Towards a Possum Free Taranaki

Hello I am Tess O'Malley, a PhD candidate from the University of Auckland. I'm here to talk about a Predator Free 2050 landscape project in the Kaitake Ranges of Taranaki.

Tess O'Malley

University of Auckland

Outline

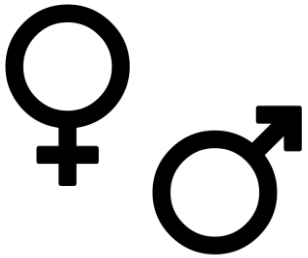
We will talk about home range. Specifically:

- Shape and size,
- And the effects of habitat (forest vs farmland) and sex (male vs female)

Possum home ranges:

shape and **size**

effect of **habitat** and **sex**



Restore Kaitake

TARANAKI MOUNGA
He Kauwa Ora – Back to Life

Taranaki Regional Council

Department of Conservation
Te Papa Atawhai

PREDATOR FREE 2050
Ka uru ora, return to life

The possum control project takes place in the Kaitake Ranges, north of Taranaki Mounga.

It is managed by the Taranaki Mounga Project, Taranaki Regional Council, and Department of Conservation, with significant funding from Predator Free 2050.

Restore Kaitake

Zero-Possum Zone

Buffer Zone

The project aims to achieve zero-possum density in the Kaitake and surrounding farmland (dark blue zone). Zero-density means all resident possums must be removed, although re-invaders can re-enter the area. If these re-invaders are removed quickly enough, we can prevent them breeding, and thereby prevent a new population establishing. This will require intensive and efficient control techniques, especially trapping.

There are no significant natural barriers to movement, so to reduce the reinvasion rate a buffer zone (light blue) is also intensively controlled.

Restore Kaitake

The project is currently in the late stages of removing all resident possums. It is employing a two-fold strategy:

First, achieve a major knockdown of the population by using 1080 in the park, and intensive trapping and baiting in the farmland. Second, mop up the remaining stragglers using ground control.

The 1080 application has been completed, but was not as successful as hoped, making this mop up stage particularly challenging.

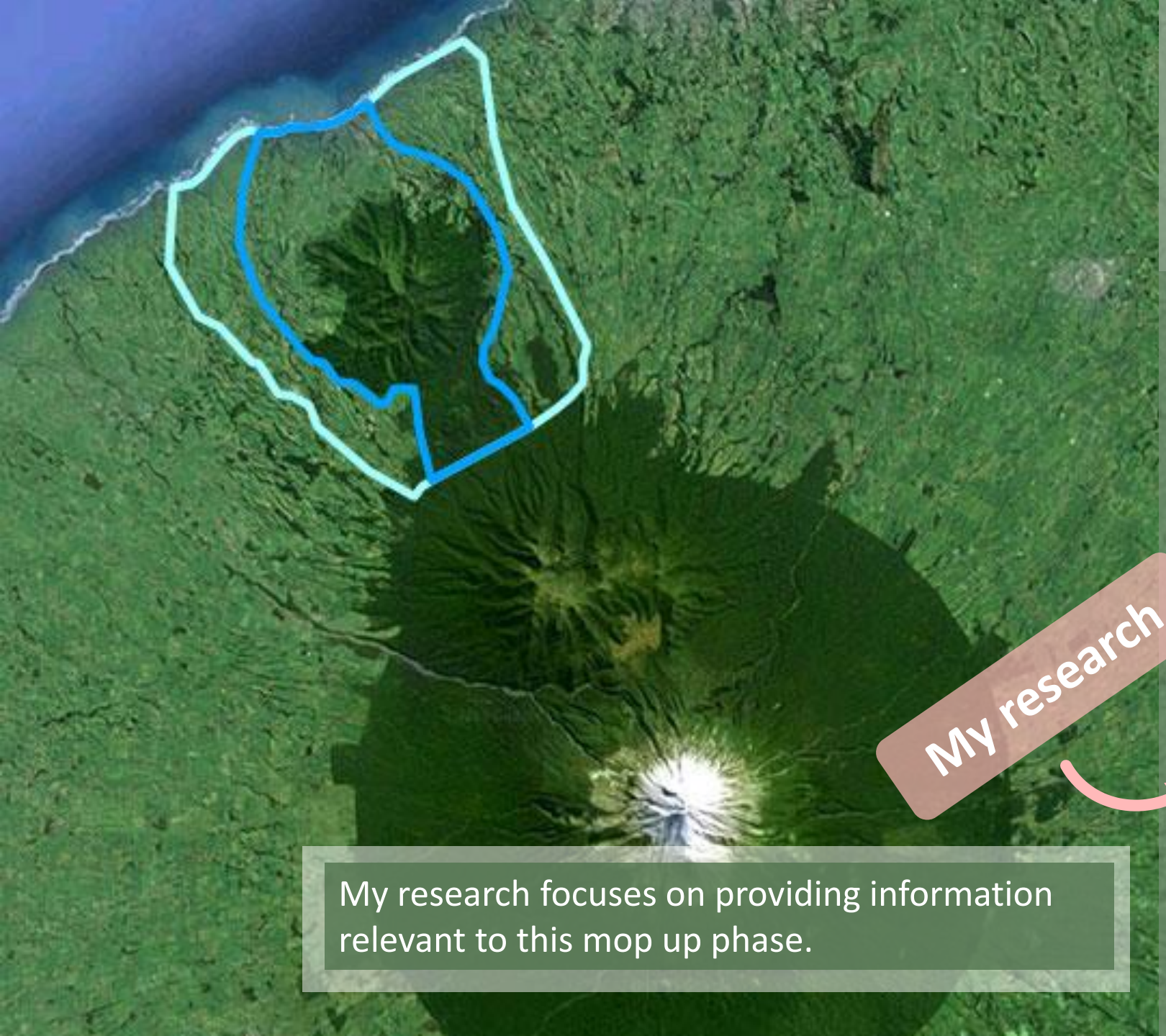
Knockdown (2018 – 2019)

1080 in park

Trapping and **toxins** in farmland

Mop up (2020 – present)

Ground control in zero density and buffer zones



Restore Kaitake

Knockdown (2018 – 2019)

1080 in park

Trapping and **toxins** in farmland

My research

Mop up (2020 – present)

Ground control in zero density and buffer zones

My research focuses on providing information relevant to this mop up phase.

Where are the remaining possums?

Measuring Home Range

Farmland study area

Forest study area

Zero-possum zone

I measured possum home range using GPS collars. I had two groups based on habitat type: farmland and forest, both inside the zero-possum zone.

This was done after the 1080 application, when possums were at low density.

(P.S. The dark green on the map denotes national park not habitat type.)

Possums Collared

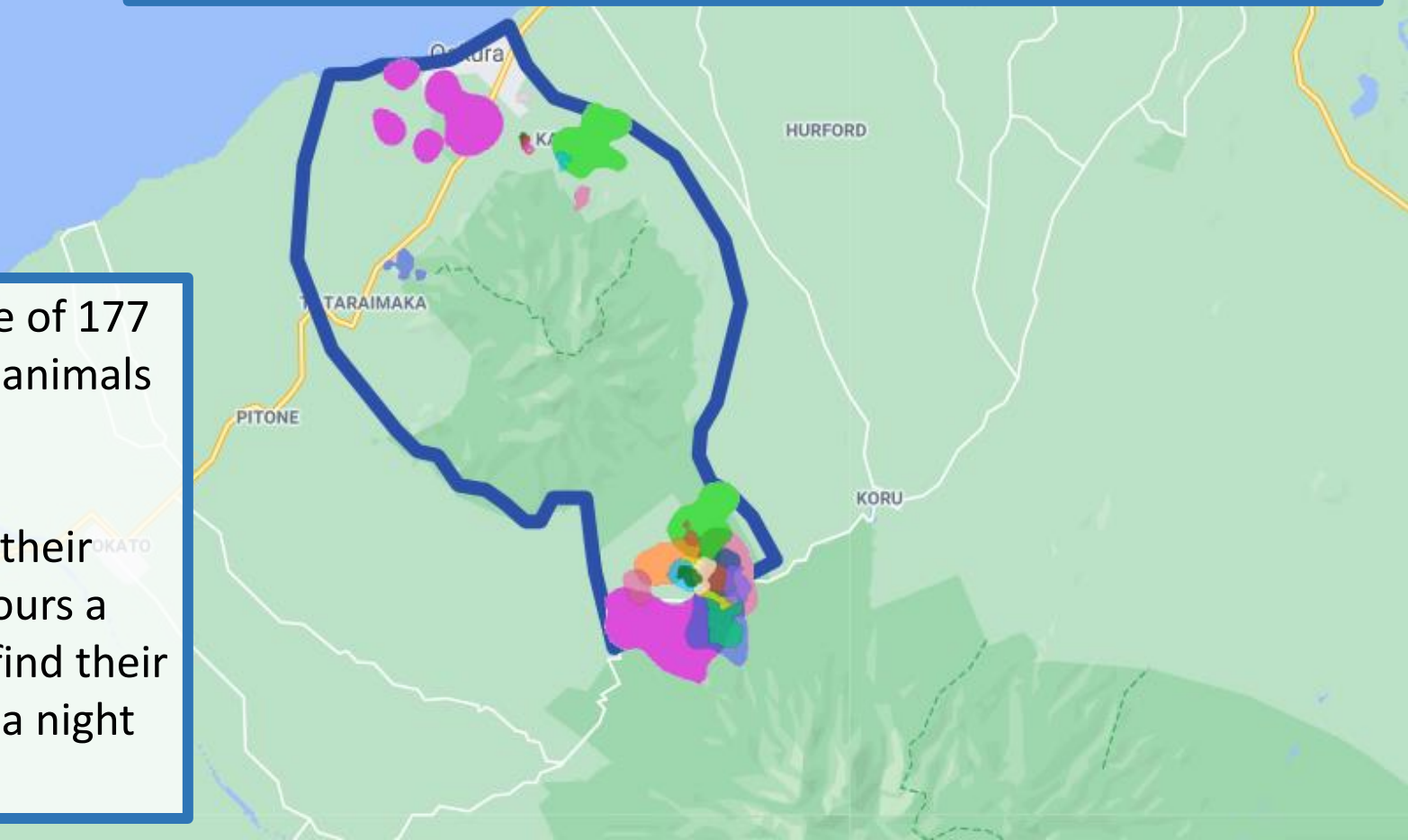
10 possums in **farmland**

14 possums in **forest**

177 days on average

We collared 10 possums in farmland and 14 in forest.

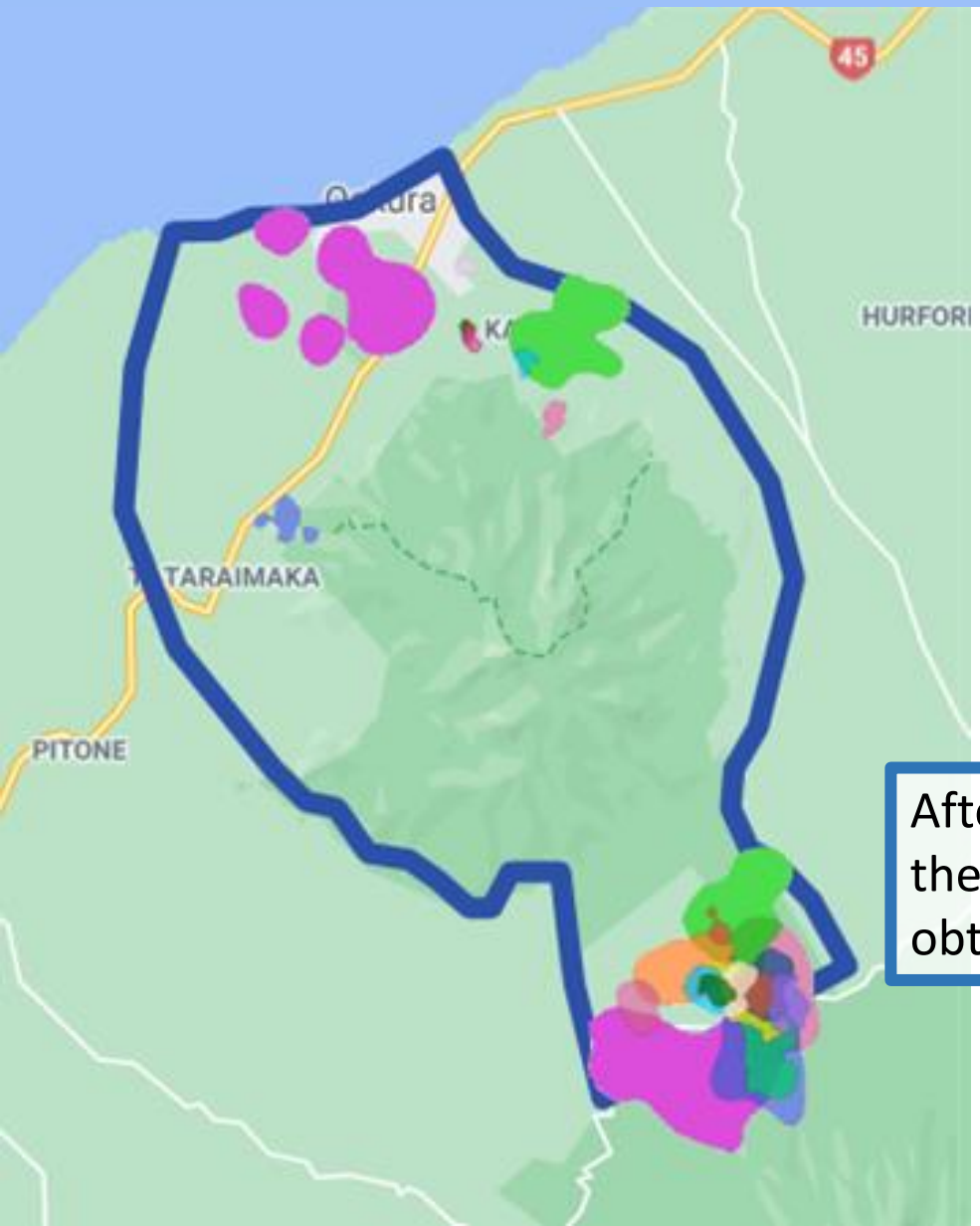
I do not yet have density estimates for these populations. But to give you an idea: it took 5 months of continuous trapping with 50 to 100 live capture cages to obtain the 14 forest possums. These 14 individuals represent a majority (but not all) of the possums in that area.

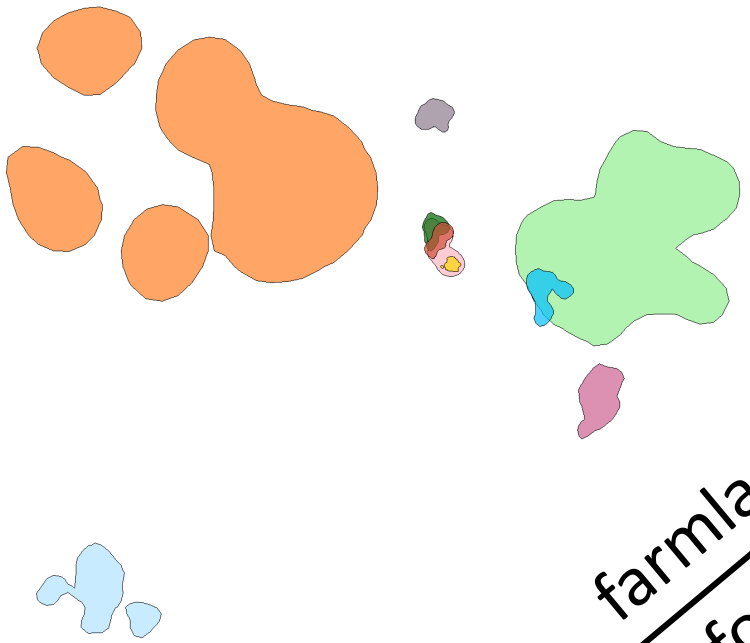


Each individual was followed for an average of 177 days (but this ranges from 41 to 365, most animals had greater than 150 days).

The collars were programmed to recorded their location once every 2 hours overnight (7 hours a night) but in dense bush collars can fail to find their point. In reality I obtained around 2 points a night for each individual.

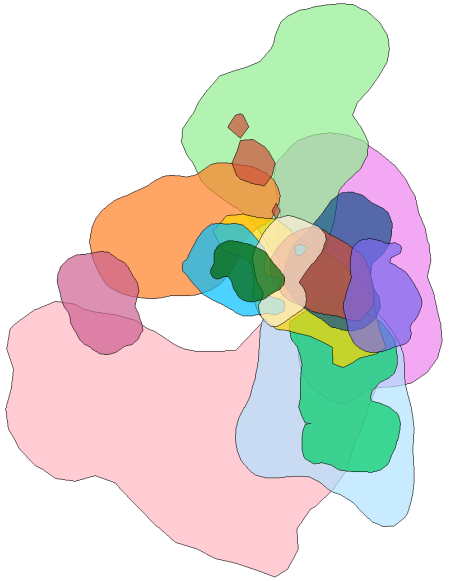
Home Range Results





farmland

forest



After processing the GPS data, these are the home ranges obtained.

Home Range Analysis

We will look at home range size and shape (and the effect of habitat on this). We will also look at the effect of sex.

Let's start with size.

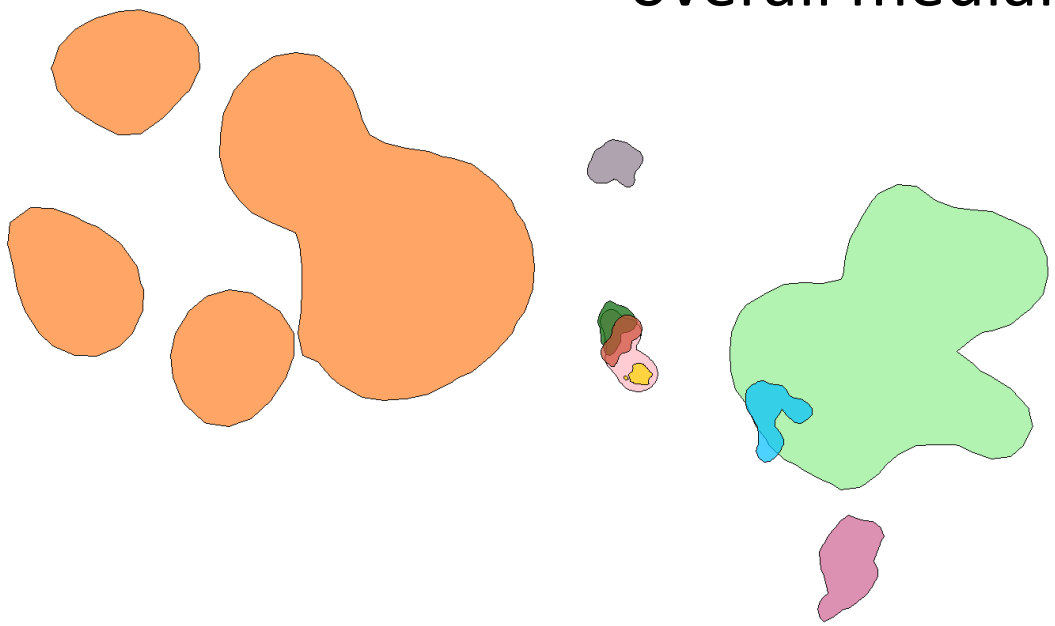
Size

Shape

Sex

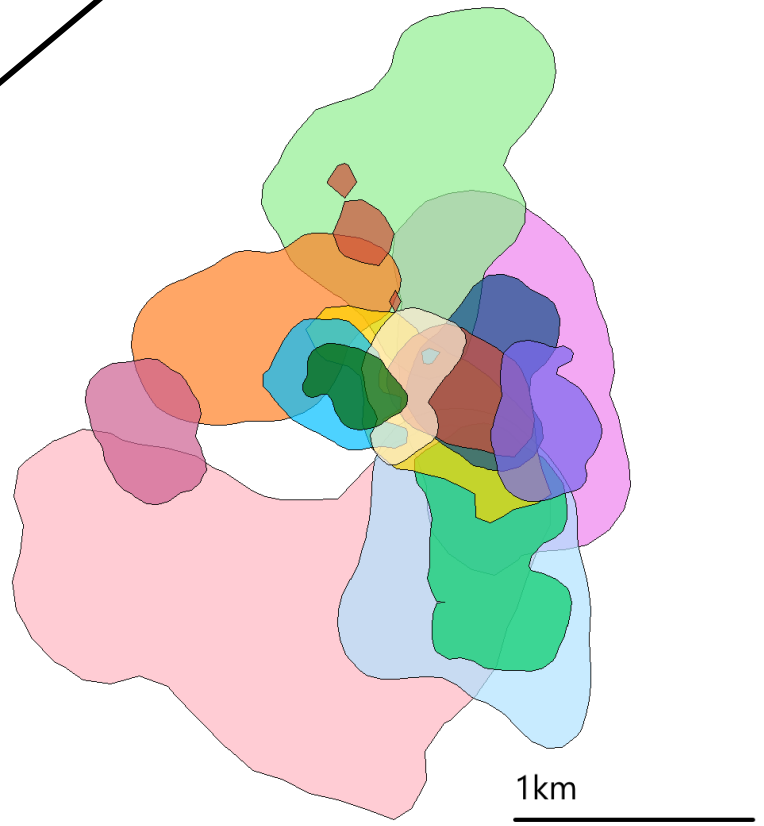
Home Range Size

overall median of **23 ha** (+- 25 CI)



farmland

forest

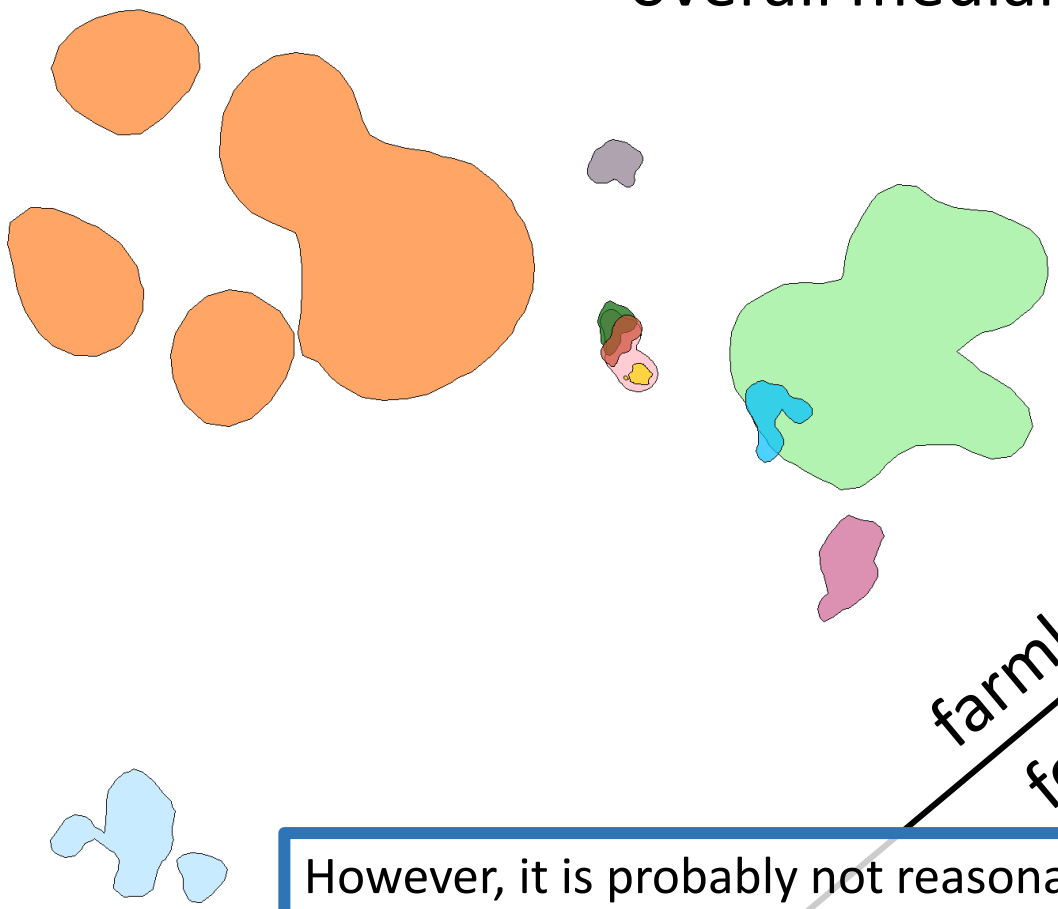


We obtained an overall median value of 23 hectares.

(Median is similar to average, but is not as heavily influenced by usually small or large values.) (The 95% confidence interval was +- 25 ha).

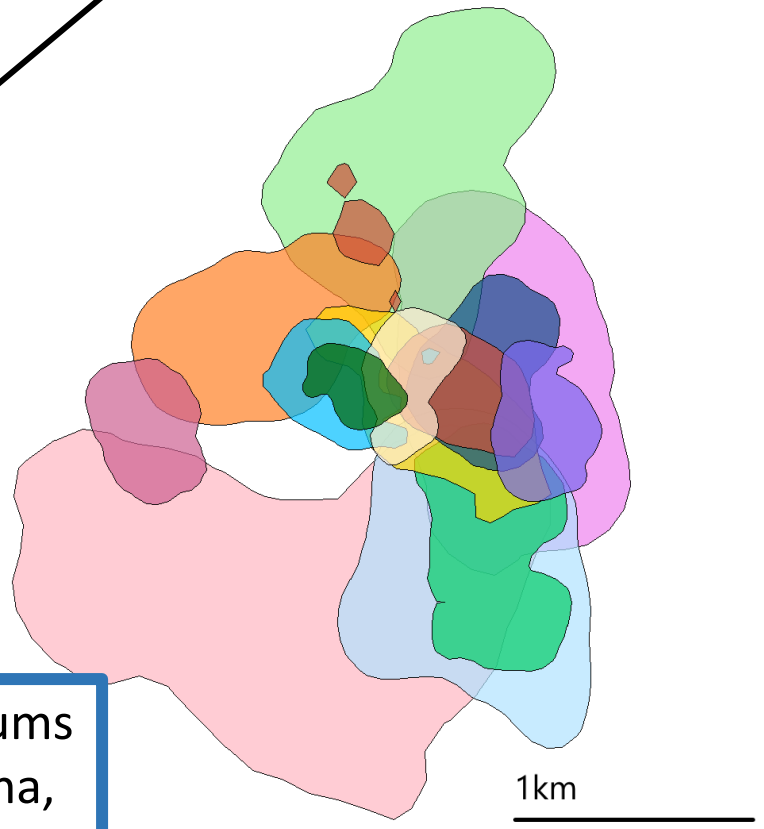
Home Range Size

overall median of **23 ha** (+- 25 CI)



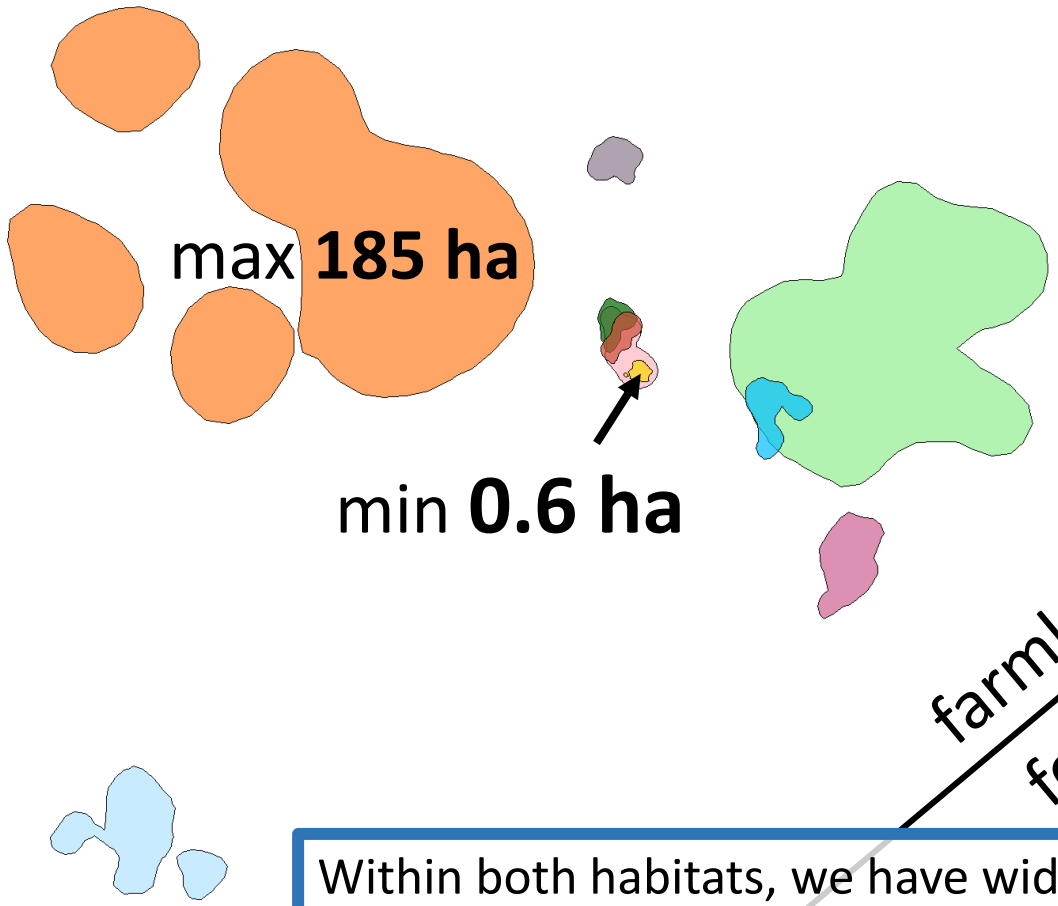
farmland **5 ha** (± 39 CI)

forest **40 ha** (± 33 CI)



However, it is probably not reasonable to look at these possums as one population. The median farmland home range was 5 ha, versus 40 ha for the forest. This is a wide difference and as such, we should be considering them separately.

Home Range Size



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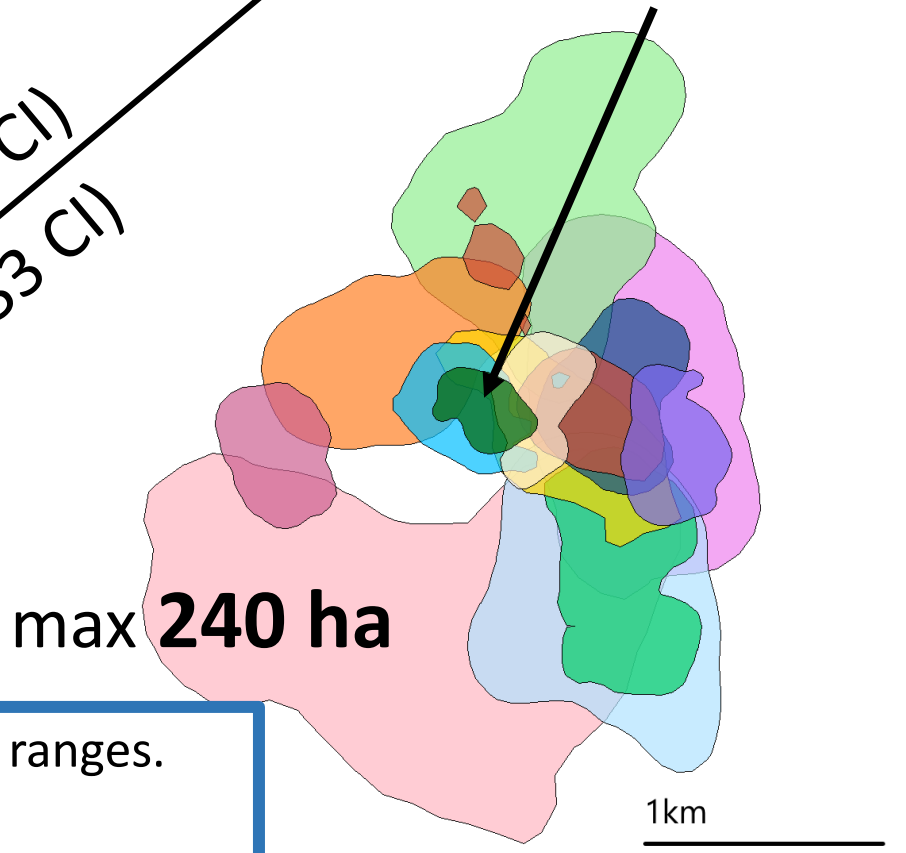


Within both habitats, we have wide variation in home ranges.

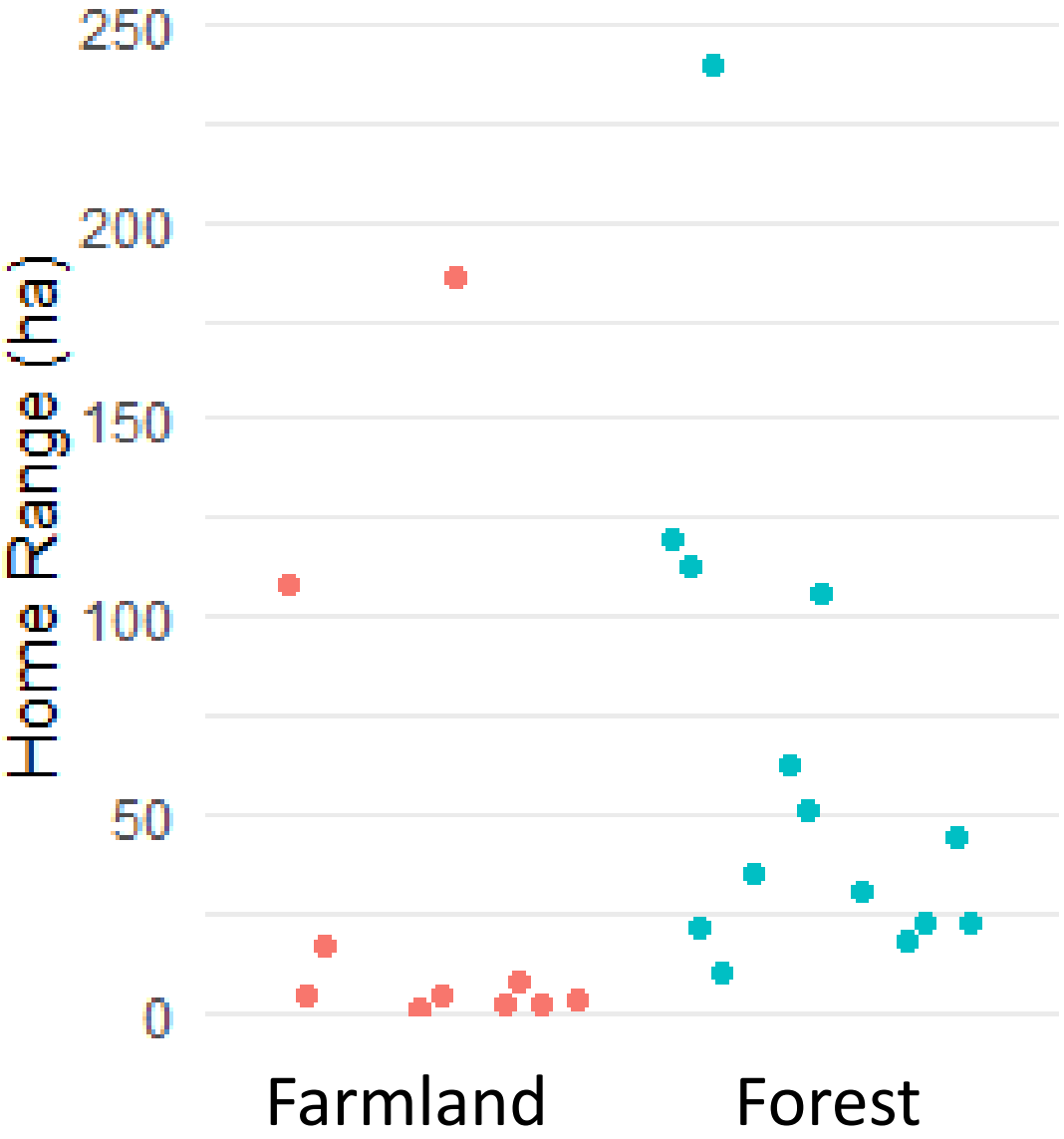
We need to understand what is happening between our minimum and maximum values.

Finding a **Meaningful** Home Range

By graphing our results it is easier to see the home range distribution.

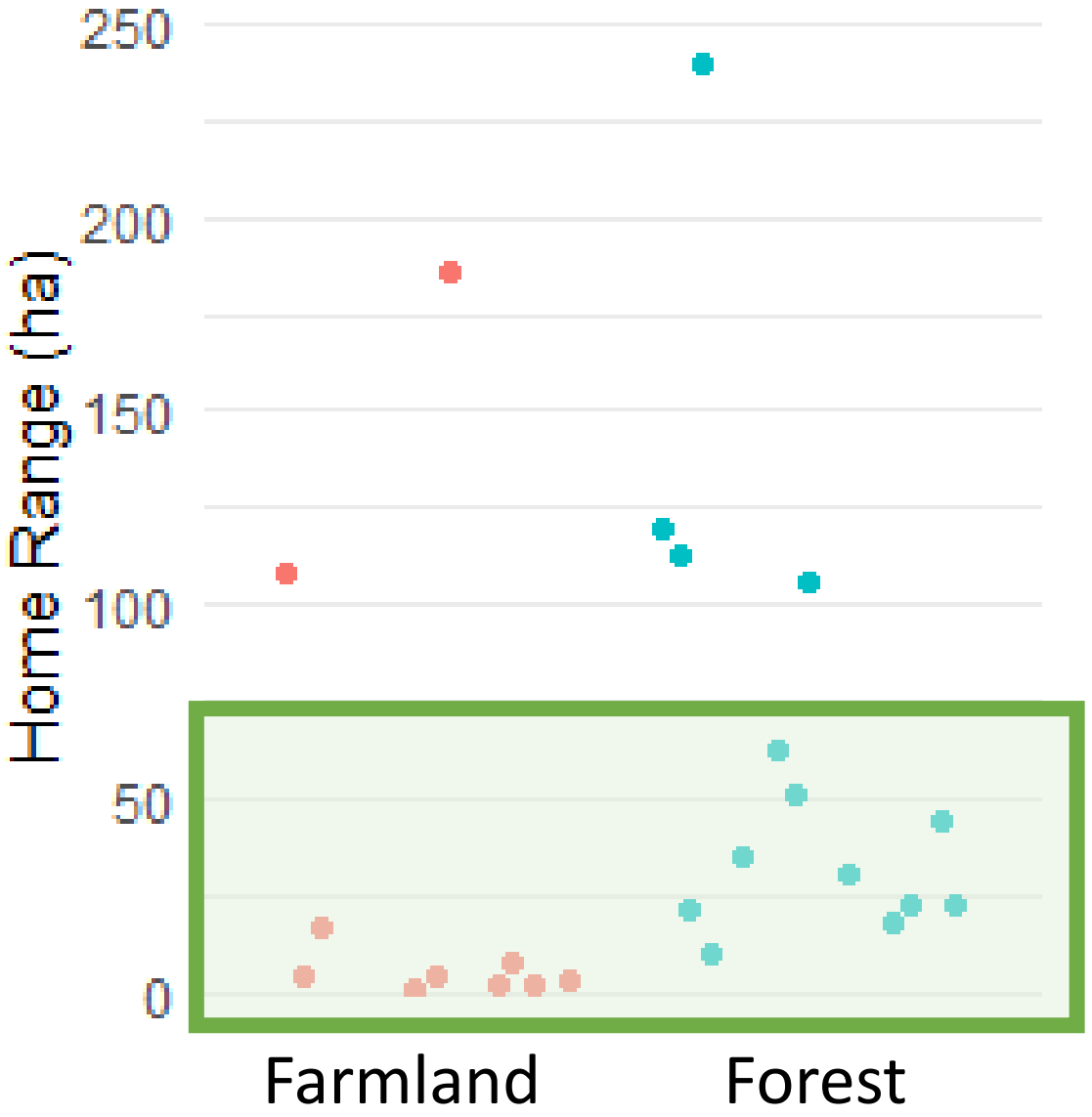
On the vertical axis is home range in hectares.

Each point is a possum, with red being farmland and blue forest.



Finding a **Meaningful** Home Range

We can see that most of our possums have smaller home ranges.

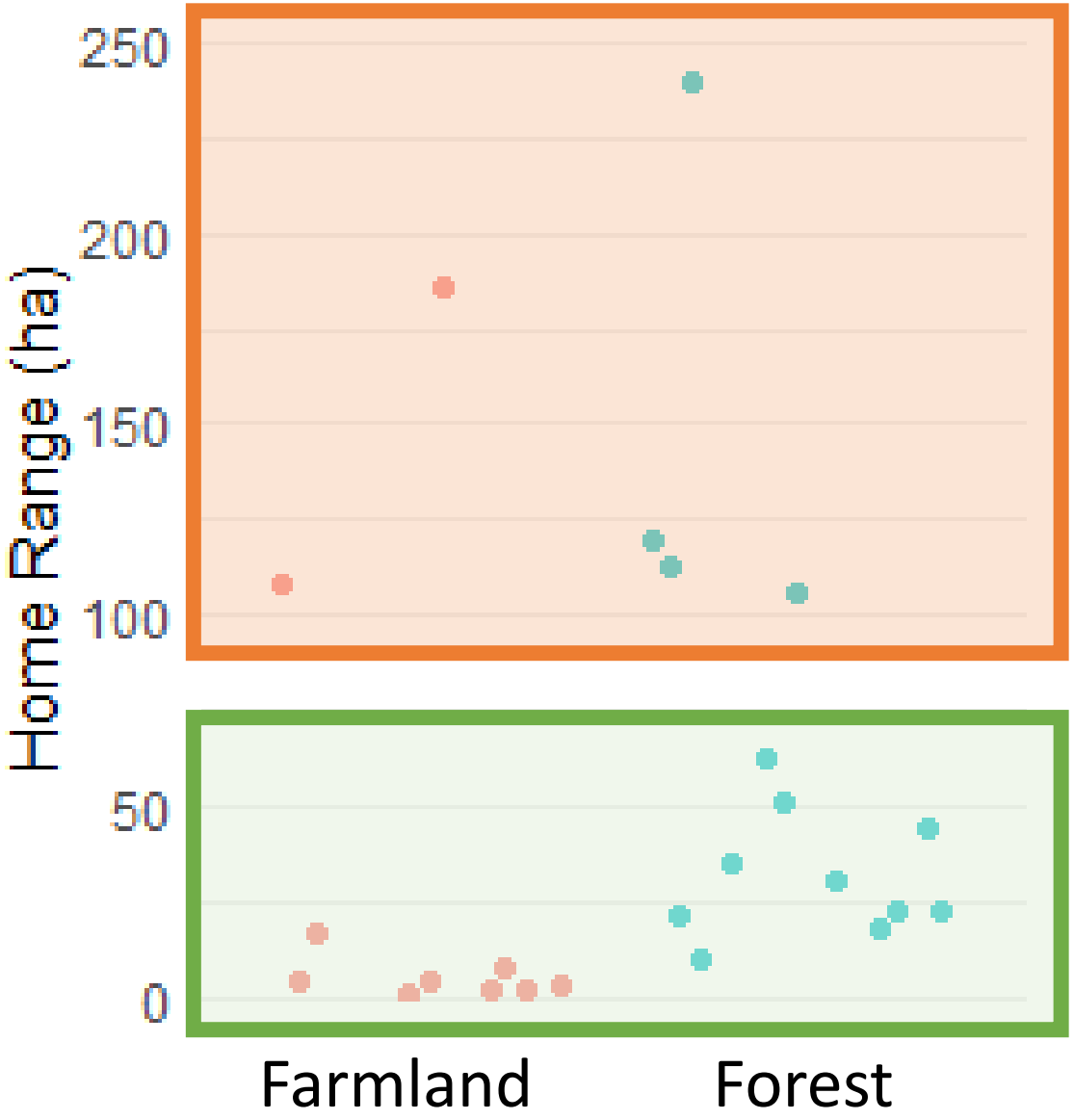


Most possums

Small home range

Finding a **Meaningful** Home Range

In comparison, the large home ranges are relatively rare.



Uncommon

Large home range

Most possums

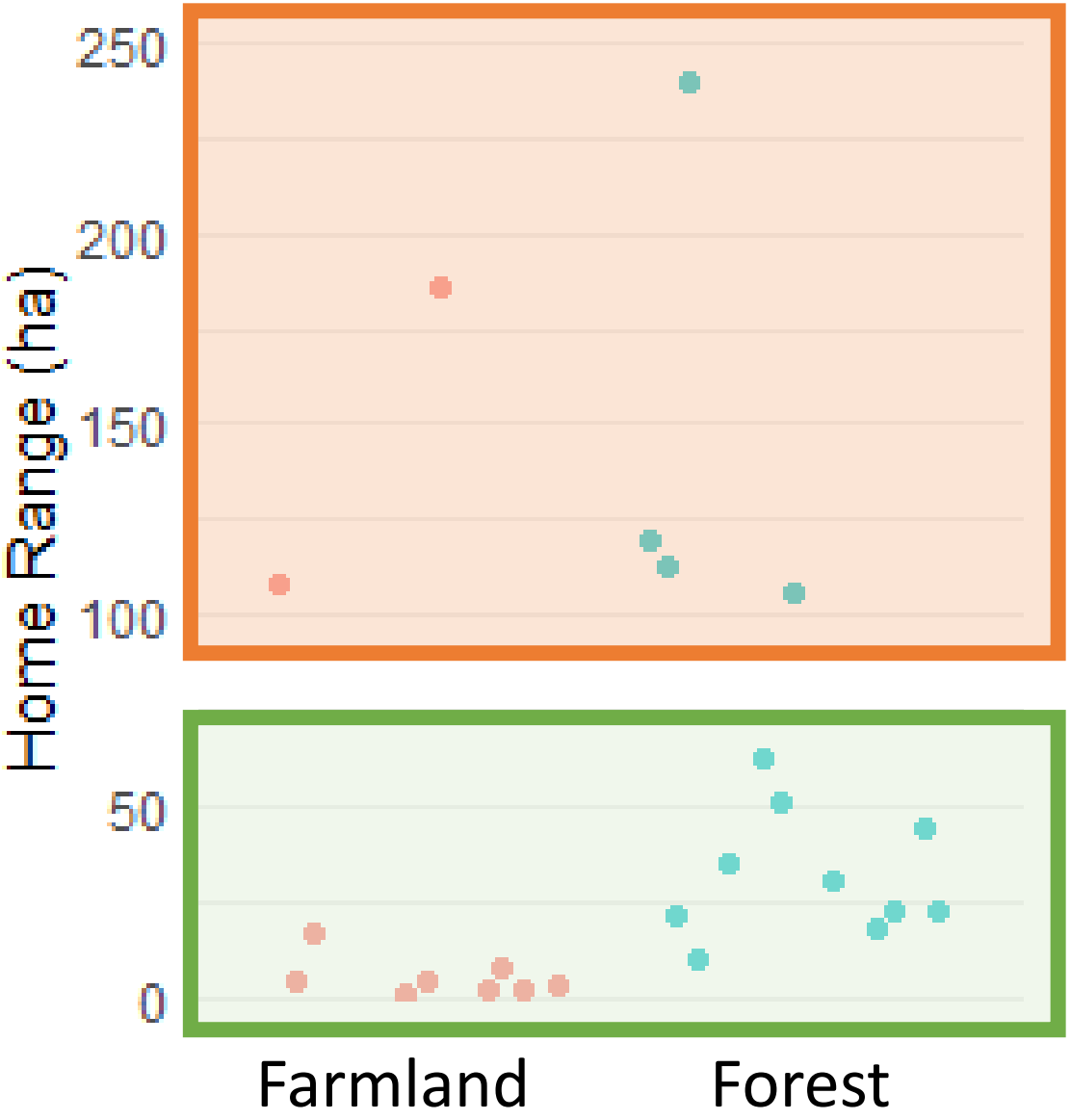
Small home range

Finding a **Meaningful** Home Range

The importance of these large vs small home range groups depends on what management strategy you are using.

If you are only controlling a small part of your sanctuary at a time (such as by using a rolling eradication front) then the large home range individuals can be a big problem: they may be in another part of their home range, and when you move your control zone they could move back and evade your tools.

They also present a greater risk of reinvasion if you have a small buffer zone between your sanctuary and nearby uncontrolled areas.



Uncommon

Large home range

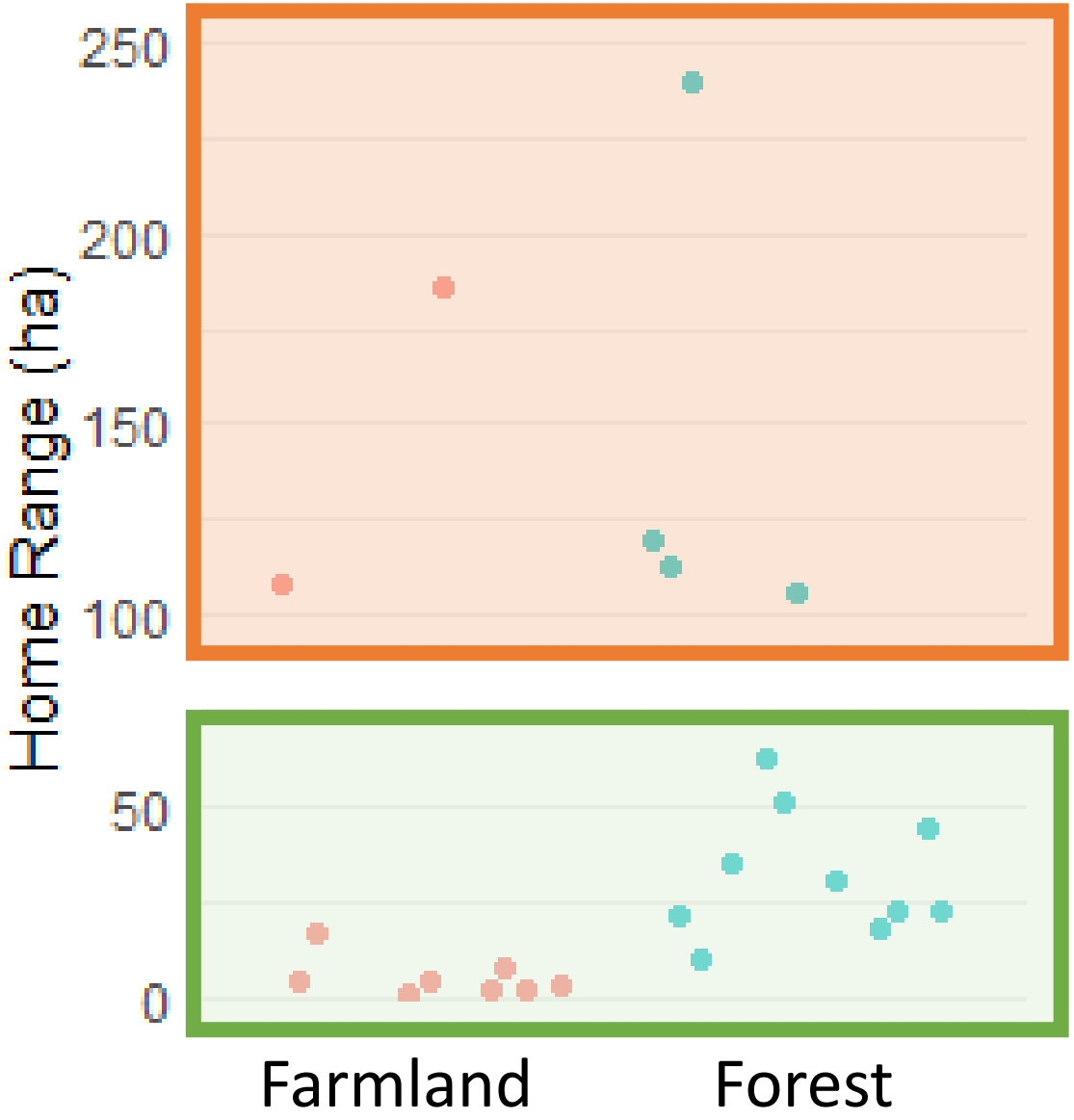
Most possums

Small home range

Finding a **Meaningful** Home Range

However, for the Restore Kaitake project, the small home range individuals are more concerning. In Restore Kaitake, possum control is being applied to very large areas (often the whole management zone is being treated at once). The key question here is: how far apart do we fit our devices?

To answer this, we need to know the smaller home ranges, as these may fall within gaps between devices.

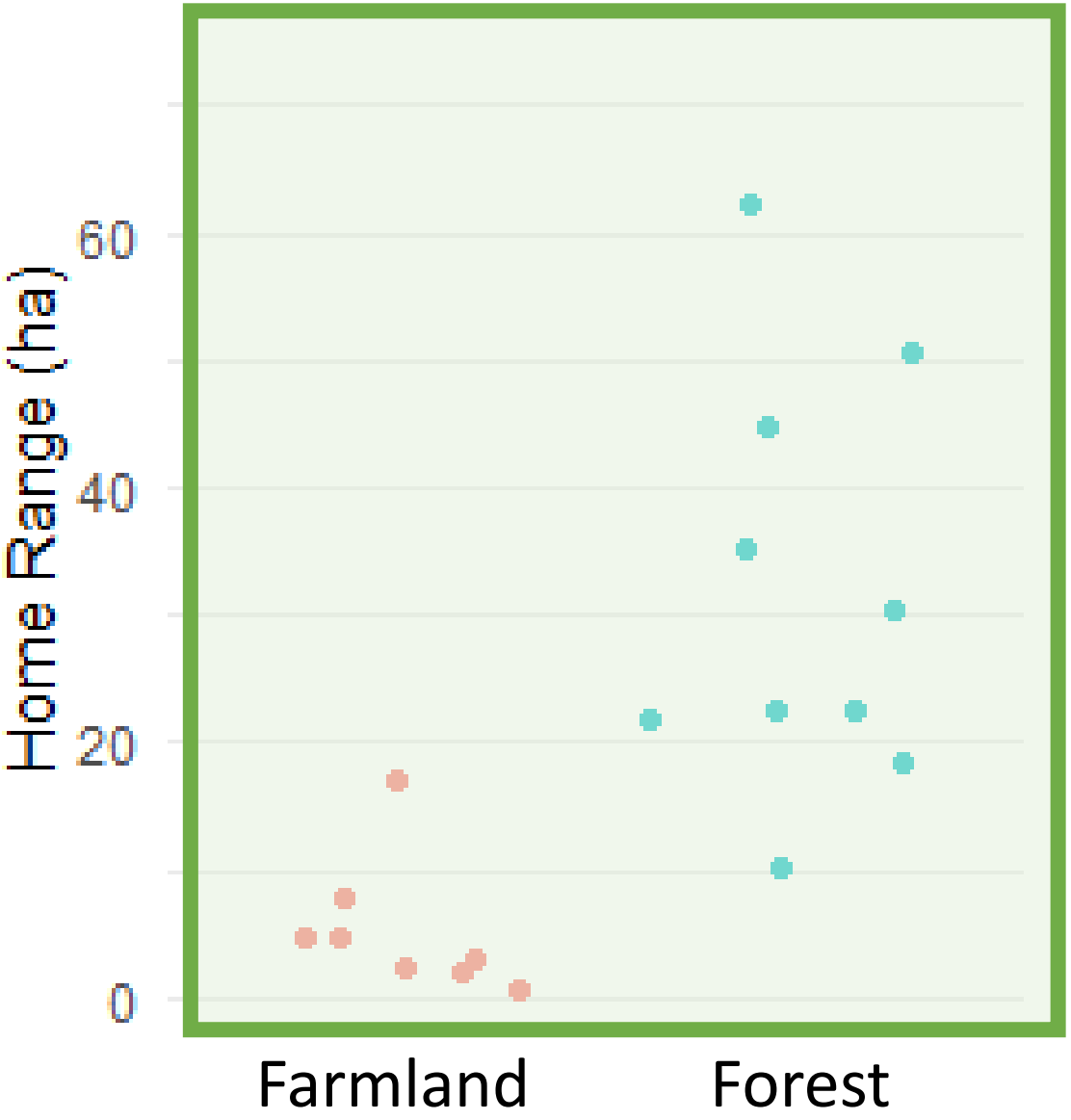


Not our main target

Target for eradication

Finding a **Meaningful** Home Range

Let's zoom in on those small home range possums.

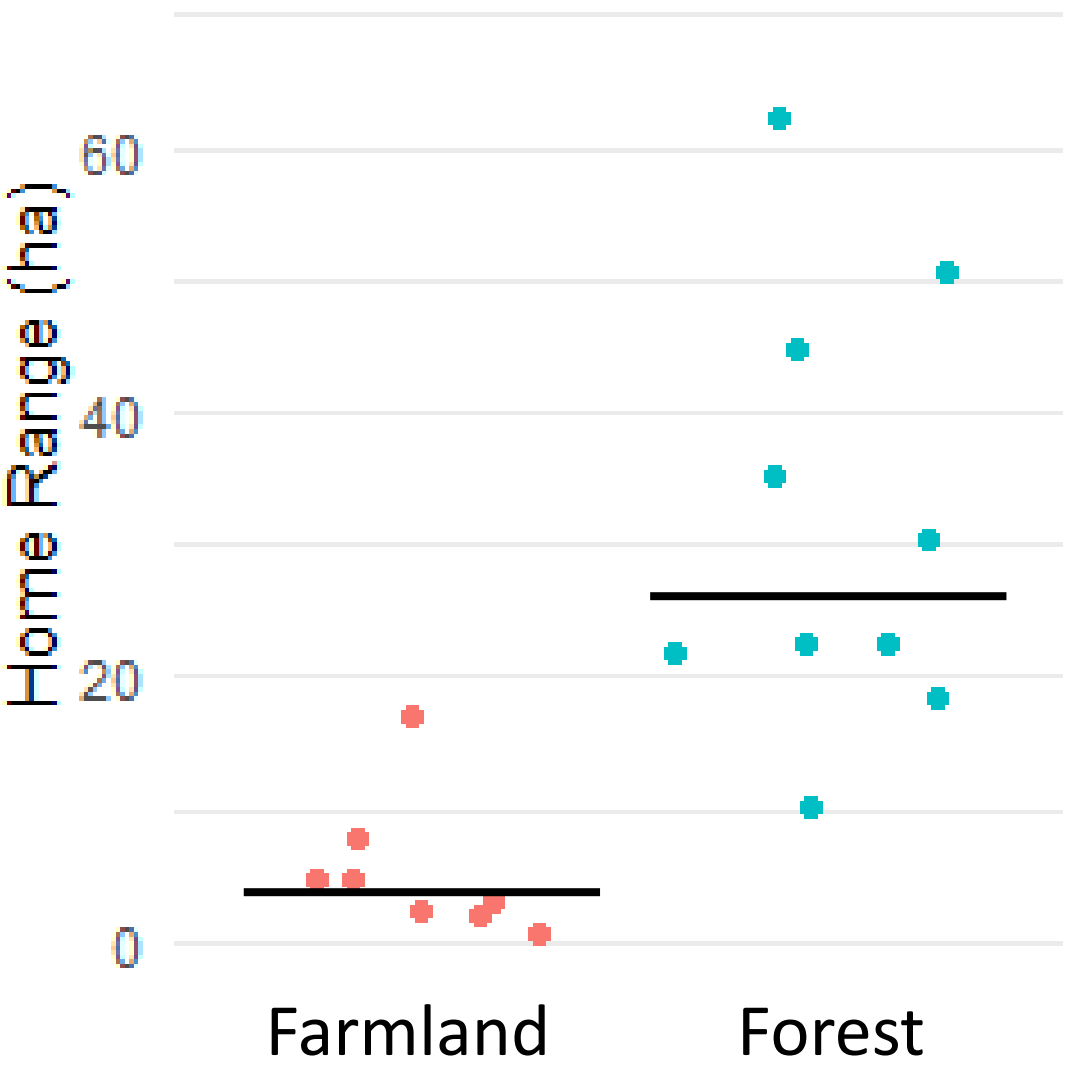


Focus in on **lower** home ranges.

Finding a **Meaningful** Home Range

Now we can make new summary statistics for them, such as new medians.

Here the forest median has dropped from 40 to 26 ha, and the farmland from 5 to 4 ha.



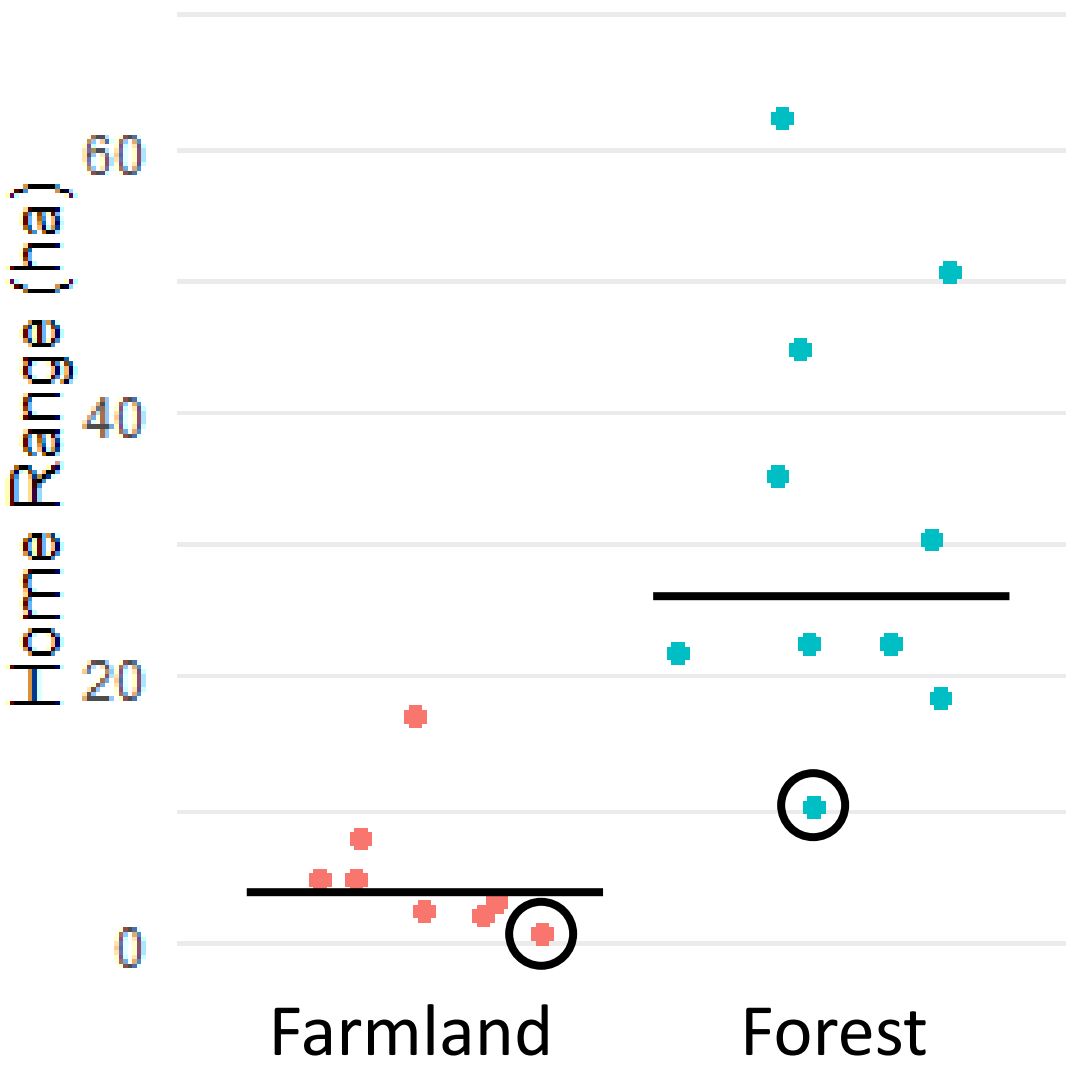
Median

Forest **26 ha** (± 10)

Farmland **4 ha** (± 4)

Finding a **Meaningful** Home Range

But median might not be good enough. Depending on your aims and management strategy, you may even want to look at the minimum value, or something in between.



Median

Forest **26 ha** (± 10)

Farmland **4 ha** (± 4)

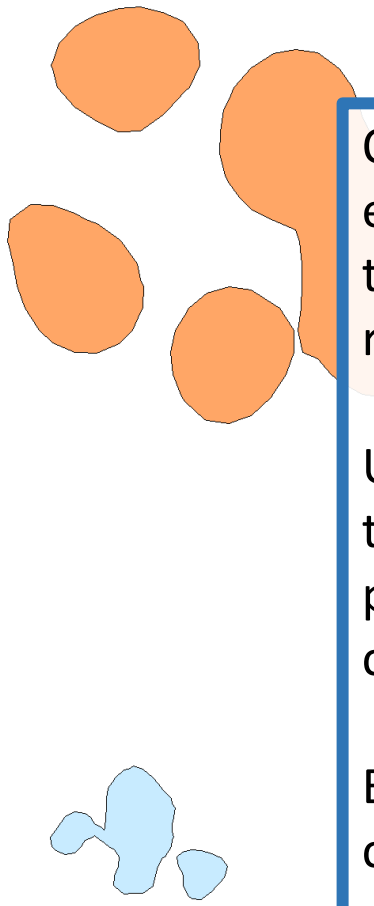
Minimum

Forest **10 ha**

Farmland **0.6 ha**

Home Range Size

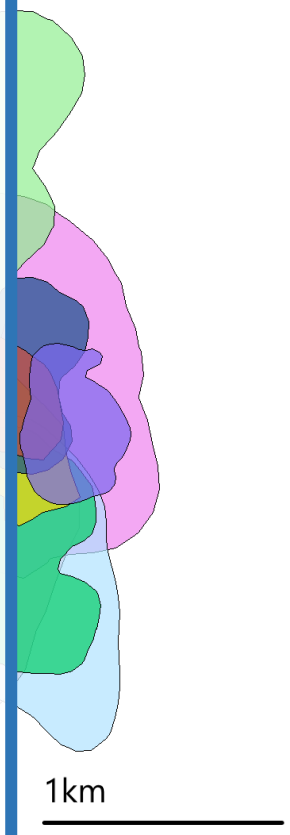
Farmland **5 ha** Forest **40 ha**



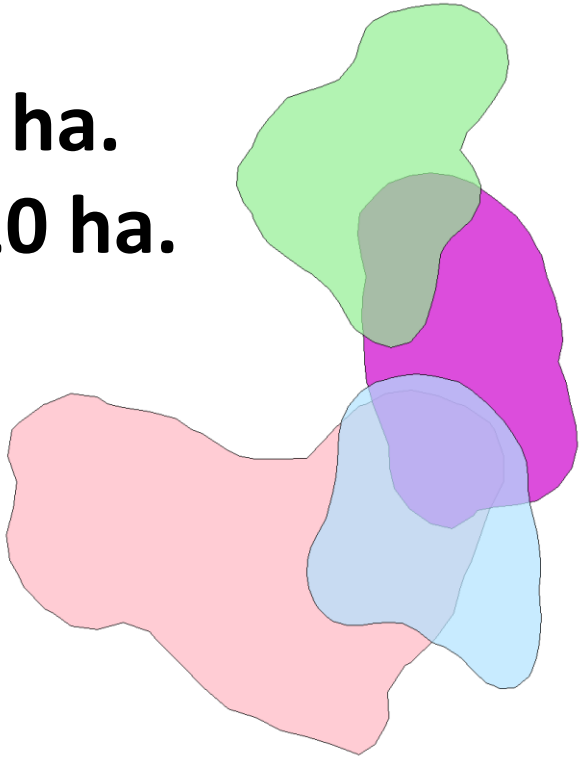
One thing to note there is that overall, these home ranges were smaller than expected, especially in the farmland. Going into the project, it was predicted that home ranges would be around 50 to 100 ha post-1080. This was based on results from South Island beech forest.

Understanding this difference in expectations vs. results is made difficult by the fact that we don't have accurate density estimates for the Kaitake populations. It may be possible to obtain density estimates from trap and camera results but this had not been done yet.

Even so, this area has been under intensive control for over 2 years, and current trap capture rates are very low. As stated in a prior slide, it took 5 months with 50 to 100 traps to capture 14 possums in the forest. As such, it seems reasonable to assume that densities are very low.



Results



1 out of 3 forest possums had a range of less than **25 ha.**

7 of the 10 farmland possums had a range of less than **10 ha.**

This was **smaller** than expected.

Forest home ranges were as large as **240 ha.**

Farmland ranges were as large as **185 ha.**

This shows massive **variation.**

Forest home ranges are **8 times** the size of farmland.

Habitat is important.

Home Range Analysis

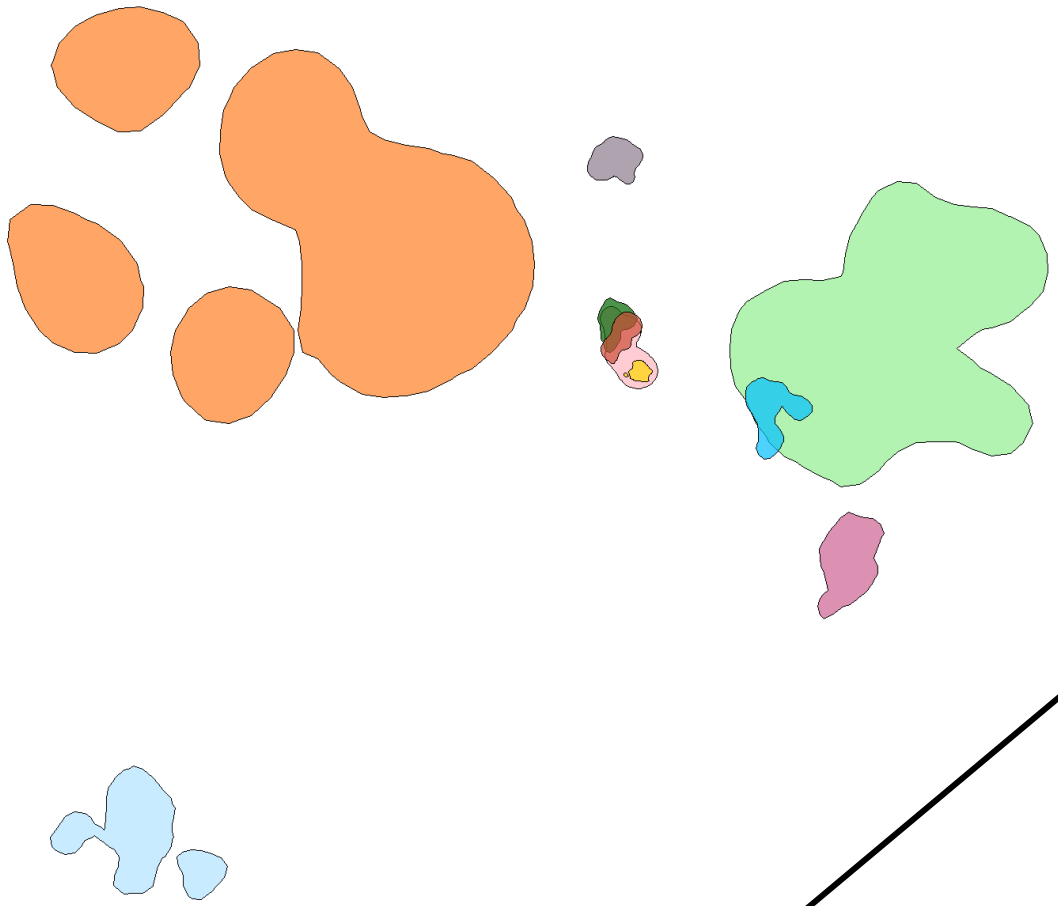
Size

Shape

Sex

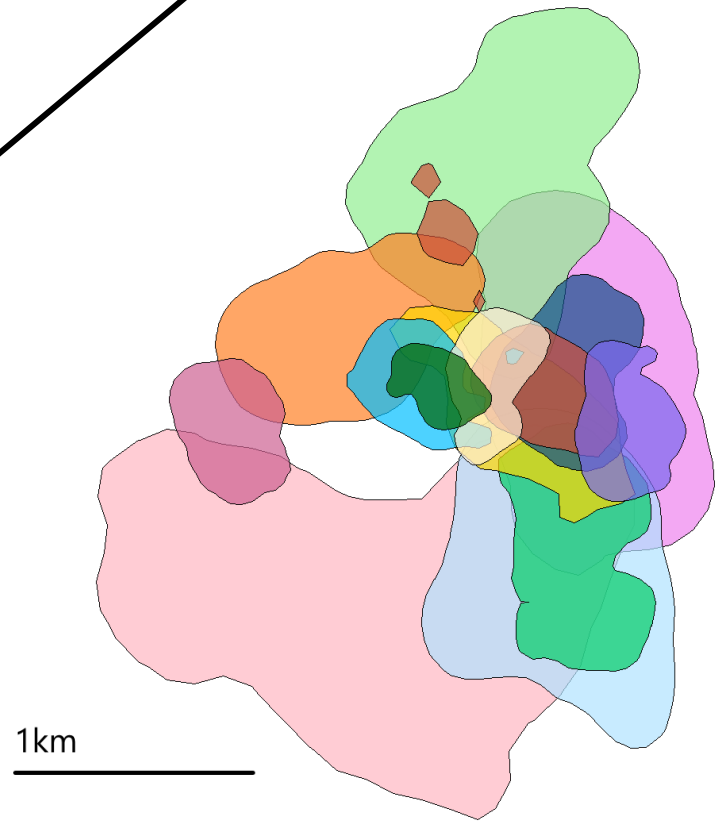
Home Range Shape

None of our home ranges are neat circles. But, the farmland ranges look a little more irregular.



farmland

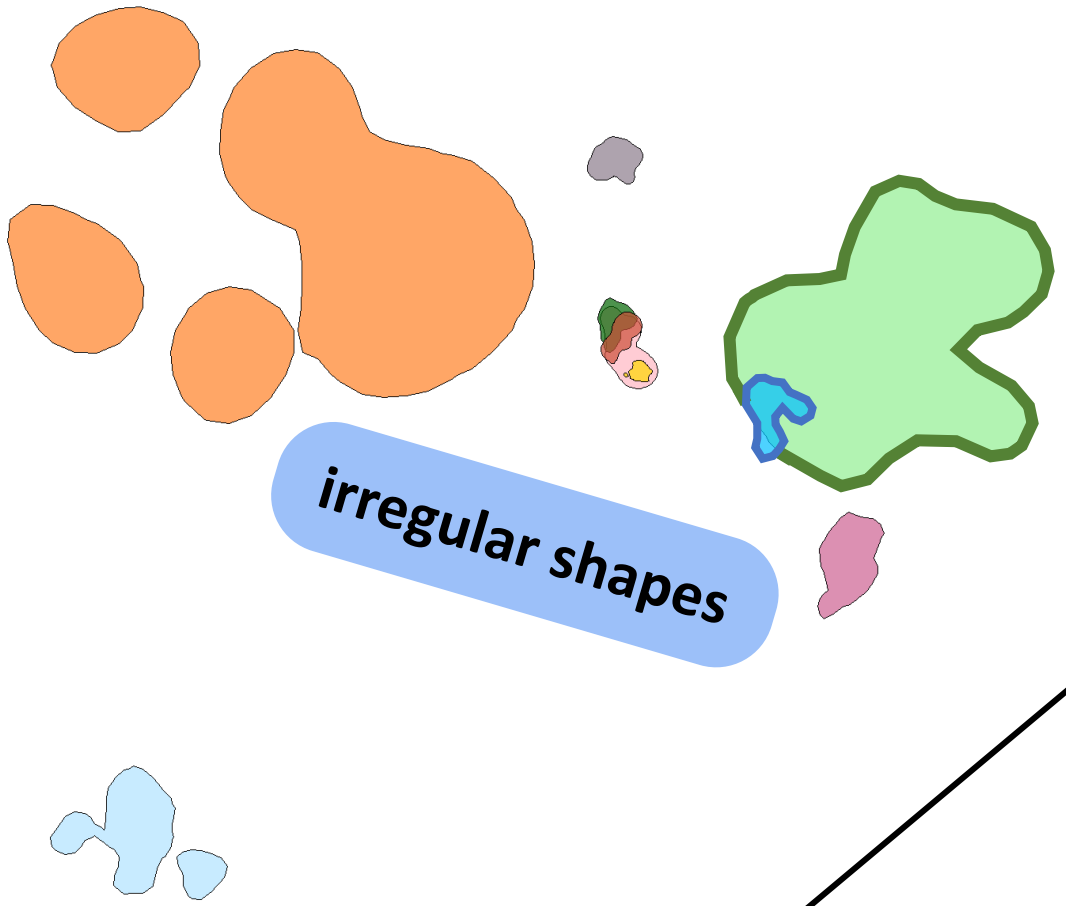
forest



Home Range Shape

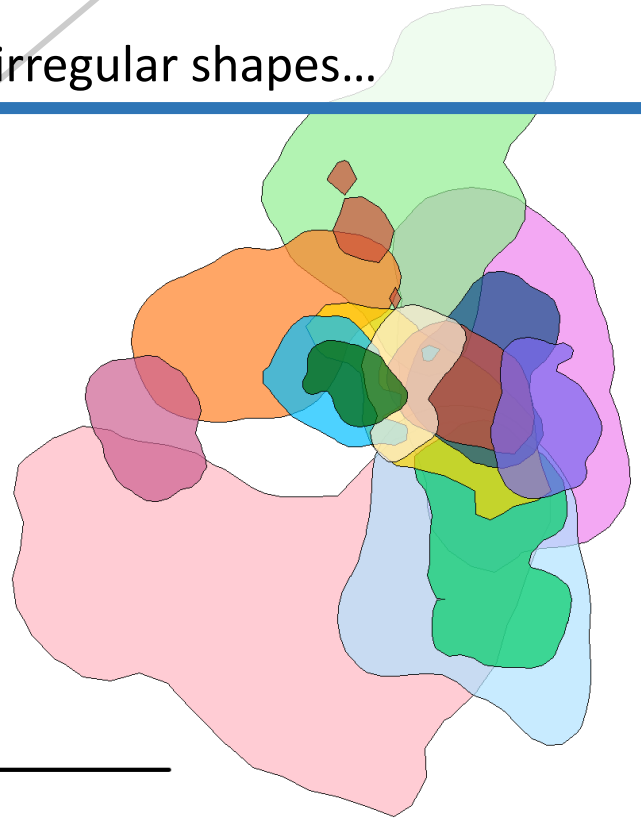
None of our home ranges are neat circles. But, the farmland ranges look a little more irregular.

We see irregular shapes…

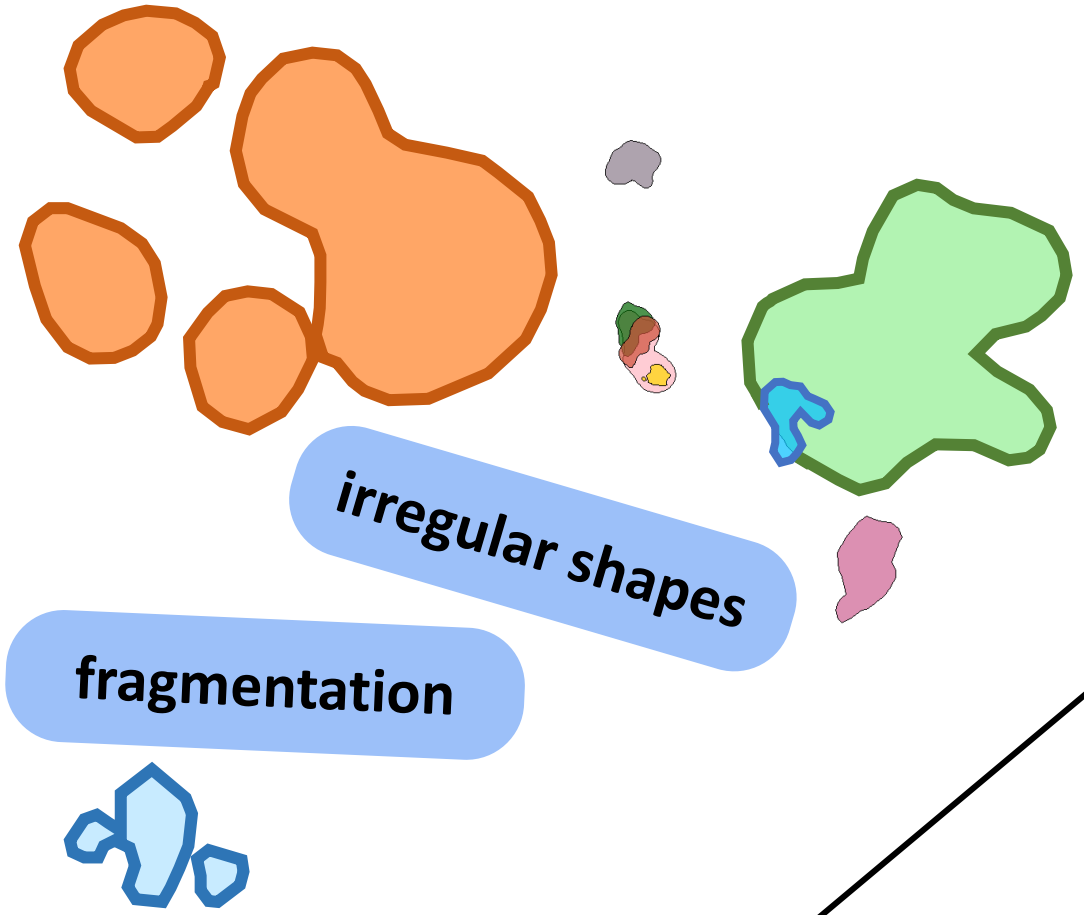


farmland

forest



Home Range Shape



farmland

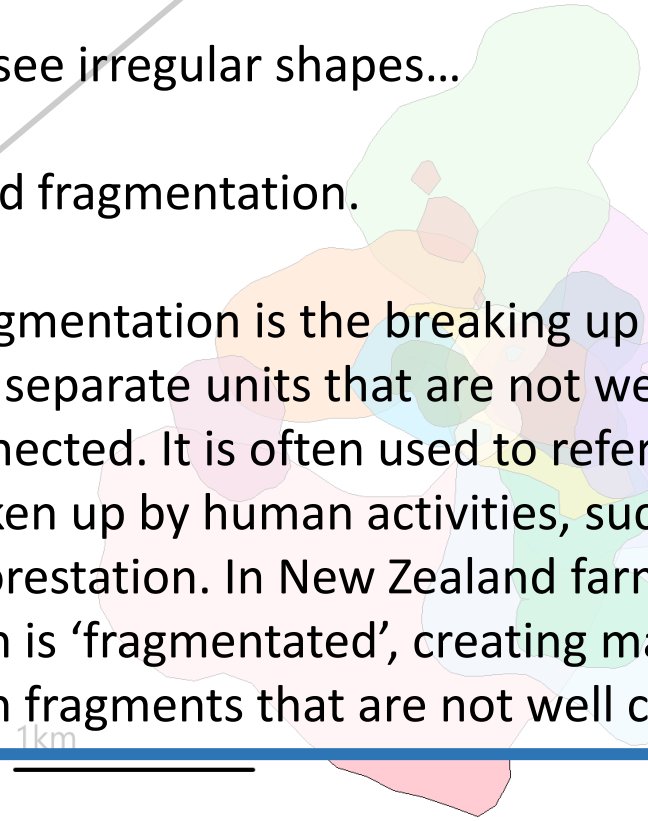
forest

None of our home ranges are neat circles. But, the farmland ranges look a little more irregular.

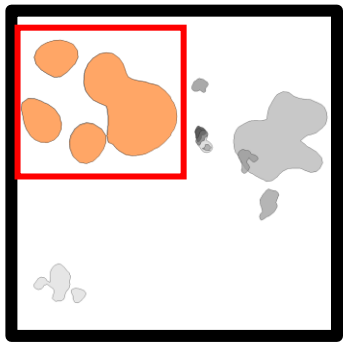
We see irregular shapes…

…and fragmentation.

(Fragmentation is the breaking up of an area into separate units that are not well connected. It is often used to refer to habitats broken up by human activities, such as deforestation. In New Zealand farmland, most bush is ‘fragmentated’, creating many small bush fragments that are not well connected.)



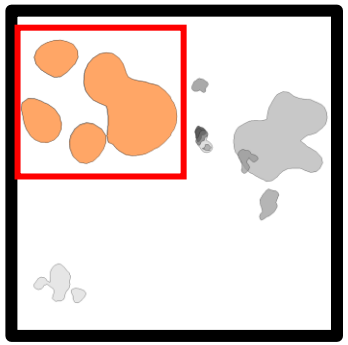
Home Range Shape



Here are the raw GPS points for an individual (red are low accuracy and were not included in the analysis).

500 m

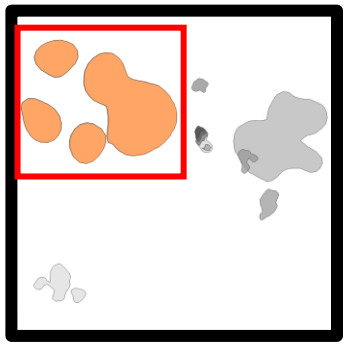
Home Range Shape



We can see fragmentation of the home range. The individual spends most of its time in small bush fragments, avoiding pasture. The bush fragmentation is obviously having a strong effect on this individual's movement patterns.

500 m

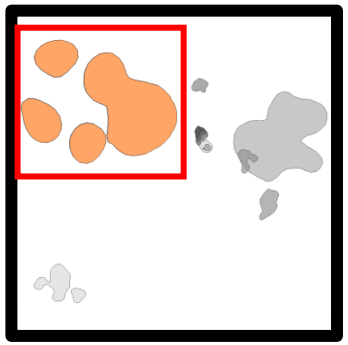
Home Range Shape



Normally, habitat fragmentation is really bad because it also affects native animal's movements. But in this case, it could make possum eradication easier, by preventing them from moving as far and making it easier to target them (just target the bush fragments).

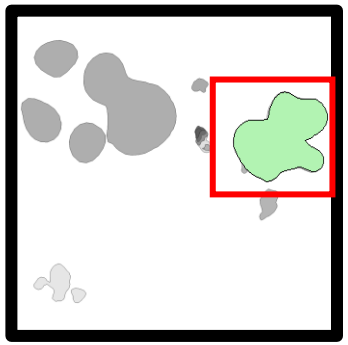
500 m

Home Range Shape



That doesn't mean you shouldn't improve bush connectivity (it's good for our native species)! But maybe if you have possum plans coming up, try to execute them before you reduce bush fragmentation. It might make your work easier.

Home Range Shape

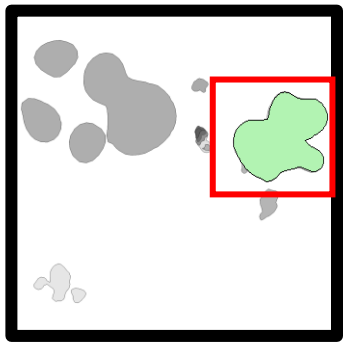


Another individual:

Here we see another effect of habitat connectivity. This individual is using bush corridors (long skinny areas of trees) to move around and avoid crossing pasture.

500 m

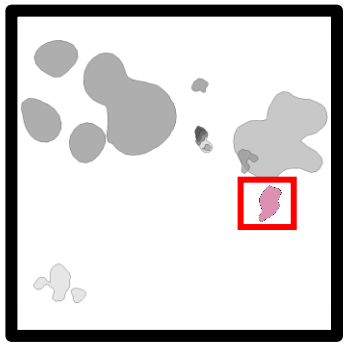
Home Range Shape



Corridors (long sections of native habitat) can help native species move around, but it can help possums too.

500 m

Home Range Shape

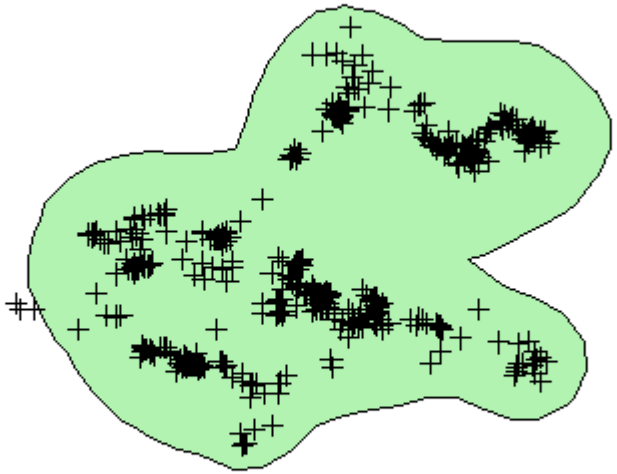


This possum is staying mostly inside one forest fragment. This was common across the farmland possums.

Home range might be smaller in the farmland because fragment size is limiting possum movement.

100 m

Results



Farmland home ranges are **irregular** and **fragmented.**

Farmland possums do not often move **between fragments.**

They spend **little time** in the **pasture.**

When traveling **long distance,** they use forest fragments and treed corridors.

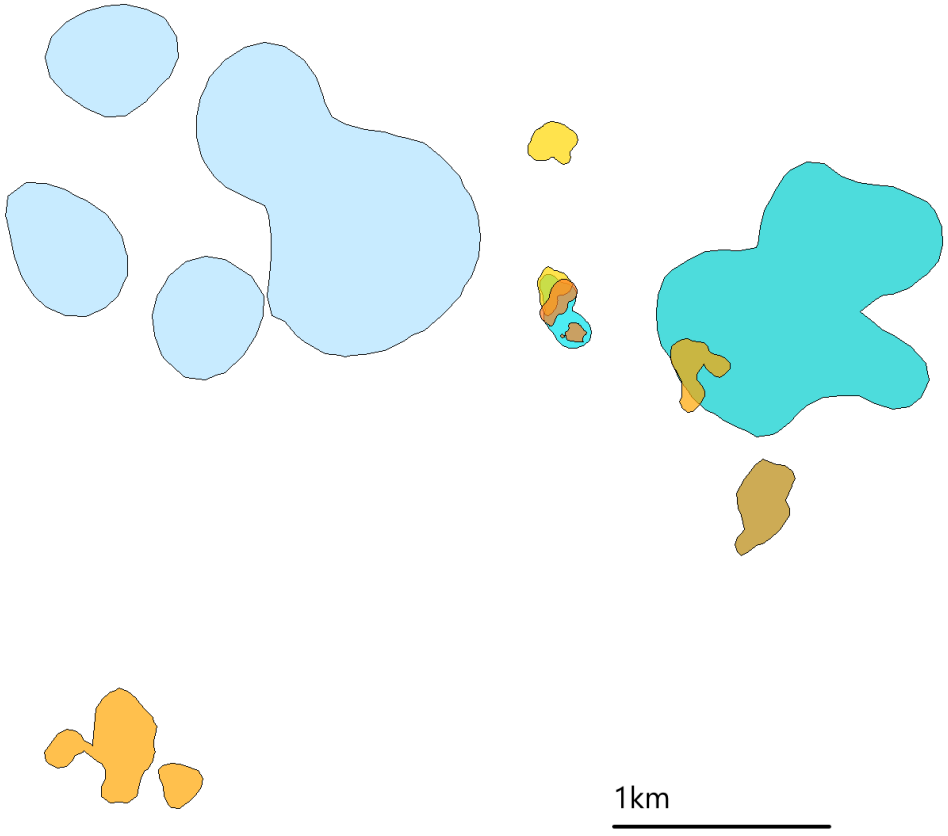
Home Range Analysis

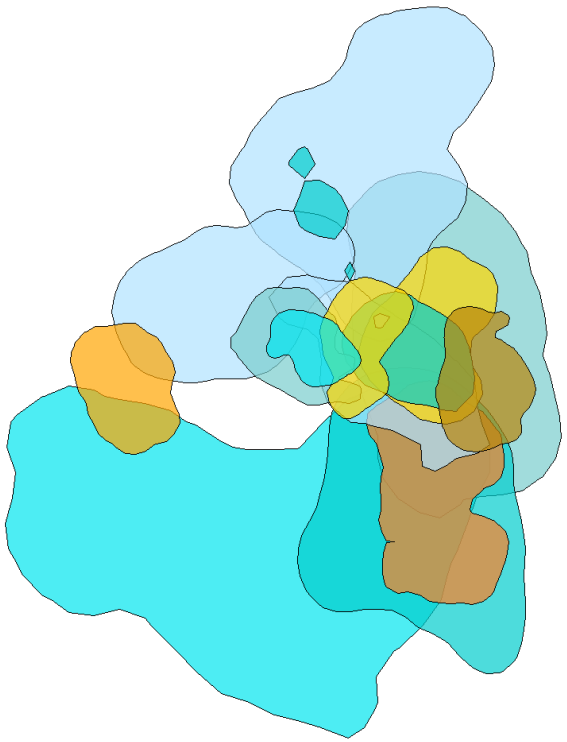
Size

Shape

Sex

Female vs Male





Here the home ranges are coloured by sex (yellow = female, blue = male).

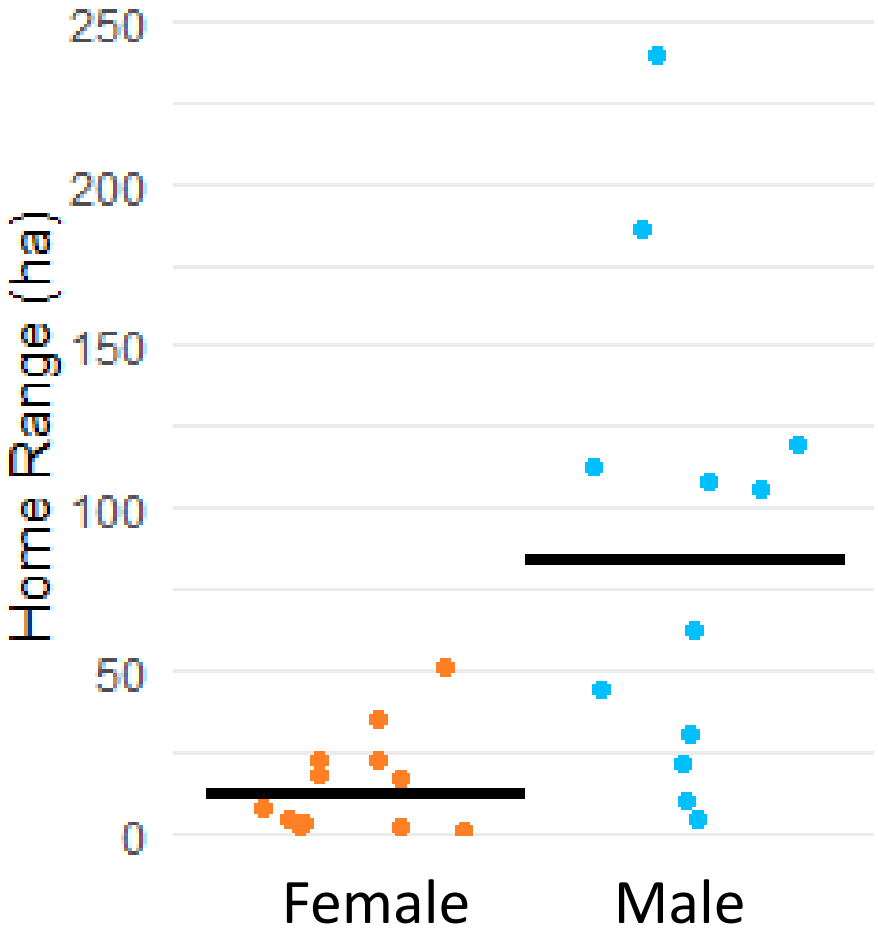
I've grouped the farmland and forest populations, because a statistical analysis showed there was no interaction between habitat and sex (ie. when comparing females and males within the farmland, you get similar results as when comparing females and males within the forest.)

Female vs Male

We can see that the median value for females is much lower than males.

Both males and females can have moderate or small home ranges. (around 50 ha or less)

But only males seem to have these very large ranges. (250 to 100 ha)



Median

Male **84 ha** (± 41)

Female **12 ha** (± 9)

Concerns

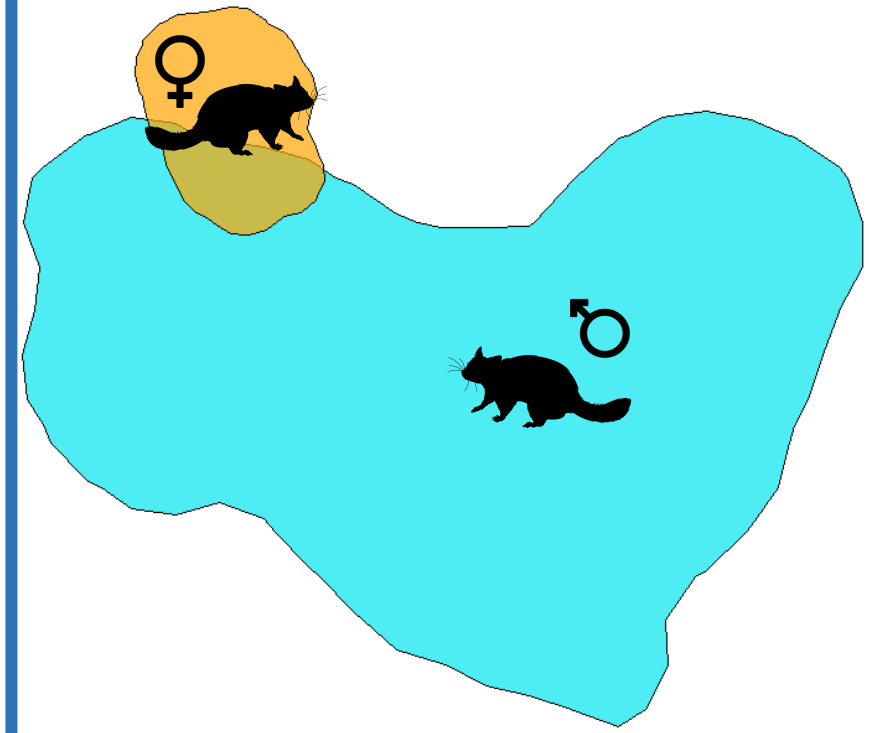
Cryptic breeding **females?**

What this means for your management depends on if the small or large home ranges are your biggest threat.

In the Kaitake, the main risk is that we might miss individuals with small home ranges.

We could miss some small range females. They can then be visited by large home range males, potentially recent re-invaders. We might remove that re-invader quickly, because his large home range makes him easy to target, but it's to late because he's already impregnated a number of females. And we don't even know it.

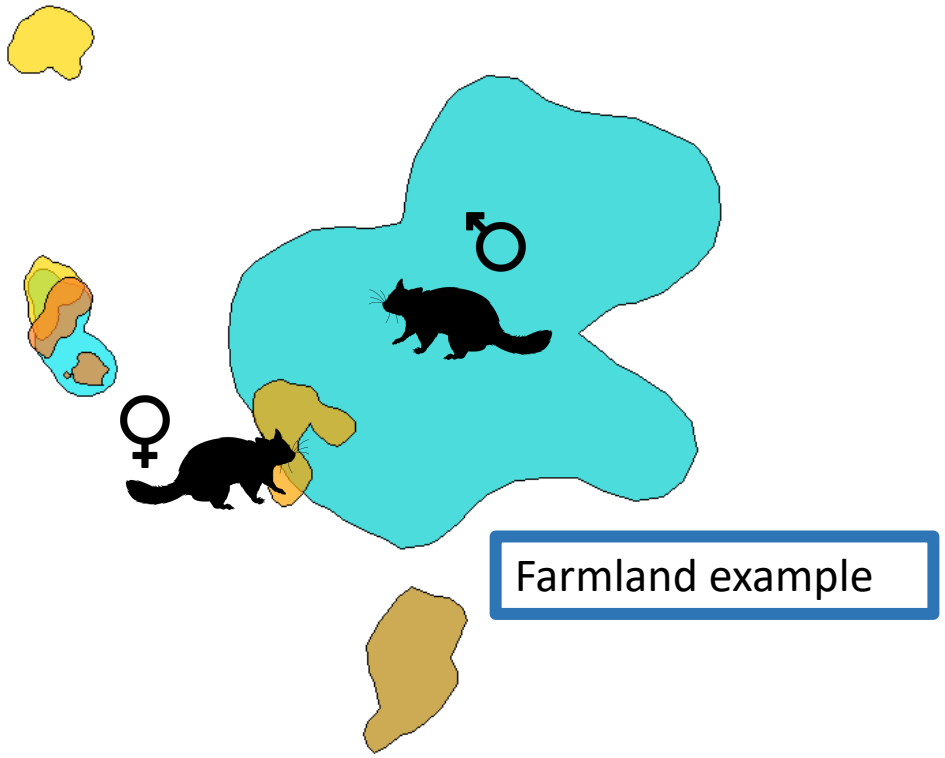
In this way, we could end up with a 'cryptic' (or 'hidden') breeding population of females, that our cameras don't pick up because we have our devices spaced too far apart.

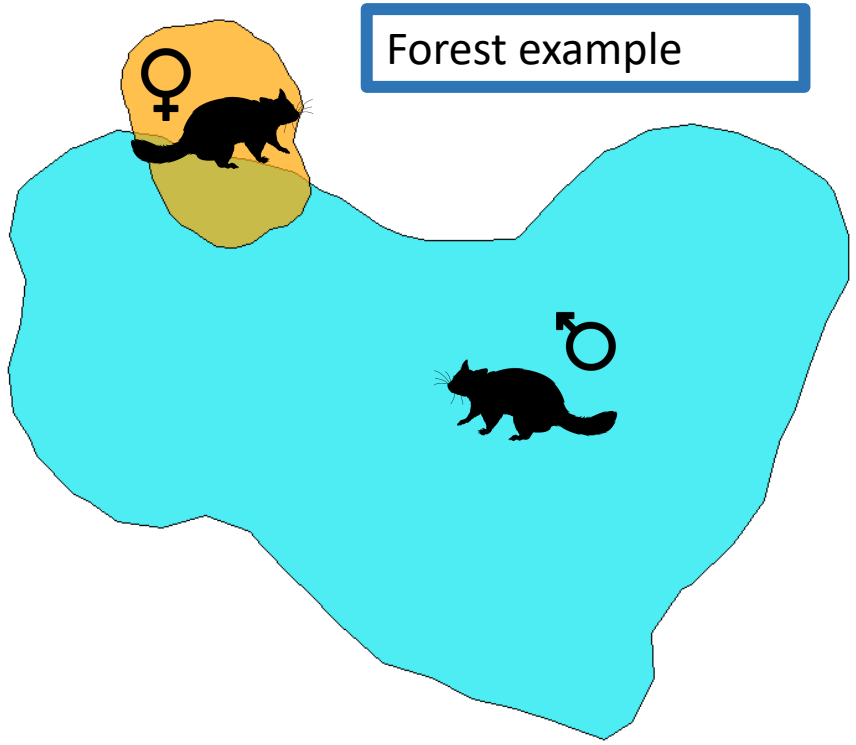


Concerns

Here are actual possums we observed where a male's large home range overlaps with a smaller home range of a female.

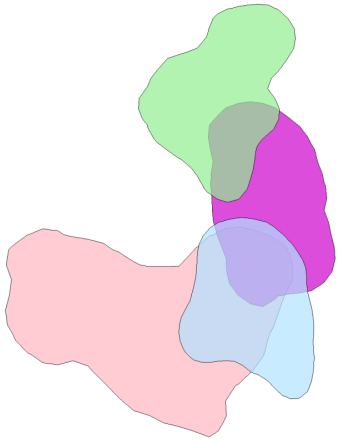
Cryptic breeding **females?**





Summary

Many home ranges were **smaller** than expected.



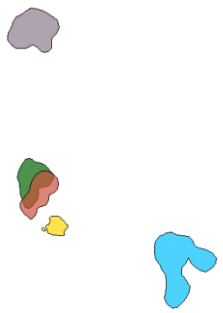
There was **huge variation** between individuals.

Farmland home ranges were **irregularly shaped** and **smaller** than **forest.**

Female home ranges were **smaller** than **male.**

Conclusions

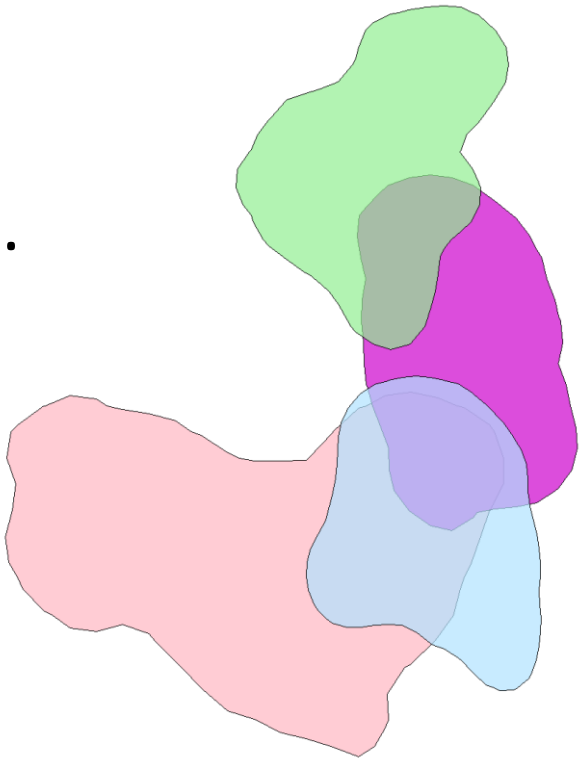
We saw smaller ranges than expected, but maybe it is because we were using data from South Island beech forests?



Be **cautious** when applying home ranges data from **other habitats.**

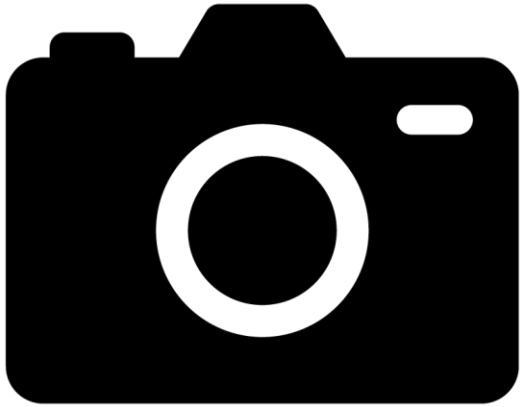
Plan separately for forest vs. farmland.

Beware of **cryptic** individuals.

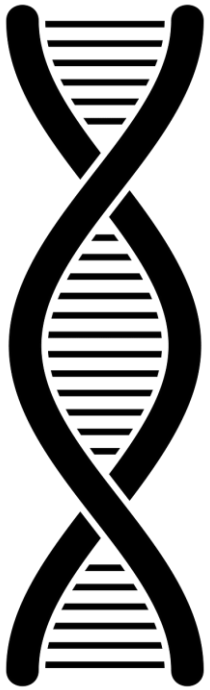


Recommendations

Use **robust monitoring** tools.



Dense **camera** networks.



Get **genetic** advice.

Test removed possums for **parentage** and **lineage.**


Thank you
for
listening!