 1) concerns about the correct ownership of the cat, 2) already having other pets (including cats), and 3) the nature of the cat (e.g. how tame the cat was).**

Barriers to taking ownership of semi-owned cats (n = 154)



“Cats are parasitic pets with purchasable loyalty. They carry disease that the unwitting gardener can catch which can have enormous impact on the unwary”

“I have always had cats since a child & have always slept with them & had them in the house. They always turn up at my place I never have to find one. Cats seem to like me”

Concluding summary

We used a **citizen science** approach, getting people involved in research, to study pet cats in New Zealand. 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 2,610 surveys, including data about 2,428 individual cats. 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 slightly more female cats than male cats, most were “moggie” cats (not purebred), 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, or a family member
- Most survey respondents reported that their cat caught prey
- Cat owners reported that their cat’s hunting was not a problem (34%), that it was a problem (27%), or that their cat did not hunt (24%)
- Cat owners provide a range of resources for their cats, including food, water, shelter, handling, and companionship. Less than half of cat owners reported providing their cat/s with a litterbox
- Nearly all of cat owners reported that their cats were desexed and the majority of cat owners reported that they provided regular health treatments for their pet 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.

Cat tracking

Data from 209 cats were included in our analyses, including 28,627 location data points. These cats were tracked for at least five days. The home ranges of cats ranged from 0.1 – 213.9 hectares, and the median home range was 1.3 hectares (slightly less than the size of Wellington’s Basin Reserve). 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 moggie and purebred cats.

We compared **Sedentary** and **Wandering** cats. Sedentary cats had home ranges of one hectare or less, while Wandering cats had home ranges over one hectare in size. Wandering cats typically crossed more roads per day and spent less time inside than Sedentary cats. Regarding time spent with their owners, we found no difference between Sedentary and Wandering cats.

We found no significant differences between the daytime and night-time home ranges of the tracked cats. We had tracked 65 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 (21%) 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 (75%), 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 did not know the cat laws in their area or were unsure. For respondents who reported that they knew local cat laws, just over 50% stated correct knowledge of those laws (or lack thereof). We also asked about satisfaction with cat laws and found that non-owners had significantly higher dissatisfaction levels with cat laws than cat 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 desex cats (with some exceptions for registered breeders);
- It should be mandatory to microchip 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 very few cat owners;

- Regarding an actual limit to the number of cats per residence, the median responses were four cats per residence for cat owners and three cats per residence for non-owners; and
- While half of 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. Approximately half of 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 endanger wildlife. However, only 35% of respondents had taken some action regarding the roaming cats. The most common actions reported were scaring the cat away (often involving water) and 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 (also sometimes referred to as “unowned” or “community” cats) are cats that are intentionally provided with food, medical treatment, or shelter, but are not considered to be officially owned by anyone. There were 154 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, but very few people reported providing veterinary care. Most of these people (65%) would consider taking ownership of the semi-owned cats that visit them. The most common barriers to taking ownership of semi-owned cats were concerns about the correct ownership of the cat, already having other pets (including 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 New Zealand. We now better understand the cat-owner attachment to cats and the personalities of cats. We know more about the home ranges of pet cats, including 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 New Zealand 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 209 cats included in further analyses. In the table below (and on the next few pages) 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 (95% MCP)	209	0.1 – 213.9 hectares	3.28 hectares	1.3 hectares
Age	Owner reported ages of tracked cats	202 (3% missing)	0.17 – 16 years old	4.94 years old	4 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 	205 (2% missing)	1 – 4 See the categories in the description of this variable to see what these responses indicate.	2.71 This result is based on the categories for this variable; the average of 2.71 indicates an average between categories 2 and 3.	3 This result is based on the categories for this variable and corresponds to 10 – 20 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. Weekly 2. Monthly 3. 6-monthly 4. Yearly 5. Every few years 6. Never 	207 (1% missing)	1 – 6 See the categories in the description of this variable to see what these responses indicate.	3.97 This result is based on the categories for this variable; the average of 3.97 indicates an average close to category four: yearly.	4 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>	145 (31% missing)	1 – 21 See the categories in the description of this variable to see what these responses indicate.	5.1 This result is based on the categories for this variable; the average of 5.1 corresponds approximately to four items of prey per month.	3 This result is based on the categories for this variable and corresponds to 2 items of prey per month.

Variable	Description of variable	Number of observations	Minimum and maximum results	Average	Median
Time spent inside	Owner-reported number of hours that the cat spent inside each day	200 (4% missing)	2 – 24 hours per day	12.3 hours per day	12 hours per day
Provision for cat	What owners provided for their cats, with owner responses scored as one point for each of the 12 items: <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 	207 (1% missing)	4 – 12 This result is based on the scores for each cat; the minimum score of 4 indicates that all tracked cats were provided with at least four 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.	10.1 This result is based on the scores of each cat; the average of 10.1 indicates that, on average, the cats tracked were provided with approximately 10 of the 12 items in the list of provisions.	10 This result is based on the scores of each cat (i.e. the median score for this variable was 10 of the 12 items in the list of provisions).
Owner-estimated distance that their cat travels	Owner responses to the following categories: <ol style="list-style-type: none"> 1. Just on my property 2. 100 m beyond my property 3. 1 km 4. 2 kms 5. Many kms 	87 (58% missing)	1 – 5 See the categories in the description of this variable to see what these responses indicate.	2.3 This result is based on the categories for this variable; the average of 2.3 indicates an average close to category two: 100 m 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 m 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.	209	0 – 25 roads per day	4.2 roads per day	3.4 roads per day

Appendix 2: Statistical test results

Topic and type of test	Result	Additional information
Home ranges (male / female cats) Mann-Whitney <i>U</i> test	Male cats had larger home ranges than female cats ($U = 3885, p < .001$)	Mean ranks: <ul style="list-style-type: none"> • Male cats: 121.17 (n = 94) • Female cats: 91.78 (n = 115)
Home ranges (moggie / purebred) Mann-Whitney <i>U</i> test	There was no statistically significant difference in the size of cats' home ranges between moggie and purebred cats ($U = 2194, p = .971$)	Mean ranks: <ul style="list-style-type: none"> • Moggie cats: 103.45 (n = 182) • Purebred cats: 103.92 (n = 24)
Roads crossed (Wandering / Sedentary) Mann-Whitney <i>U</i> test	Wandering cats typically crossed more roads per day than Sedentary cats, and the difference was statistically significant ($U = 7344.5, p < .001$)	Mean ranks: <ul style="list-style-type: none"> • Wandering cats: 121.77 (n = 117) • Sedentary cats: 83.67 (n = 92)
Cat fights (Wandering / Sedentary) Mann-Whitney <i>U</i> test	There was no statistically significant difference between Wandering and Sedentary cats and the frequency at which they showed signs of being in a fight with other cats ($U = 5156, p = .792$)	Mean ranks: <ul style="list-style-type: none"> • Wandering cats: 103.07 (n = 117) • Sedentary cats: 105.21 (n = 90) <p>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 does <i>your cat</i> shows signs of being in a fight with cats that are not your cats?")</p>
Prey caught (Wandering / Sedentary) Mann-Whitney <i>U</i> test	There was no statistically significant difference between Sedentary and Wandering cats and the frequency of which their owners reported that they saw them with prey ($U = 2792.5, p = .373$)	Mean ranks = <ul style="list-style-type: none"> • Wandering cats: 75.64 (n = 83) • Sedentary cats: 69.46 (n = 62) <p>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).</p>
Time inside (Wandering / Sedentary) Mann-Whitney <i>U</i> test	Wandering cats typically spent less time inside than Sedentary cats, and the difference was statistically significant ($U = 4027, p = .028$)	Mean ranks: <ul style="list-style-type: none"> • Wandering cats: 92.64 (n = 113) • Sedentary cats: 110.71 (n = 87)

Topic and type of test	Result	Additional information
Age of cat (Wandering / Sedentary) Mann-Whitney <i>U</i> test	There was no statistically significant difference between Sedentary and Wandering cats and their ages ($U = 4757.5$, $p = .550$)	Mean ranks: <ul style="list-style-type: none"> Wandering cats: 99.37 ($n = 115$) Sedentary cats: 104.32 ($n = 87$)
Provision for cat (Wandering / Sedentary) Mann-Whitney <i>U</i> test	There was no statistically significant difference between Sedentary and Wandering cats and the number of provision types provided for them by their owners ($U = 5480$, $p = .607$)	Mean ranks: <ul style="list-style-type: none"> Wandering cats: 105.84 ($n = 117$) Sedentary cats: 101.61 ($n = 90$)
Time with owners (Wandering / Sedentary) Mann-Whitney <i>U</i> test	Regarding time spent with owners, there was no statistically significant difference between sedentary and wandering cats ($U = 5372.5$, $p = .592$)	Mean ranks: <ul style="list-style-type: none"> Wandering cats: 104.81 ($n = 116$) Sedentary cats: 100.63 ($n = 89$)
Estimated distance travelled (Wandering / Sedentary) Mann-Whitney <i>U</i> test	There was no statistically significant difference between cat owners' estimation of how far their cat travelled from home and whether the cats were classified as Sedentary or Wandering ($U = 909$, $p = .803$)	Mean ranks: <ul style="list-style-type: none"> Wandering cats: 43.44 ($n = 48$) Sedentary cats: 44.69 ($n = 39$) <p>Note: only 87 (42%) 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 (122) 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 survey were either unsure of how far their cats travelled (56%) or chose not to respond to this question (2%).</p>
Home ranges (daytime / night-time) Wilcoxon signed-rank test	There was no statistically significant difference in daytime and night-time home ranges for cats that had 24-hour access to the outdoors ($Z = 0.772$, $p = .440$)	Sample size ($n = 140$): <ul style="list-style-type: none"> Bigger daytime range ($n = 61$) Bigger night-time range ($n = 73$) No difference ($n = 6$)
General opinions of pet cats (cat owners / non-owners) Mann-Whitney <i>U</i> test	Cat owners had higher general opinions of cats than non-owners, and the difference was statistically significant. ($U = 171022.5$; $p < .001$).	Mean ranks: <ul style="list-style-type: none"> Cat owners: 1274.14 ($n = 1571$) Non-owners: 585.47 ($n = 597$)

Topic and type of test	Result	Additional information
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 ($X^2 = 10.746$, $df = 2$, $p = .005$).	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1567) • Non-owners (n = 598) <p>A higher percentage of non-owners reported that they did not know the cat laws than would be expected, and a higher percentage of cat owners reported that they were unsure about the cat laws than would be expected (if there was no association).</p>
Satisfaction with cat laws (cat owners / non-owners) Mann-Whitney <i>U</i> test	Non-owners had higher dissatisfaction with cat laws than cat owners, and the difference was statistically significant ($U = 7234.5$, $p < .001$)	Mean ranks: <ul style="list-style-type: none"> • Cat owners: 239.38 (n = 288) • Non-owners: 120.79 (n = 120)
Importance of containing cats during the night (cat owners / non-owners) Mann-Whitney <i>U</i> test	Non-owners placed higher importance on containing cats during the night than owners, and the difference was statistically significant ($U = 540673.5$, $p < .001$)	Mean ranks: <ul style="list-style-type: none"> • Cat owners: 922.33 (n = 1518) • Non-owners: 1301.76 (n = 519)
Importance of containing cats during the day (cat owners / non-owners) Mann-Whitney <i>U</i> test	Non-owners placed higher importance on containing cats during the day than owners, and the difference was statistically significant ($U = 578064$, $p < .001$)	Mean ranks: <ul style="list-style-type: none"> • Cat owners: 864.21 (n = 1483) • Non-owners: 1385.53 (n = 512)
Should there be a night-time curfew on cats? (cat owners / non-owners) Chi square test	There was a statistically significant association between cat ownership and opinions about a night-time curfew on cats ($X^2 = 246.112$, $df = 2$, $p < .001$)	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1539) • Non-owners (n = 575) <p>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 the percentage of cat owners who reported that they did support a night-time curfew was lower than expected.</p> <p>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>

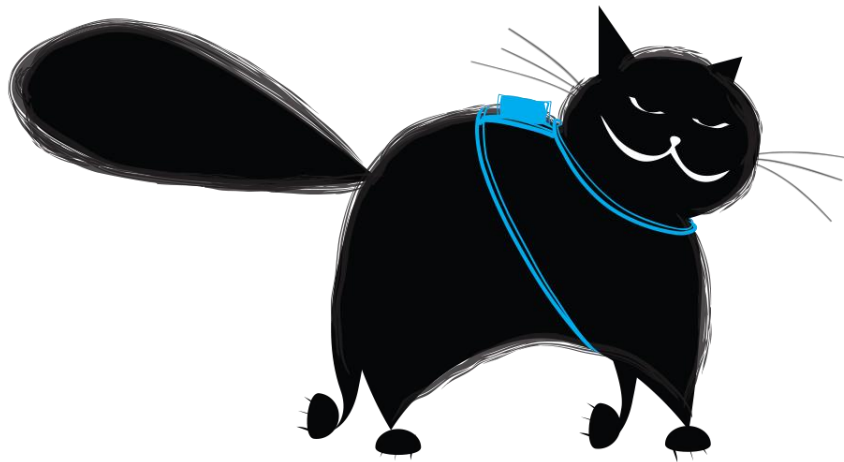
Topic and type of test	Result	Additional information
Should cat registration be mandatory? (cat owners / non-owners) Chi square test	There was a statistically significant association between cat ownership and opinions about cat registration ($X^2 = 195.055$, $df = 2$, $p < .001$)	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1550) • Non-owners (n = 578) <p>The percentages of cat owners who reported that they did not support mandatory registration or that they were unsure was higher than expected, and the percentage of cat owners who reported they did support mandatory registration was lower than expected.</p> <p>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 did not support mandatory registration was lower than expected.</p>
Should all pet cats be desexed? (cat owners / non-owners) Chi square test	There was no statistically significant association between cat ownership and opinions about mandatory desexing ($X^2 = 4.528$, $df = 2$, $p = 0.104$).	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1548) • Non-owners (n = 577)
Should microchipping be compulsory? (cat owners / non-owners) Chi square test	There was a statistically significant association between cat ownership and opinions about mandatory microchipping of cats ($X^2 = 37.837$, $df = 2$, $p < .001$).	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1544) • Non-owners (n = 578) <p>The percentage of cat owners who reported that they did not support mandatory microchipping was higher than expected.</p> <p>The percentage of non-owners who reported that they did not support mandatory microchipping was lower than expected.</p>
Cats per residence: Should there be a limit? (cat owners / non-owners) Chi square test	There was a statistically significant association between cat ownership and opinions about the need for a limit on cat ownership ($X^2 = 36.385$, $df = 2$, $p < .001$)	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1540) • Non-owners (n = 576) <p>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.</p> <p>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>

Topic and type of test	Result	Additional information
Cats per residence: What should be the limit? (cat owners / non-owners) Mann-Whitney <i>U</i> test	Owners suggested higher limits for cats per residence than non-owners, and the difference was statistically significant ($U = 192553, p < .001$)	Mean ranks: <ul style="list-style-type: none"> • Cat owners: 1079.87 (n = 1350) • Non-owners: 626.02 (n = 547)
Are roaming cats a nuisance? (cat owners vs. non-owners) Chi square test	There was a statistically significant association between cat ownership and opinions about roaming cats as a nuisance ($X^2 = 121.493, df = 1, p < .001$)	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1346) • Non-owners (n = 539) <p>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.</p> <p>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>
Responses to roaming cats (cat owners / non-owners) Chi square test	There was a statistically significant association between cat ownership and management responses to roaming cats ($X^2 = 45.445, df = 1, p < .001$)	Sample size: <ul style="list-style-type: none"> • Cat owners (n = 1328) • Non-owners (n = 537)

Appendix 3: At a glance: New Zealand vs. South Australia

Item	New Zealand	South Australia
Number of surveys completed	2610	3192
Number of cats in survey	2428	4314
Most popular male cat name	Charlie	
Most popular female cat name	Bella	
Breed of pet cats	<ul style="list-style-type: none"> Moggie (76%) Purebred (14%) Unspecified (9%) 	<ul style="list-style-type: none"> Moggie (82%) Purebred (14%) Unspecified (4%)
Sex of pet cats	<ul style="list-style-type: none"> Male (43%) Female (50%) Unspecified (8%) 	<ul style="list-style-type: none"> Male (51%) Female (47%) Unspecified (2%)
Median age of pet cats	5 years old	
Percentage of cats with 24-hour access to outdoors	55%	32%
Percentage of cats allowed to roam during the day only	22%	35%
Most common source of pet cats	Adopted or purchased from a shelter	
Percentage of pet cats that catch prey	62%	66%
Most common prey item	Rodents	
Percentage of owners that report their cat's hunting is not a problem	34%	
Five most common provisions for pet cats	Food, water, shelter, handling / patting / cuddling, and companionship	
Desex status	Yes (91%), No (2%), Unspecified (7%)	Yes (96%), No (2%), Unspecified (2%)
Health care provided	Wormed (80%), Flea treated (83%), Vaccinated (65%), Vet checked (67%)	Wormed (77%), Flea treated (77%), Vaccinated (71%), Vet checked (72%)
Number of cats tracked	209	428
Number of data points collected	28,627	61,250
Median number of data points per cat	125	128.5
Average home range size	3.28 hectares	1.99 hectares
Median home range size	1.3 hectares	1.042 hectares
Minimum home range size	0.10 hectares	0.07 hectares
Maximum home range size	213.9 hectares	31.13 hectares
Average number of roads crossed per day	4.2	4.8
Median number of roads crossed per day	3.4	
Male vs. Female home ranges	Male cats had larger home ranges than female cats	
Home range vs. breed	No difference between moggie and purebred cats	
Sedentary vs. Wandering cats		
<i>Roads crossed</i>	Wandering cats typically crossed more roads per day than Sedentary cats	
<i>Cat fights</i>	No difference	Wandering cats typically showed signs of being in fights more often than Sedentary cats
<i>Prey</i>	No difference	Wandering cats were typically seen with prey more often than Sedentary cats
<i>Time inside</i>	Wandering cats typically spent less time inside than Sedentary cats	
<i>Age</i>	No difference	Wandering cats were typically younger than Sedentary cats
<i>Provision for cats</i>	No difference	Wandering cats typically had less provided for them than Sedentary cats
<i>Time with owners</i>	No difference between Sedentary and Wandering cats	

<u>Item</u>	New Zealand		South Australia	
<i>Estimated distance travelled</i>	No relation		Cat owners typically estimated correctly that cats we classified as Wandering went further from home than cats we classified as Sedentary	
Daytime vs. Night-time home ranges	No difference between daytime and night-time home ranges		Cats had larger home ranges at night	
Survey respondent demographics				
<i>Gender</i>	<ul style="list-style-type: none"> Female (65%) Male (15%) Unspecified (20%) 		<ul style="list-style-type: none"> Female (79%) Male (18%) Unspecified (3%) 	
<i>Median age cohort</i>	31 to 40 years old			
<i>Median level of education</i>	Bachelor Degree			
Cat ownership status	<ul style="list-style-type: none"> Cat owner (75%) Non-owner (24%) Unspecified (1%) 		<ul style="list-style-type: none"> Cat owner (94%) Non-owner (6%) 	
Median number of cats per household	1			
Percentage of cat owners that reported they loved cats	67%		69%	
Percentage of non-owners that reported they loved cats	19%		17%	
Knowledge of local cat laws	<ul style="list-style-type: none"> Yes (16%) No (41%) Unsure (26%) No response (17%) 		<ul style="list-style-type: none"> Yes (39%) No (23%) Unsure (38%) 	
	Cat owners	Non-owners	Cat owners	Non-owners
Satisfaction with cat laws	41%	10%	31%	11%
Importance of containing cats at night	38%	65%	70%	74%
Importance of containing cats during the day	6%	41%	19%	55%
Cat curfew support	39%	76%	57%	81%
Cat registration support	41%	74%	48%	80%
Mandatory desexing support	87%	89%	90%	86%
Mandatory microchipping support	68%	79%	77%	82%
Cat limit support	77%	89%	74%	85%
Suggestions for limit	Average: 4.7 Median: 4	Average: 3.4 Median: 3	Average: 3.3 Median: 3	Average: 2.3 Median: 2
Percentage of respondents that reported that they had roaming cats in their neighbourhood	73%		87%	
Percentage of respondents that thought roaming cats were a nuisance	48%		40%	
Top issues with roaming cats	<ol style="list-style-type: none"> Impact on pets Spraying / defecating 			
Percentage of respondents that reported that they had taken action against roaming cats	35%		26%	
Top actions taken against roaming cats	<ol style="list-style-type: none"> Scaring cat away Talking to owner 			
Percentage of respondents that reported that they provided care for semi-owned cats	7.3%		7.5%	
Top three provisions for semi-owned cats	<ol style="list-style-type: none"> Food Water Shelter 			



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