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Studying vital ranges of European rabbits using GPS collars

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Context

The **European rabbit**, *Oryctolagus cuniculus*, once abundant in France, is now in sharp decline. The species has become a problem for farmers because of the damage caused to crops.

Currently, the main question is how to **conserve the species while controlling the damage it is likely to cause**. This study can help to better understand their spatial behaviour and provide management options to limit the risk of agricultural damage.

Material and method

Study area

We have conducted a three-year study in a rural area of southern France. This **Mediterranean area** is mainly composed of winter cereal fields and vineyards.

GPS tracking/records scheduling

We monitored **18 adult wild rabbits** (Table 1) between **2019 and 2021**. Rabbits were captured and equipped with VHF/GPS collars (LiteTrack RF-30, LOTEK; weight: 35g). The GPS function allows for **location at night (12 locations every 2 nights)**; the VHF radio function allows the animal to be located during the day and to download data.

Accuracy and data selection

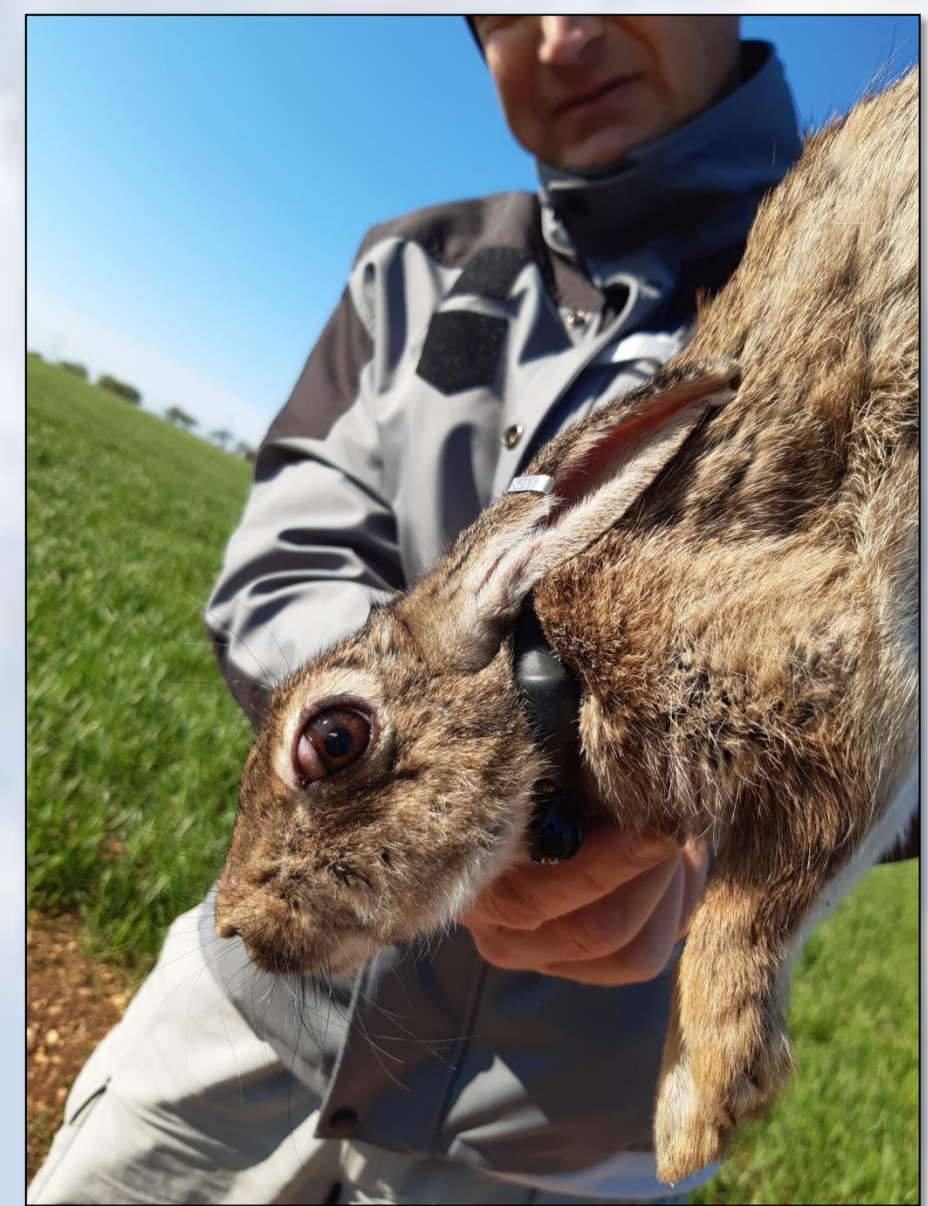
We first tested the dispersion of the GPS locations. As an indicator of accuracy we used the **DOP (Dilution Of Precision)**, and took a **DOP threshold value of 3.5** (with 93% of the GPS locations included within 10 meters).

Home range analysis

We used the method of the **Minimum Convex Polygon** (MCP, smallest polygon around the locations) to calculate the size of the home range. We only used complete monitoring months, and discarded the 1st month because of the stress due to capture.

Number of months of tracking	0	1	2	3	4	5	≥ 6	Total
Females	0	2	2	0	1	1	1	7
Males	2	1	1	2	2	1	2	11
Total	2	3	3	2	3	2	3	18

Table 1. Number of rabbits per sex and monitoring duration (months).



Results/Discussion

Total home range

The total **home range of males was on average larger and more variable** (2.29 ± 1.43 ha; mean \pm SD) than that of females (1.06 ± 0.51 ha) (Figure 1). This could be explained by territorial competition or the dispersal behaviour of the breeders. The average range around the warren varied from 50 to 131 m, depending on the individual behaviour (reckless vs shy).

Monthly changes in home range

The same difference between the sexes was observed for the monthly home ranges (Figure 2). In females, the average monthly home range remained around 0,5 ha from March to July. The largest home range size was observed in August (due to the end of the breeding season or a decrease in food resources).

Some examples of individual home ranges

The **most important home range was observed in a male** (5.41 ha; Map 1). Conversely, the **smallest home range was observed in a female** (0,69 ha; Map 2). An interesting observation concerns two males captured a year apart, in two warrens 20 meters apart (Map 3). Behaviors seems to indicate an **enduring pattern of territorial exclusion**.

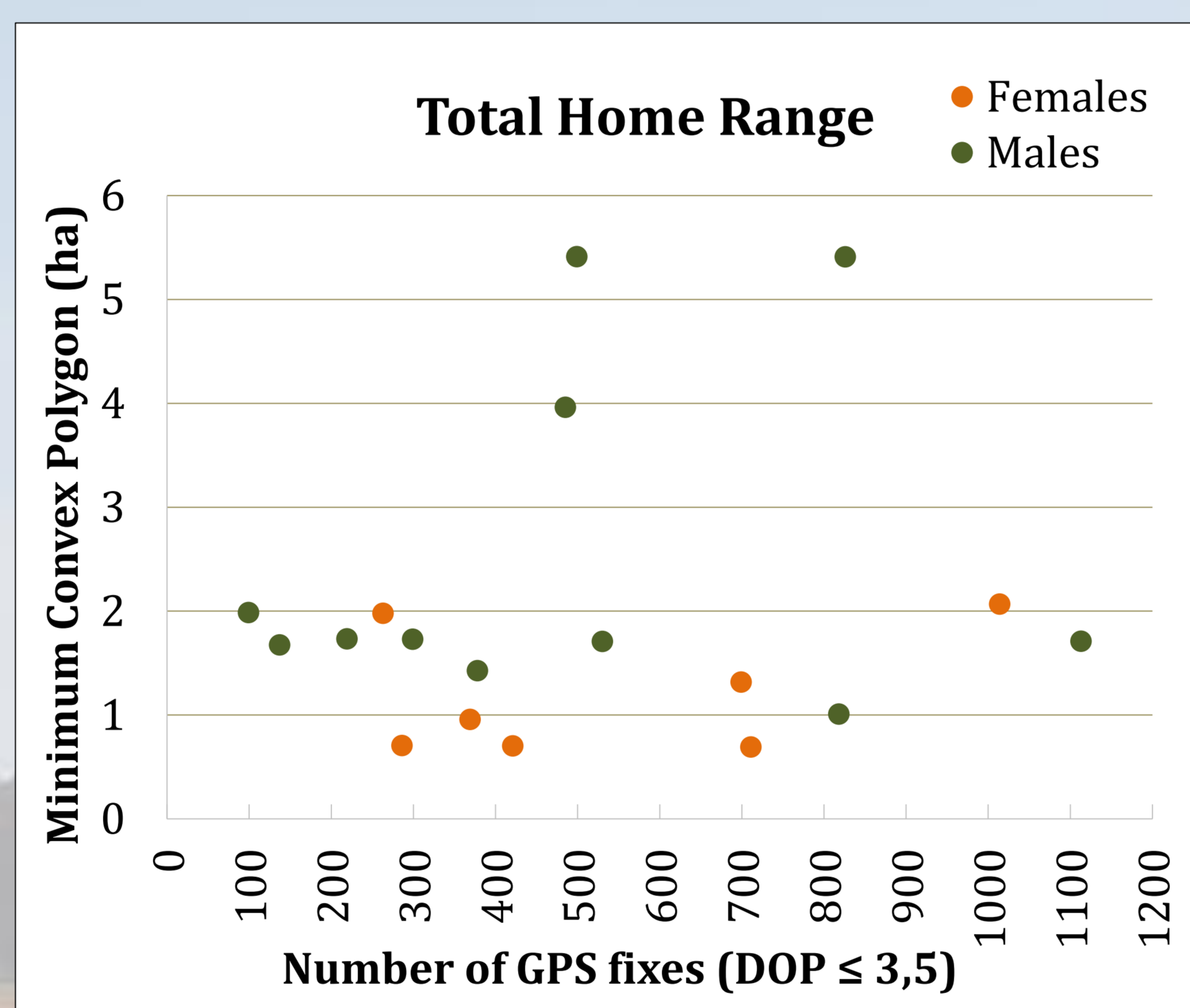


Figure 1. Rabbit total home range (MCP) estimates.

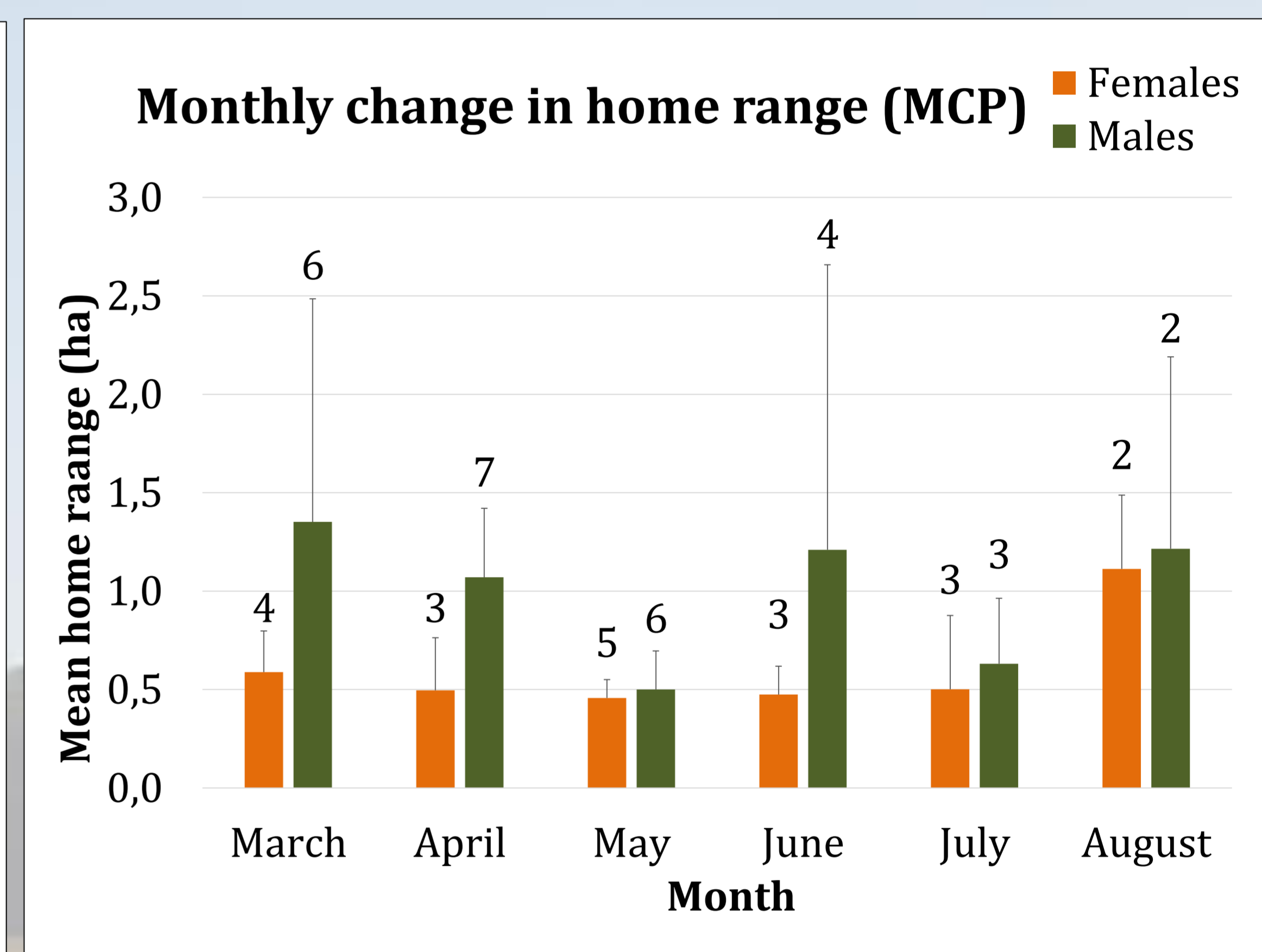
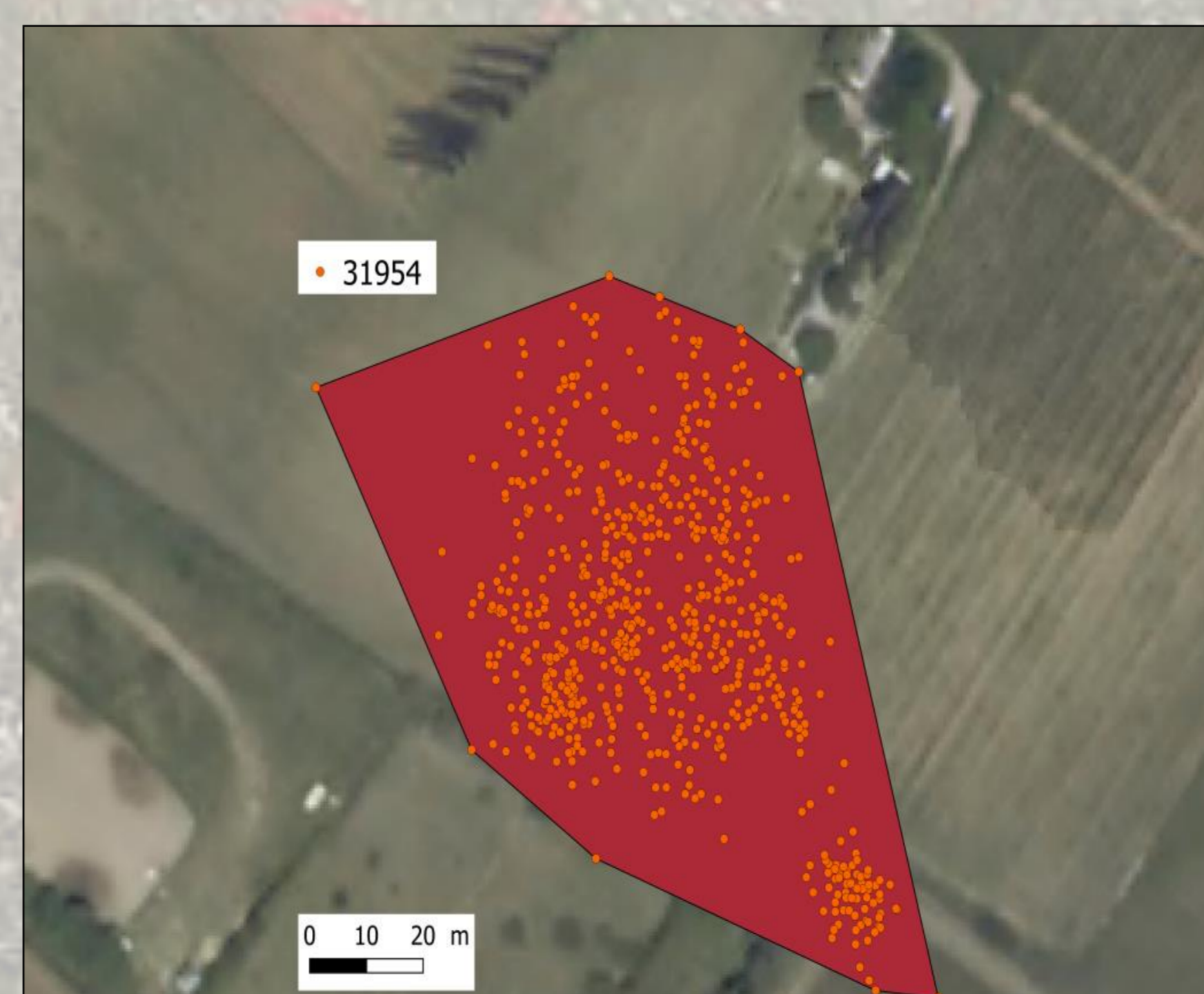
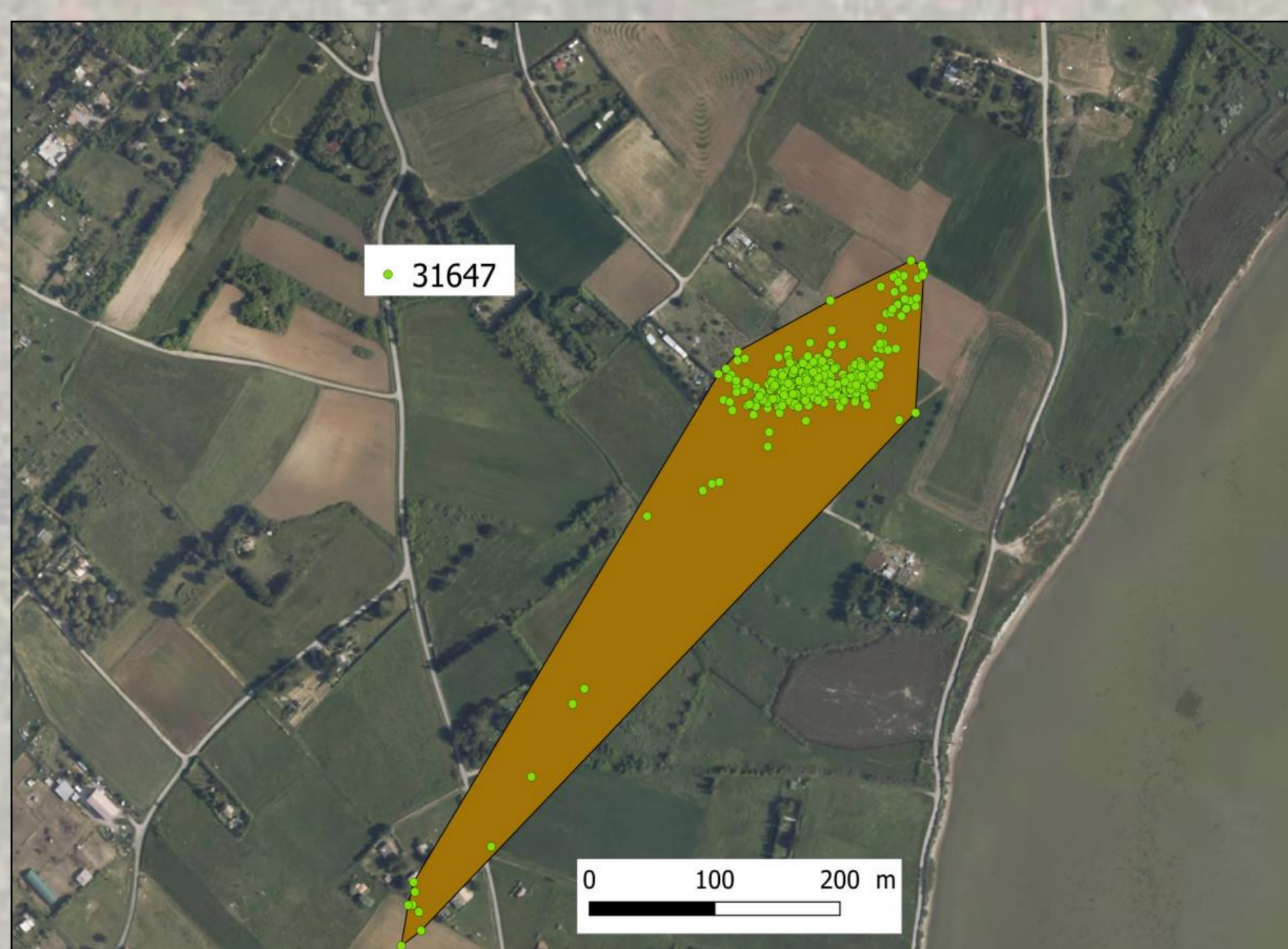


Figure 2. Rabbit monthly home range (MCP) estimates from March to August.



MCP method as an exploratory estimator

Use **MCP method** may be questionable to estimate home range size because it **overestimate the surface** (some areas which are not actually used by the individual). However, this **first exploration** of data was intended to be **descriptive** in order to get a first idea of the nocturnal use of the wild rabbit home range.

Go further

This first data exploration provided important insights into the **size of the home range** of a wild rabbit, **sex differences** and **changes over the season**. Further analyzes will allow to know the habitat selection of the species and provide recommendations to farmers to mitigate crop damages.

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