

# Homing in domestic cats (*Felis catus*) evidenced by self-reported events

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## Research Article

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# Abstract

Homing (i.e., the ability to navigate back to a known location after displacement) is well documented in migratory and wild species but has received little systematic attention in domestic animals. We analysed 173 self-reported cases of homing in domestic cats (*Felis catus*), collected via an online questionnaire (2013–2026), to characterise homing distance, duration, velocity, and their predictors. Most homing events occurred within 5 km of home (59.0%), with a median distance of 4.4 km and median duration of 6 days. Generalised Additive Models for Location, Scale and Shape (GAMLSS) showed that boldness was the only consistent predictor of homing performance, associated with higher velocity and shorter duration but not distance, suggesting boldness affects navigational style rather than range. Feral-adopted cats showed significantly higher velocity than kitten-adopted cats, potentially reflecting pre-domestication spatial experience. Age, age at adoption, and outdoor access type showed no significant effects, likely reflecting limited sample sizes in some categories. Most cats (64%) crossed obstacles such as roads or waterways en route home, with homing distance increasing with obstacle number. These findings provide the first quantitative evidence of homing capacity in domestic cats and identify boldness and prior outdoor/environmental experience as key behavioural correlates. We recommend that searches for lost cats prioritise the immediate area of escape, since most homing occurs over short distances and success rates remain unknown; that boldness and adoption history be considered when assessing likely return behaviour; and that search efforts account for physical obstacles such as highways and waterways along probable homing routes.

## Introduction

Homing, i.e., the ability of animals to navigate back to a known location, has been documented in migratory birds, salmonid fish, sea turtles, invertebrates and several mammalian species (Papi 2012; Zeil 2012). The following mechanisms have been proposed to explain homing: geomagnetic sensitivity, olfactory mapping, sun-compass orientation, and cognitive spatial representations. Current evidence suggests that homing in most species depends on the integration of the different mechanisms (Morford et al., 2025). The most extensively studied mechanism is geomagnetic sensitivity, whereby animals detect features of the Earth's magnetic field (e.g., inclination, intensity, or polarity) to derive both compass bearing and positional information (Mouritsen 2018). In birds, the photoreceptor protein cryptochrome 4 (CRY4) is suggested as the main light-dependent magnetoreceptor (Günther et al., 2018; Xu et al., 2021). In mammals, the magnetic compass is polarity-based rather than inclination-based, operates in darkness, and is likely mediated by magnetite rather than cryptochromes (Wiltschko and Wiltschko 2019). Mammalian cryptochromes may function primarily in circadian rhythm regulation rather than magnetoreception (Zhang & Malkemper, 2023). A second mechanism, i.e., the construct of gradient-based olfactory maps from volatile compounds distributed across the landscape, originally developed for homing pigeons (Wallraff, 2004), has been extended to mammals (Bonadonna & Gagliardo, 2021). It is well established that mammals use spatially structured scent information to orient within familiar territories, and that the olfactory system interfaces with hippocampal spatial representations to support navigation (Marin et al. 2021). A third mechanism, path integration, relies on

the continuous accumulation of self-motion information (i.e., speed, direction, and elapsed time) to compute a running estimate of current position relative to a known starting point. This process is supported by a circuit in the mammalian brain, centred on hippocampal place cells and entorhinal grid cells, which together implement a dynamic spatial representation that is updated by vestibular and proprioceptive input (McNaughton et al., 2006; Moser et al., 2017). Path integration accumulates error over distance and must be periodically recalibrated by external landmarks or other positional cues (Etienne & Jeffery, 2004); it is therefore generally considered more plausible as an explanation for short- to medium-range orientation. Finally, the construction and retrieval of allocentric cognitive maps (i.e., internal representations of the spatial relationships between landmarks in the environment, independent of the animal's current viewpoint) provides a framework for flexible, goal-directed navigation in familiar spaces (Jeffery 2024; Jeffery et al. 2024).

Among domestic animals, homing has received comparatively little attention. Yet, anecdotal and experimental evidence suggest that the domestic cat (*Felis catus*) possesses the capacity for spatial orientation and long-distance homing. Herrick (1922) proposed that cats likely possess homing ability, and failure to return home in displaced individuals reflects interference from environmental or physiological factors rather than an absence of navigational capacity. Precht and Lindenlaub (1954) transported cats in opaque sacks and placed them at the centre of a multi-exit maze. At distances of approximately 5 km from home, over 60% of subjects oriented toward the exit facing their home direction. Performance degraded at greater distances, and cats maintained in laboratory conditions between trials, as well as young cats with no outdoor experience, showed markedly diminished homing success, suggesting that the ability is at least partly dependent on prior environmental experience.

Several authors sought evidence of the processes underlying homing in domestic cats. Beadle (1977) hypothesised that cats, analogously to migratory birds, may possess sensitivity to the Earth's geomagnetic field, providing a compass-like reference frame independent of visual landmarks. Some support for this view comes from experiments in which magnets affixed to cats disrupted their directional choices (Precht & Lindenlaub, 1954). Alternative or complementary explanations include olfactory mapping, by which cats construct and recall spatial representations based on scent gradients, and path integration, in which the vestibular system and proprioceptive feedback allow cumulative tracking of displacement. In cats specifically, olfactory cues plausibly contribute both to short-range orientation within known territory and to longer-range position-fixing during displacement (Mermet et al. 2007). More recent work on feline spatial cognition has demonstrated that cats form allocentric mental representations of their environment and can track the inferred positions of individuals based on auditory cues (Takagi et al., 2021), consistent with a broader capacity for cognitive mapping (Jeffery 2024; Jeffery et al. 2024).

Beyond experimental designs, homing in cats has captured sustained public attention. Individual cases have repeatedly generated widespread media coverage: the story of Holly, a tortoiseshell cat who navigated approximately 190 miles back to her home in West Palm Beach, Florida after becoming lost during a family holiday, was reported by ABC News, covered on BBC Radio 4's Today programme, and

picked up by outlets across multiple continents following her discovery in January 2013 (ABC News, 2013; BBC News, 2013). The story of Howie, a Persian cat reported to have crossed over 1,000 miles of Australian outback to return home, has similarly circulated widely in popular science writing and pet media for decades. We here present evidence from self-reported assessments of homing behaviour in domestic cats, evaluating performance based on characteristics.

## Methods

### Data collection

A self-reported questionnaire was launched in January 2013 and is still accessible at this link: <https://www.esurveyspro.com/Survey.aspx?id=0790921b-4da5-442c-991d-15c9091cde2f>. The full list of questions is available in Table A1. The dataset for this analysis was retrieved in May 2026. We collected 342 self-reported questionnaires on cat homing behaviours. We excluded 142 questionnaires since they were not reporting relevant data (e.g., cats still missing, cats who left home and returned after a few days). The home range of domestic cats is about 2–3 ha (Barratt 1997; Horn et al. 2011). For this paper, we consider homing when cats return from a location which is outside of their regular home range. We thus excluded all the self-reported homing behaviours that indicated less than 1 km distance (12 occurrences). We also excluded 15 instances where the distance was not indicated, as we could not assess the reliability of the data. We included 173 instances of self-reported cat homing behaviour in the final dataset for analysis.

In 44 instances, the respondents included start and end locations, allowing us to extract the aerial distance for comparison with the distances provided by the respondents. There was a significant correspondence between the self-reported distances and the straight-line mapped distance ( $\rho = 0.90$ ,  $p < 0.001$ ). Still, the owners typically reported distances approximately 27% greater than the straight-line equivalent (Figure A2). In proportion, the overestimation is higher at shorter distances (48.7% for 1–5 km) than at longer distances (23.5% for 5–20 km, 25.0% for > 20km), although the absolute difference is smaller at shorter distances (0.78 km at 1–5 km, 1.66 km at 5–20 km, 18 km at > 20 km). Given the strong correspondence between self-reported and mapped distances, we consider the self-reported estimates reliable, despite significant overestimation.

### Data analysis

To investigate predictors of homing behaviour, three response variables were modelled separately: homing distance (km), homing duration (days), and homing velocity (km/day). Given the right-skewed nature of all three outcomes, Generalised Additive Models for Location, Scale and Shape (GAMLSS; Rigby & Stasinopoulos, 2005) were fitted using the `gamlss` package (v5.4-22) in R (v4.3.1). The distributional family for each outcome was selected empirically by fitting five families (i.e., Inverse Gaussian, Log-Normal, Log-Logistic, Gamma, and Weibull) and comparing models using the Akaike Information Criterion (AIC). The Inverse Gaussian distribution provided the best fit for homing distance ( $\Delta\text{AIC} = -92.9$  vs. Gamma), while the Log-Logistic distribution was selected for both homing duration

and velocity ( $\Delta AIC = -77.3$  and  $-10.3$  vs. Gamma, respectively). All models used a log link function for the location parameter ( $\mu$ ) and included the following predictors: current age category (adult, young adult, senior, kitten), age at adoption (kitten, young adult, adult, feral), area familiarity (1–4 ordinal scale), personality/boldness (1–5 ordinal scale), and outdoor access type (outdoor access, indoor only, outdoor only). Pairwise comparisons between levels of each categorical predictor were performed using a bootstrap procedure ( $n = 500$  resamples) in which the full model was refitted on each bootstrap sample using the appropriate distributional family, and group-specific predicted geometric means on the log-linear predictor scale were compared; two-tailed p-values were derived from the empirical bootstrap distribution. Marginal predicted means and 95% confidence intervals for each predictor level were computed by evaluating the model at each level while holding all other predictors at their observed sample means, with CIs derived from the bootstrap distribution of the linear predictor.

## Results

Homing behaviour was mostly reported within 5 km of the home (59.0%), but homing was also regularly recorded at distances above 10 km (22.0%) (Table 1). We obtained more reports on male cats (65.9%) than female cats (34.1%) showing homing behaviour. Most of the reports were on adults (57.8%) or young adults (34.7%), with seniors (although with a couple of reports of distances above 10km) and kittens less likely to show homing behaviour. Most of the cats displaying homing had outdoor access (65.3%) or were outdoor-only cats (29.5%). Indoor-only cats reported were only 9, mostly indoor-only cats with previous outdoor access or cats with supervised outdoor access. The median homing distance was 4.4 km, with a median of 6 days lost (Table 2).

Table 1. Total number of reported cases of homing in cats considering distances, sex (NM: neutered male; SF: spayed female; UF: unspayed female; UM: unneutered male), age (K: kitten; YA: young adult; A: adult; Sr: senior) and type (IO: indoor only; OA: outdoor access; OO: outdoor only).

| Distance covered | Sex |    |    |    | Age |    |     | Type |    |     |    | Total |
|------------------|-----|----|----|----|-----|----|-----|------|----|-----|----|-------|
|                  | NM  | SF | UF | UM | K   | YA | A   | Sr   | IO | OA  | OO |       |
| 1-5 km           | 39  | 22 | 13 | 28 | 2   | 36 | 58  | 6    | 4  | 74  | 24 | 102   |
| 5-10 km          | 12  | 3  | 5  | 13 | 2   | 11 | 19  | 1    | 1  | 15  | 17 | 33    |
| 10-20 km         | 10  | 3  | 5  | 6  |     | 5  | 18  | 1    | 2  | 14  | 8  | 24    |
| 20-50 km         |     | 4  | 1  | 4  |     | 6  | 2   | 1    | 2  | 5   | 2  | 9     |
| >50 km           | 1   | 3  |    | 1  |     | 2  | 3   |      |    | 5   |    | 5     |
| Total            | 62  | 35 | 24 | 52 | 4   | 60 | 100 | 9    | 9  | 113 | 51 |       |

Table 2. Overall descriptive statistics for homing outcomes in domestic cats ( $n = 171$ )

| <b>Outcome</b>    | <b>n</b> | <b>Mean</b> | <b>Median</b> | <b>Range</b> | <b>95% CI (mean)</b> |
|-------------------|----------|-------------|---------------|--------------|----------------------|
| Distance (km)     | 171      | 10.42       | 4.44          | 1.13–225.40  | [6.86, 13.97]        |
| Days lost         | 171      | 39.02       | 6.00          | 0.20–1095.00 | [19.09, 58.94]       |
| Velocity (km/day) | 171      | 1.72        | 0.81          | 0.01–33.81   | [1.23, 2.21]         |

95% CI = 95% confidence interval of the mean (t-distribution). All values in original units.

Most of the cases reported cats returning home (57.8%) after being lost or after intentional disposal (i.e., when it was clear from the comments that the respondent attempted to dispose of the cat; this included 15 feral cats). Apart from two instances in which cats were reported to return to the rescuer's house after being returned to the owner, the remaining homing reports involved cats returning to their current or previous home (Table3).

Table 3. Details of the homing behaviour of cats, with frequencies by destination and reason.

| <b>Destination</b>              | <b>Reason</b>                           | <b>Count</b> |
|---------------------------------|-----------------------------------------|--------------|
| Returned home                   | Intentional disposal                    | 34           |
|                                 | Lost away from home (e.g. vet, holiday) | 32           |
|                                 | Lost during accidental transport        | 31           |
|                                 | Left home with GPS                      | 1            |
| Returned to the previous home   | Recently moved to a new home            | 51           |
|                                 | Recently adopted                        | 17           |
|                                 | Left home                               | 2            |
|                                 | Lost during accidental transport        | 1            |
| Returned to the rescuer's house | Returned to the owner                   | 2            |

Obstacles were encountered by the majority of cats (112/174, 64%), with 2-lane highways being the most common (79 cats, 45%), followed by streams or rivers (60 cats, 34%), and 4-lane highways (35 cats, 20%). Homing distance increased with the number of obstacles encountered: cats with no obstacles had a median homing distance of 3.1 km, rising to 4.0 km with one obstacle, 6.8 km with two, and 17.7 km with three.

### Factors determining homing performance

Boldness score was associated with an increase in homing velocity (Incidence Rate Ratio: IRR = 1.29, 95% CI [1.11, 1.49],  $p < 0.001$ ) and homing duration (IRR = 0.78, 95% CI [0.66, 0.93],  $p = 0.006$ ). Boldness had no significant effect on distance (IRR = 1.00,  $p = 0.97$ ). Familiarity with the area showed a non-

significant positive trend with time (IRR = 1.22,  $p = 0.25$ ) and a non-significant negative trend with velocity (IRR = 0.88,  $p = 0.35$ ). Among categorical predictors, current age, age at adoption, and outdoor access type were all non-significant across outcomes (Table A3; Table A4). Pairwise bootstrap comparisons between levels confirmed this pattern, with the sole significant contrast being higher velocity in feral-adopted cats compared to those adopted as kittens ( $p = 0.027$ ). Several comparisons approached but did not reach significance, including shorter homing times in adult-phase cats relative to kittens ( $p = 0.093$  for distance;  $p = 0.096$  for velocity) and higher velocity in outdoor-only compared to outdoor-access cats ( $p = 0.10$ ).

## Discussion

In this paper, we present the first evidence that domestic cats can perform homing, based on self-reported questionnaires. That said, it is important to note that we do not report the homing success rate; we are simply reporting that homing is possible and that factors can improve homing performance. It is also important to note that the vast majority of cats (97% based on Huang et al. 2018) go missing from a familiar location. And 75% of cats are found within a 500 m radius of their point of escape (Huang et al. 2018). Thus, homing skills need to be considered when searching for a lost cat, but effective search methods near the location lost or last seen should be prioritised.

Demographic parameters did not have a significant effect on distance and velocity, but this might be a reflection of the small sample size for some of them. For example, only 9 indoor-only cats or senior cats were reported in this questionnaire. And we need to note that cats labelled by the owner as 'indoor-only' might have had some exposure to environmental stimuli necessary for homing (e.g., supervised outdoor access). In this respect, the experiment from Precht and Lindenlaub (1954) suggested that cats without outdoor experience had lower homing ability. Indoor-only cats are also known to travel shorter distances when they get lost (Huang et al. 2018).

Boldness was the only predictor consistently and significantly associated with homing outcomes, with bolder cats returning faster (lower duration, higher velocity) but not necessarily covering greater distances. This suggests boldness influences how a cat navigates rather than how far it travels, possibly reflecting greater willingness to move through unfamiliar terrain, cross obstacles, travel during daylight hours, or approach human settlements for assistance. This aligns with personality-behaviour consistency theory and has implications for predicting homing success in lost cat cases. Based on practitioner experience of DR, shyer lost cats (especially escaped indoor-only cats) are often present around their home, but they mostly come out at night and are caught on surveillance cameras rather than seen by their owner. Without cameras, it could take days or weeks before the owner sees their lost cat even though it is essentially home.

The category 'not very familiar' included unowned cats (trapped and released intentionally) that were not familiar with the house but could be familiar with the area (we only have this information for some respondents if they left comments). Unowned cats are shown to have larger home ranges, so they could

have been familiar with areas farther from what we considered the threshold. For example, male unowned cats are shown to have home ranges of 100–150 ha in the absence of geographical barriers (Horn et al. 2011), meaning that they might be familiar with areas about 10 km away from the release site. This might also explain why feral-adopted cats showed significantly higher homing velocity compared to kitten-adopted cats, with a trend towards longer distances and shorter durations. This may reflect greater spatial awareness and independent navigation developed before domestication.

## Recommendations

We here report some practical recommendations emerging from this study, highlighting that we do not report homing success rate or predict what characteristics make a cat more likely to attempt homing behaviour.

1. Based on other studies, not all cats will attempt homing behaviour, and the likelihood decreases over 5 km. Precht and Lindenlaub (1954) found that at distances of 5 km or less, only 60% of cats appeared able to determine the direction of their home, but most cats were unable to do so at greater distances. Searching and advertising near the point of escape or last seen is always important even if you suspect homing behaviour is possible.
2. Precht and Lindenlaub (1954) also suggested that cats without outdoor experience had lower homing ability. In our study only 5.2% (9) of homing reports were indoor-only cats. This, however, could also indicate that fewer indoor-only cats go missing from unfamiliar locations.
3. Most homing reports (59%) were 5km or less. Only 8.1% of homing reports were over 20 km. It is also possible that more cats attempt homing from farther away but do not succeed in returning home.
4. Bolder cats and feral-adopted cats both travelled at a higher velocity and thus made it home in fewer days. But boldness or shyness had no effect on distance travelled.
5. Cats often cross obstacles when homing, including 34% (60) of cats crossing rivers and streams and 20% (35) of cats crossing 4-lane highways. So do not rule out homing due to potential obstacles. But from personal experience of DR, these obstacles sometimes stop a cat from homing. It is advisable to draw a line between the location lost and their home, and place posters along this route as well as around the location lost and their home. If any significant obstacles such as multi-lane highways or streams/rivers that cannot be easily crossed are present along the route, put additional posters in these areas.

## Declarations

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### Author contributions

MC: Writing – original draft, Methodology, Conceptualisation, Data Curation, Formal Analysis, Software.  
DR: Writing – review and editing, Methodology, Investigation, Conceptualisation, Data Curation. All authors approved the final version of the manuscript for publication.

### **Ethics declaration**

Participant information and request for consent are present at the beginning of the questionnaire, and details on the website use and personal information policy are present here:  
<https://lostpetresearch.com/privacy-policy/>.

The study protocol was deemed to be exempt by Oxford Brookes University Ethics Committee and Information Security Committee since no participant information was shared for the analysis or included in the paper. The study was conducted in accordance with the Declaration of Helsinki, Belmont Report.

### **Consent to Participate**

Informed consent was obtained from all participants involved in the study.

### **Data availability**

The dataset used for this article is enclosed as supplementary material

### **Consent for publication**

Not applicable. No identifying information of participants or patients has been disclosed in this manuscript.

### **Competing interests**

Dr. Marco Campera declares he is an Editorial Board Member of Discover Animals and confirms that he was not involved in the handling or decision-making of his own submission. DR declare no COI.

### **Declaration of generative AI and AI-assisted technologies in the writing process**

Claude (Anthropic) has been used to help with R coding. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

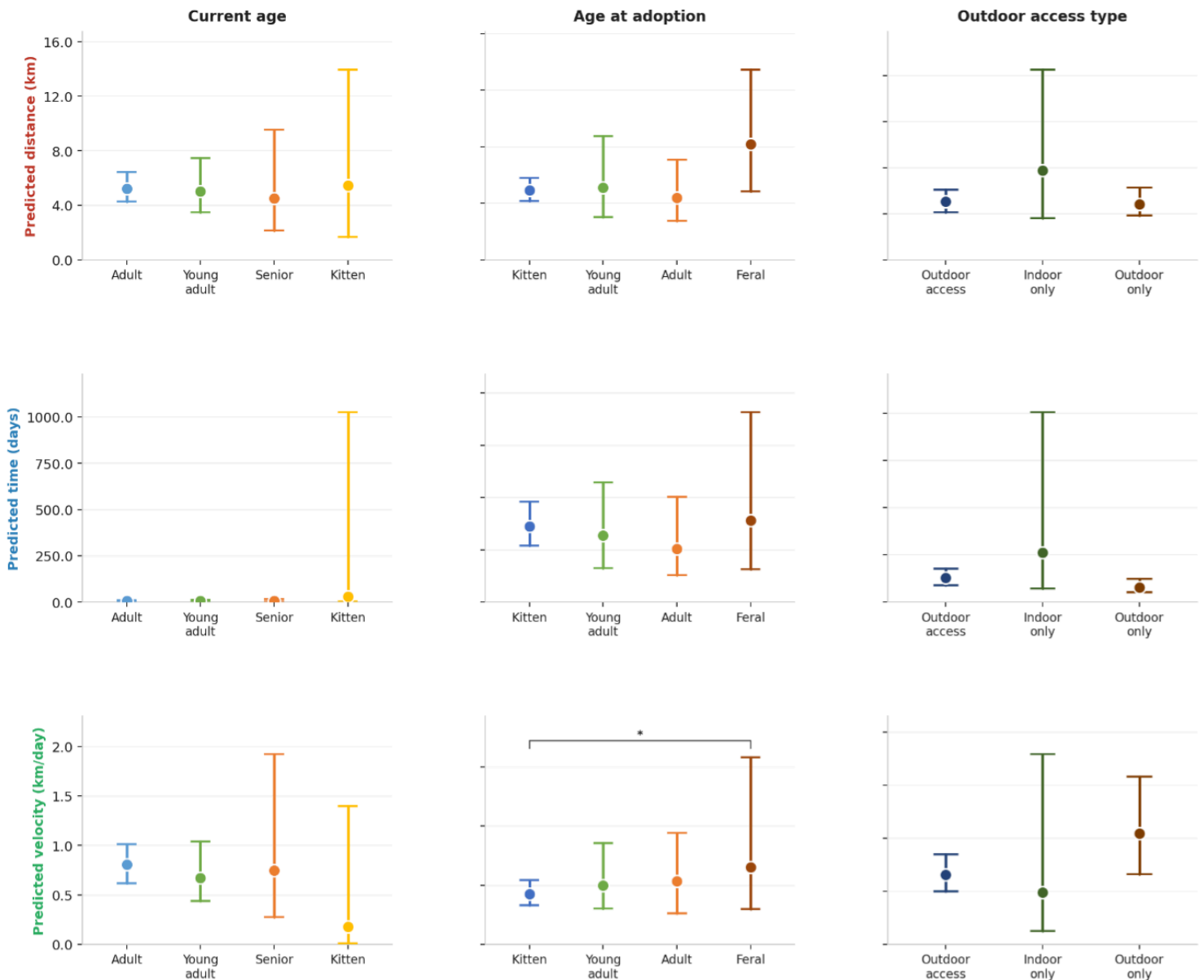
## **References**

1. Barratt, D.G., 1997. Home range size, habitat utilisation and movement patterns of suburban and farm cats *Felis catus*. *Ecography*, 20(3), pp.271-280.
2. Beadle, M. 1977. *The Little Differences in The Cat: History, Biology, and Behavior*. New York, New York: Simon and Schuster.

3. Bonadonna, F. and Gagliardo, A., 2021. Not only pigeons: avian olfactory navigation studied by satellite telemetry. *Ethology Ecology & Evolution*, 33(3), pp.273-289.
4. Etienne, A.S. and Jeffery, K.J., 2004. Path integration in mammals. *Hippocampus*, 14(2), pp.180-192.
5. Günther, A., Einwich, A., Sjulstok, E., Feederle, R., Bolte, P., Koch, K.W., Solov'yov, I.A. and Mouritsen, H., 2018. Double-cone localization and seasonal expression pattern suggest a role in magnetoreception for European robin cryptochrome 4. *Current Biology*, 28(2), pp.211-223.
6. Herrick, C.J., 1922. An introduction to neurology.
7. Horn, J.A., Mateus-Pinilla, N., Warner, R.E. and Heske, E.J., 2011. Home range, habitat use, and activity patterns of free-roaming domestic cats. *The Journal of Wildlife Management*, 75(5), pp.1177-1185.
8. Huang, L., Coradini, M., Rand, J., Morton, J., Albrecht, K., Wasson, B., & Robertson, D. (2018). Search Methods Used to Locate Missing Cats and Locations Where Missing Cats Are Found. *Animals*, 8(1), 5.
9. Jeffery, K.J., 2024. The mosaic structure of the mammalian cognitive map. *Learning & Behavior*, 52(1), pp.19-34.
10. Jeffery, K.J., Cheng, K., Newcombe, N.S., Bingman, V.P. and Menzel, R., 2024. Unpacking the navigation toolbox: insights from comparative cognition. *Proceedings of the Royal Society B: Biological Sciences*, 291(2016), p.20231304.
11. Liedvogel, M. and Mouritsen, H., 2009. Cryptochromes—a potential magnetoreceptor: what do we know and what do we want to know?. *Journal of the Royal Society Interface*, 7(Suppl 2), p.S147.
12. Marin, A.C., Schaefer, A.T. and Ackels, T., 2021. Spatial information from the odour environment in mammalian olfaction. *Cell and Tissue Research*, 383(1), pp.473-483.
13. McNaughton, B.L., Battaglia, F.P., Jensen, O., Moser, E.I. and Moser, M.B., 2006. Path integration and the neural basis of the 'cognitive map'. *Nature Reviews Neuroscience*, 7(8), pp.663-678.
14. Mermet, N., Coureaud, G., McGrane, S. and Schaal, B., 2007. Odour-guided social behaviour in newborn and young cats: an analytical survey. *Chemoecology*, 17(4), pp.187-199.
15. Moser, E.I., Moser, M.B. and McNaughton, B.L., 2017. Spatial representation in the hippocampal formation: a history. *Nature Neuroscience*, 20(11), pp.1448-1464.
16. Mouritsen, H., 2018. Long-distance navigation and magnetoreception in migratory animals. *Nature*, 558(7708), pp.50-59.
17. Papi, F. ed., 2012. Animal homing. Springer Science & Business Media.
18. Precht, H., and E. Lindenlaub. 1954. Über das Heimfindevermögen von Säugetieren. I. Versuche an Katzen. *Z. Tierpsychologie*, 11, 485.
19. Rigby, R.A. and Stasinopoulos, D.M., 2005. Generalized additive models for location, scale and shape. *Journal of the Royal Statistical Society Series C: Applied Statistics*, 54(3), pp.507-554.
20. Takagi, S., Chijiwa, H., Arahori, M., Saito, A., Fujita, K. and Kuroshima, H., 2021. Socio-spatial cognition in cats: Mentally mapping owner's location from voice. *PLoS One*, 16(11), p.e0257611.

21. Xu, J., Jarocho, L.E., Zollitsch, T., Konowalczyk, M., Henbest, K.B., Richert, S., Golesworthy, M.J., Schmidt, J., Déjean, V., Sowood, D.J. and Bassetto, M., 2021. Magnetic sensitivity of cryptochrome 4 from a migratory songbird. *Nature*, 594(7864), pp.535-540.
22. Wallraff, H.G., 2004. Avian olfactory navigation: its empirical foundation and conceptual state. *Animal Behaviour*, 67(2), pp.189-204.
23. Wiltschko, R. and Wiltschko, W., 2019. Magnetoreception in birds. *Journal of the Royal Society Interface*, 16(158), p.20190295.
24. Zeil, J., 2012. Visual homing: an insect perspective. *Current Opinion in Neurobiology*, 22(2), pp.285-293.
25. Zhang, L. and Malkemper, E.P., 2023. Cryptochromes in mammals: a magnetoreception misconception?. *Frontiers in Physiology*, 14, p.1250798.

## Figures



## Figure 1

Model-adjusted marginal predicted means and 95% bootstrap confidence intervals for homing distance (km; red), homing duration (days; blue), and homing velocity (km/day; green) across three categorical predictors: current age at the time of loss (left column), age at adoption (centre column), and outdoor access type (right column). Each point represents the model-predicted response for that level, estimated from the best-fit GAMLSS model (Inverse Gaussian for distance; Log-Logistic for duration and velocity) with all other predictors held at their observed sample means. Vertical bars show 95% bootstrap confidence intervals ( $n = 500$  resamples). Reference categories for each predictor are adult (current age), kitten (age at adoption), and outdoor-access (access type). Significance brackets indicate pairwise differences identified by bootstrap comparison (\*  $p < 0.05$ ).

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [CatHomingFinalAnalysis.csv](#)
- [Appendix.docx](#)