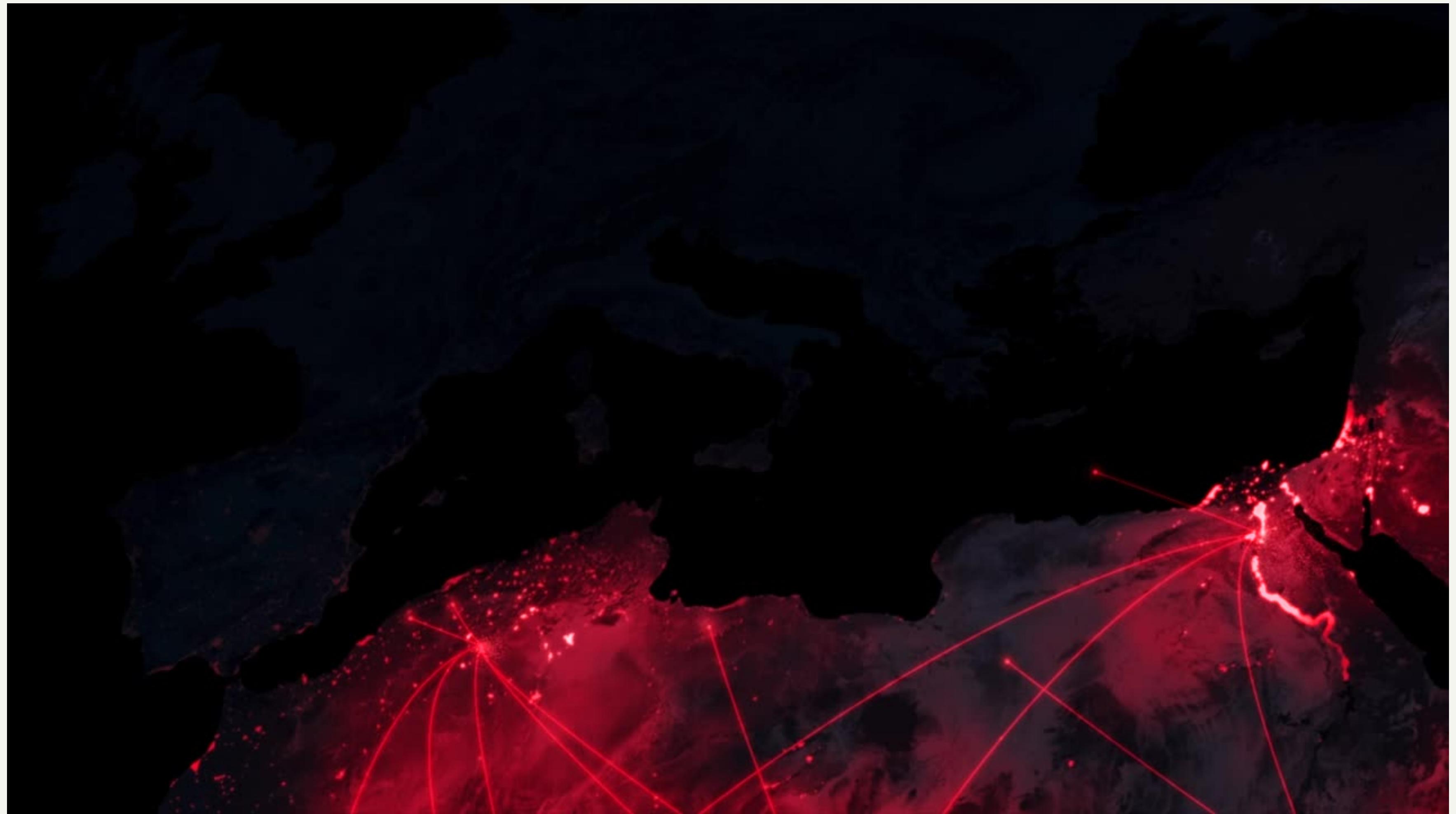


KOPURU CHALLENGE

"VESPAA VELUTINA"

IE XL DATA SCIENCE TEAM
[HTTPS://GITHUB.COM/IEWASPBUSTERS](https://github.com/iewaspbusters)



'IT'S LIKE A DESCENT OF
BARBARIANS THAT
DESTROY EVERYTHING IN
THEIR WAY"

le monde, 2011

EL PAÍS, 2015

"IT WILL COLONIZE THE IBERIAN PENINSULA
WITHIN A DECADE"





KOPURU CHALLENGE

VESPA VELUTINA

Opening remarks

- Of bees, and wasps...
- How's the weather?
- Keep Calm and Data Science 

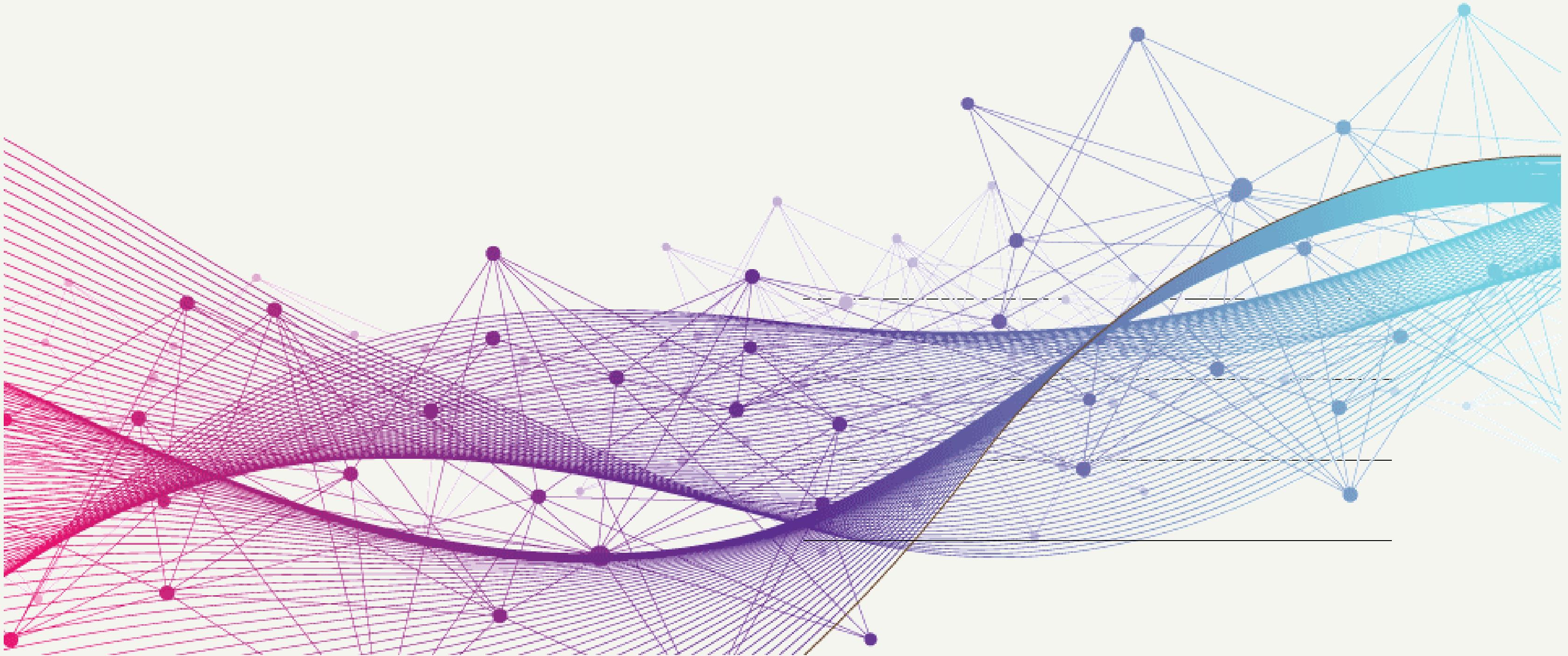
Closing remarks

COMMON FRUIT FLY OR VINEGAR FLY





Spain

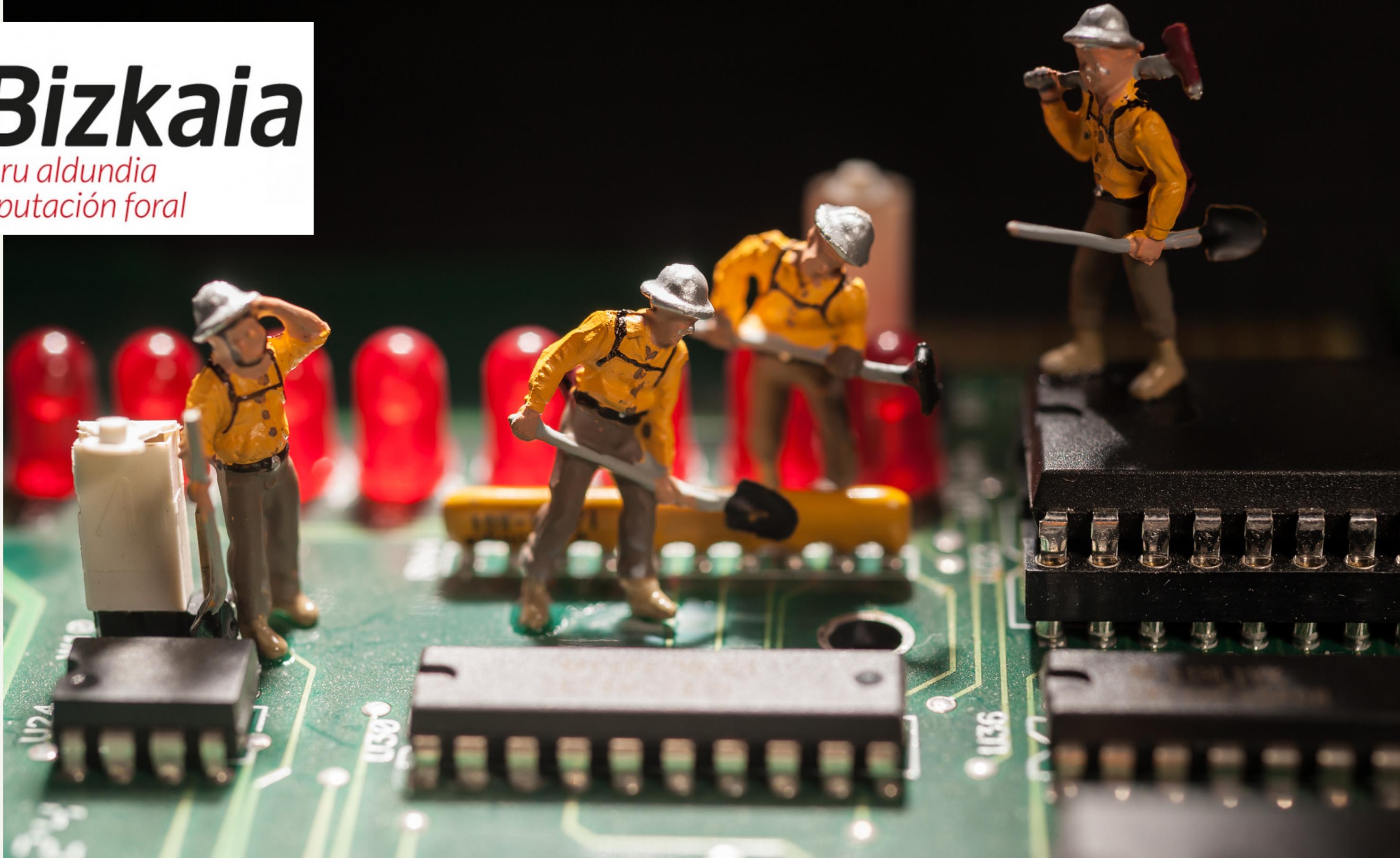


WHAT IS THE KOPURU CHALLENGE?



HOW MANY WASP NESTS ARE THERE IN EACH OF THE 112 MUNICIPALITIES IN 2020?







VESPA VELUTINA

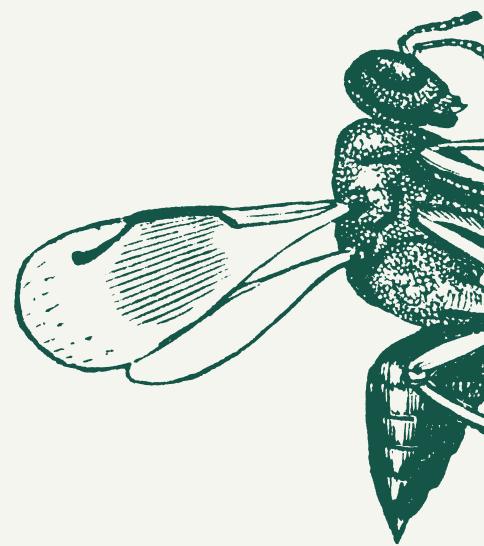
OF BEES, AND WASPS ...



Vespa Velutina is native to Southeast Asia.

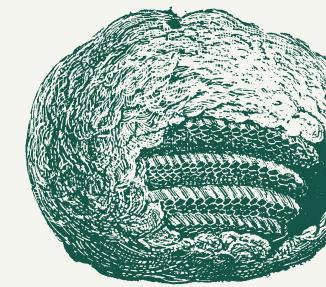
Accidentally arrived in Europe (France) in 2010 via import ship.

Negative impact:
Ecosystem.
Beekeeping Industry.
Health Hazard.



OF BEES,
AND
WASPS...

WHAT IS NEEDED FOR VESPA VELUTINA TO THRIVE?



No Enemies:

- No natural predators

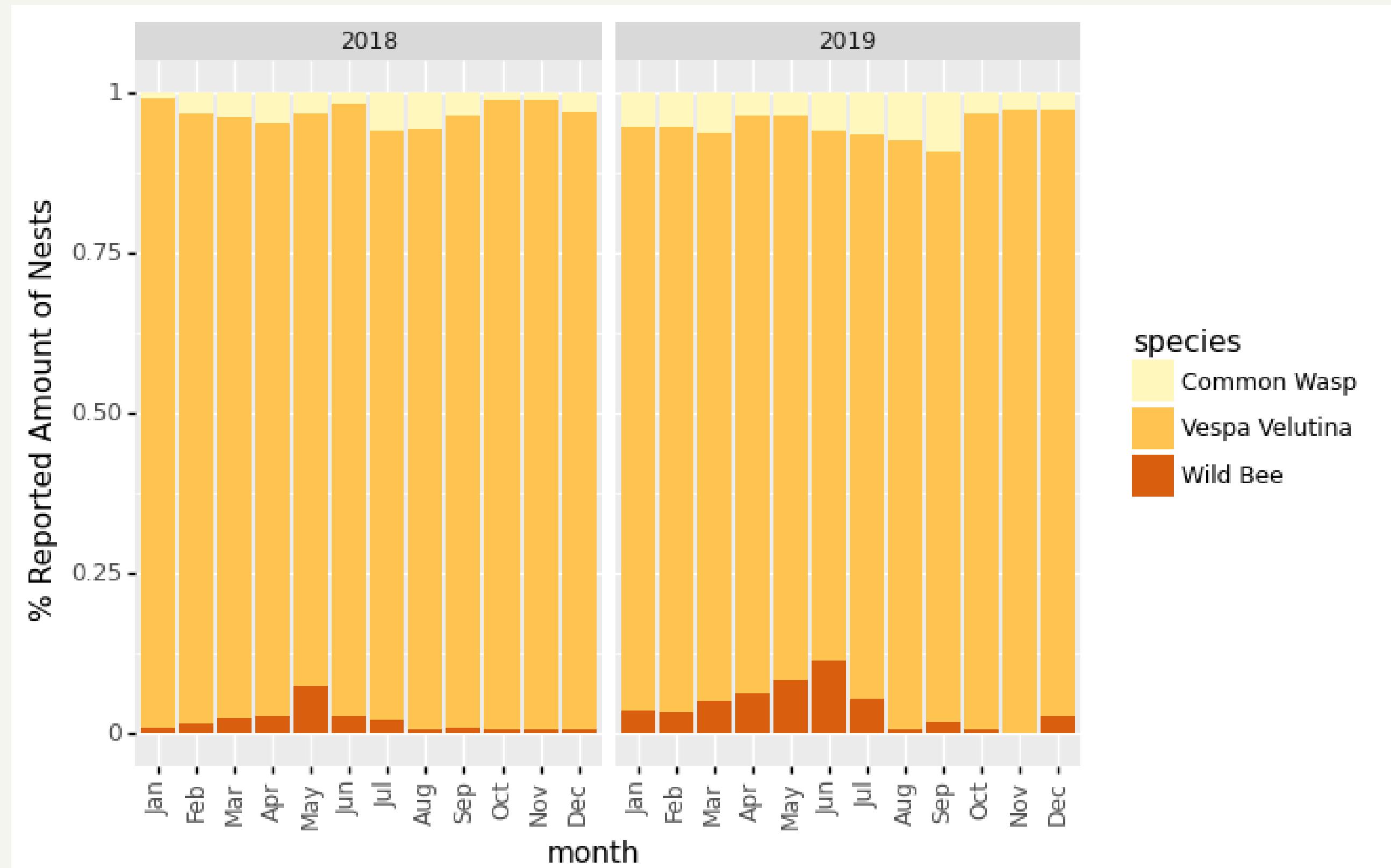
Food:

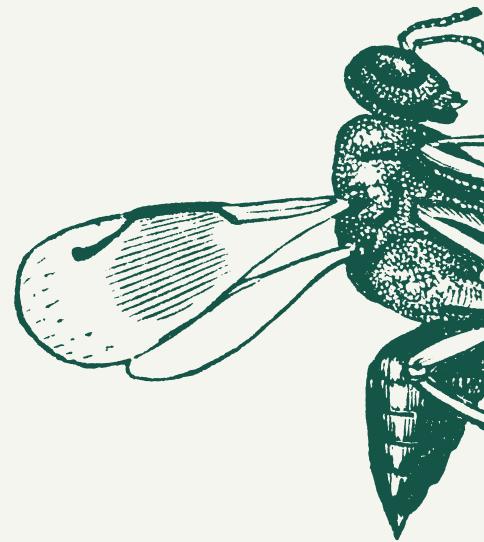
- Honey bees
- Carbohydrates from flowers and fruits.

Housing and Surroundings:

- Protection from rain and winds.

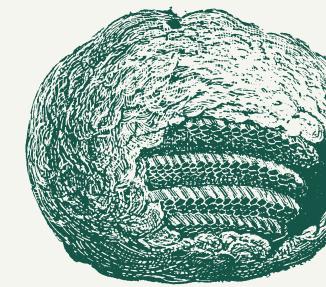
OBSERVED SPECIES BY MONTH AND YEAR





OF BEES,
AND
WASPS...

WHAT IS NEEDED FOR VESPA VELUTINA TO THRIVE?



No Enemies:

- No natural predators

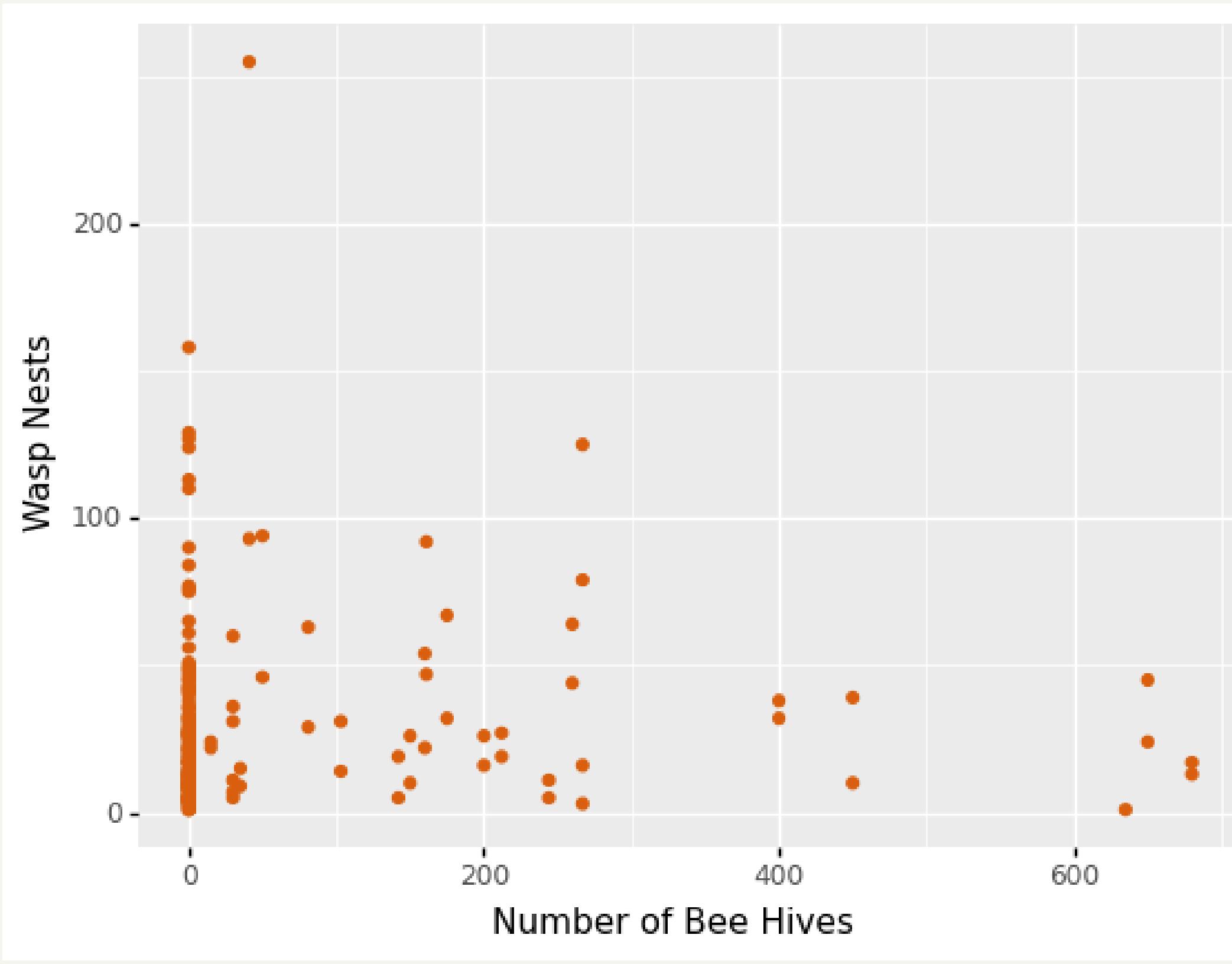
Food:

- Honey bees
- Carbohydrates from flowers and fruits.

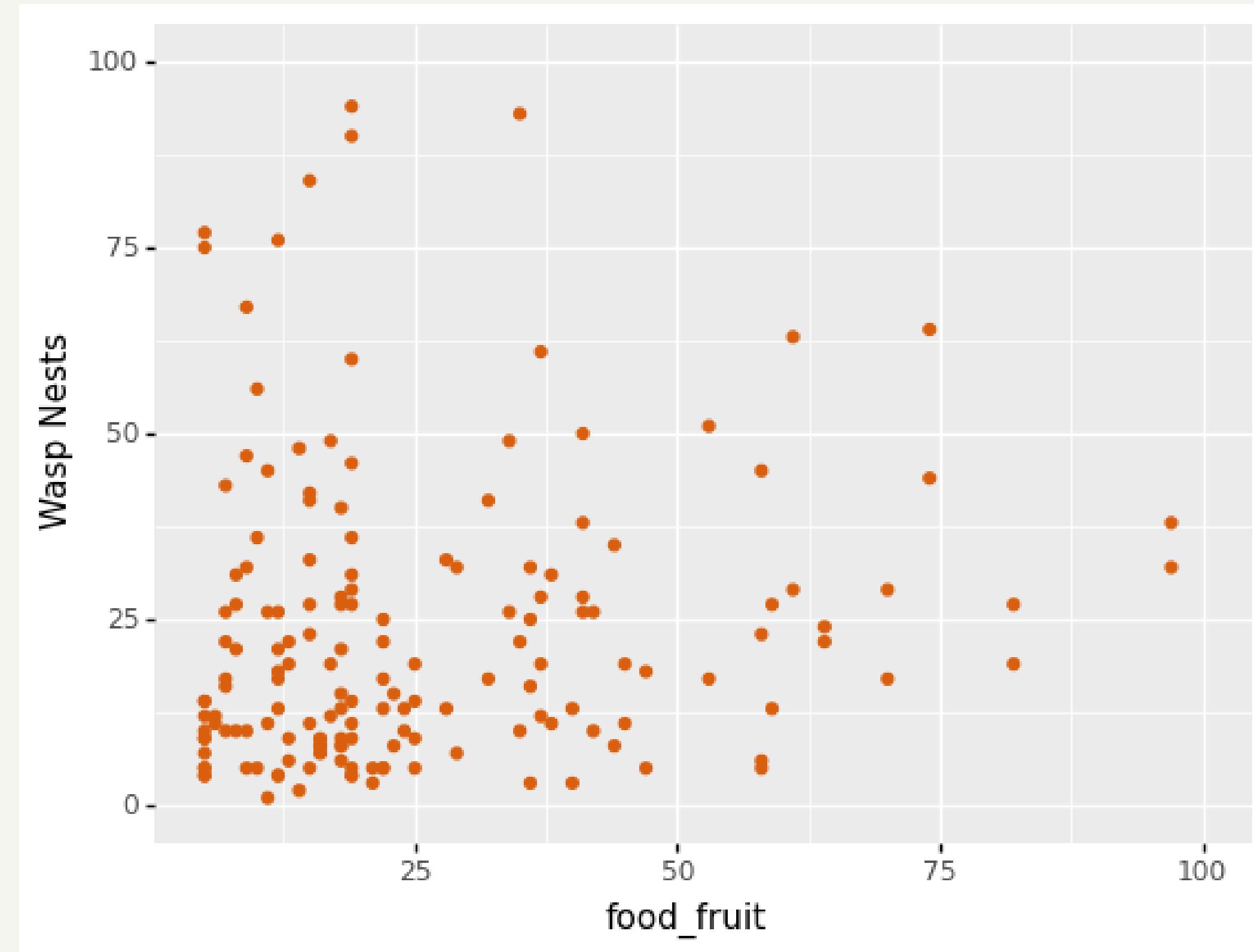
Housing and Surroundings:

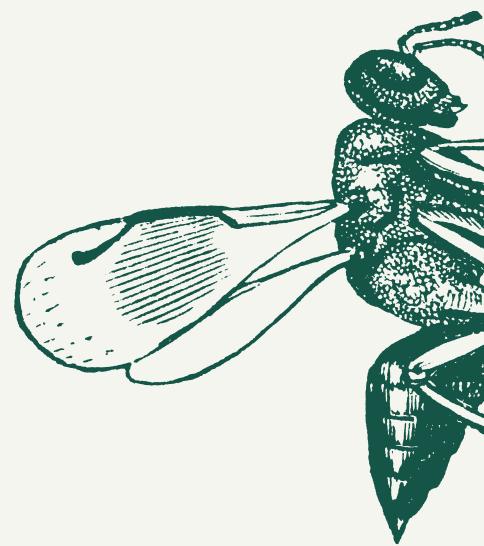
- Protection from rain and winds.

FOOD: NESTS VS BEE HIVES



FOOD: NESTS VS FRUITS





OF BEES,
AND
WASPS...

WHAT IS NEEDED FOR VESPA VELUTINA TO THRIVE?

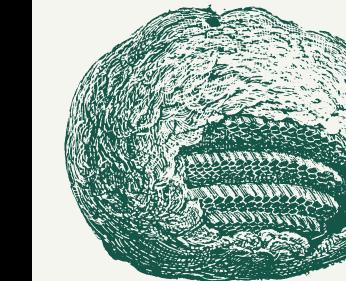
No Enemies:

- No natural predators



Food:

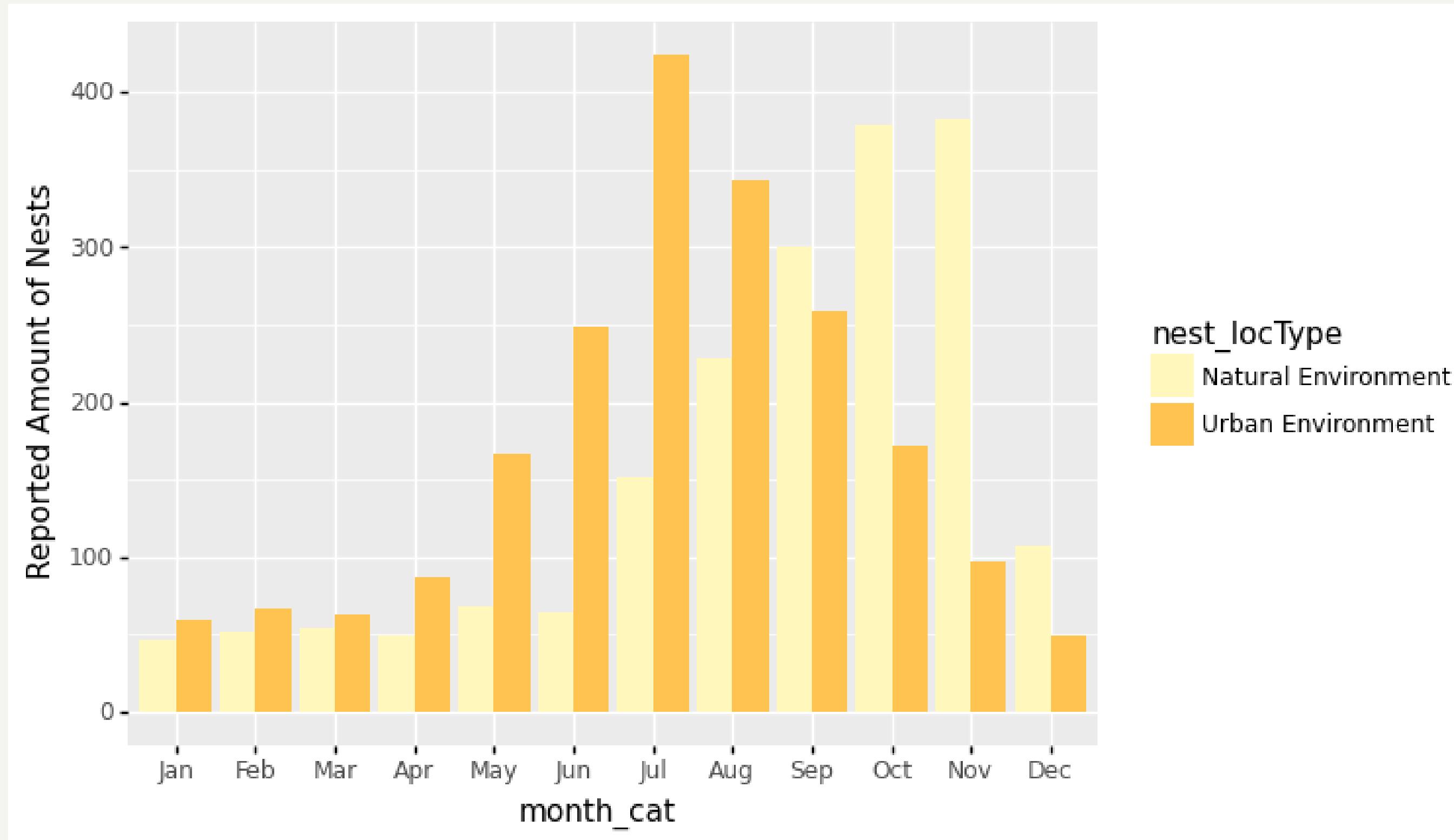
- Honey bees
- Carbohydrates from flowers and fruits.



Housing and Surroundings:

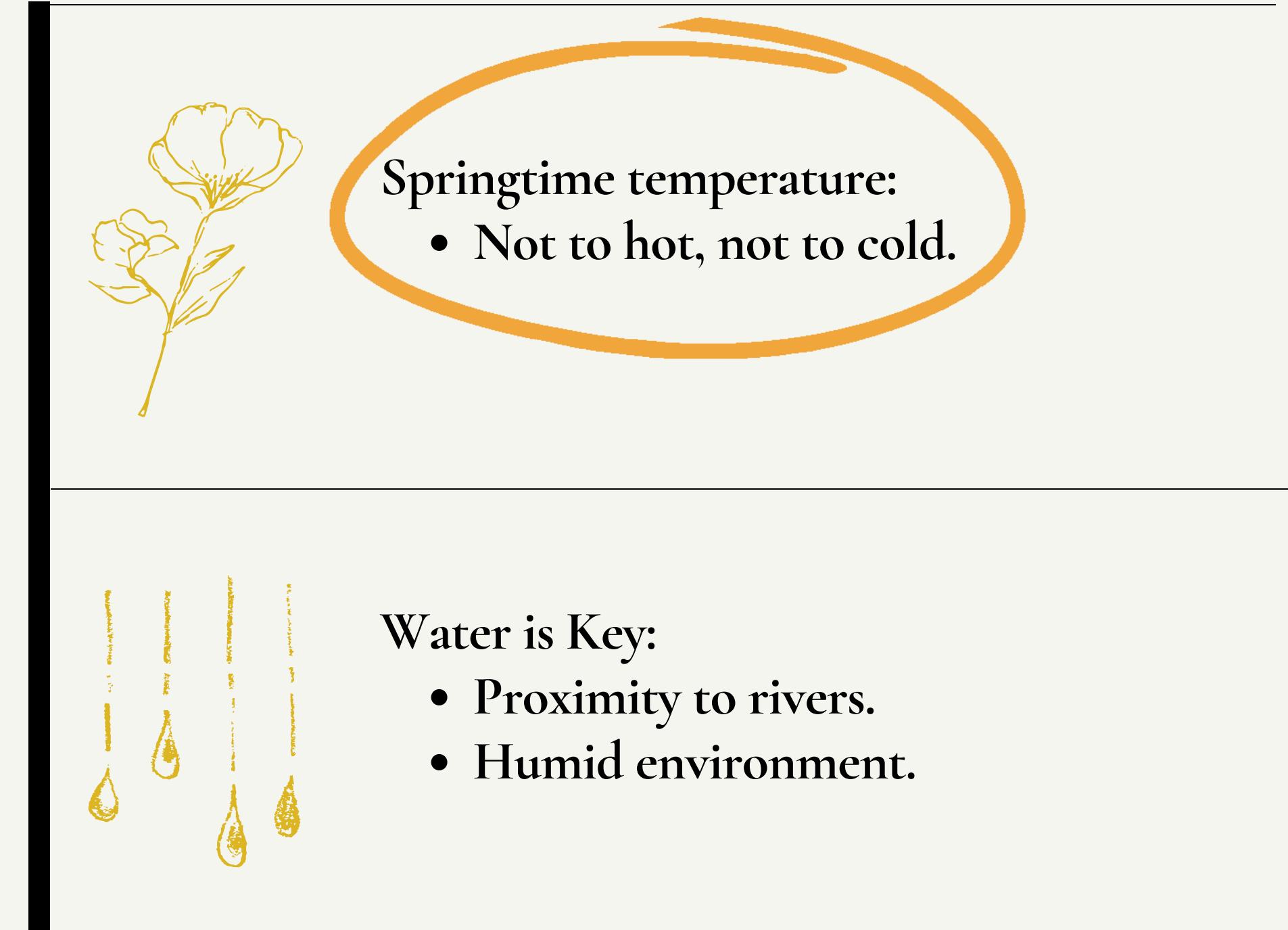
- Protection from rain and winds.

HOUSE: NESTS BY LOCATION TYPE

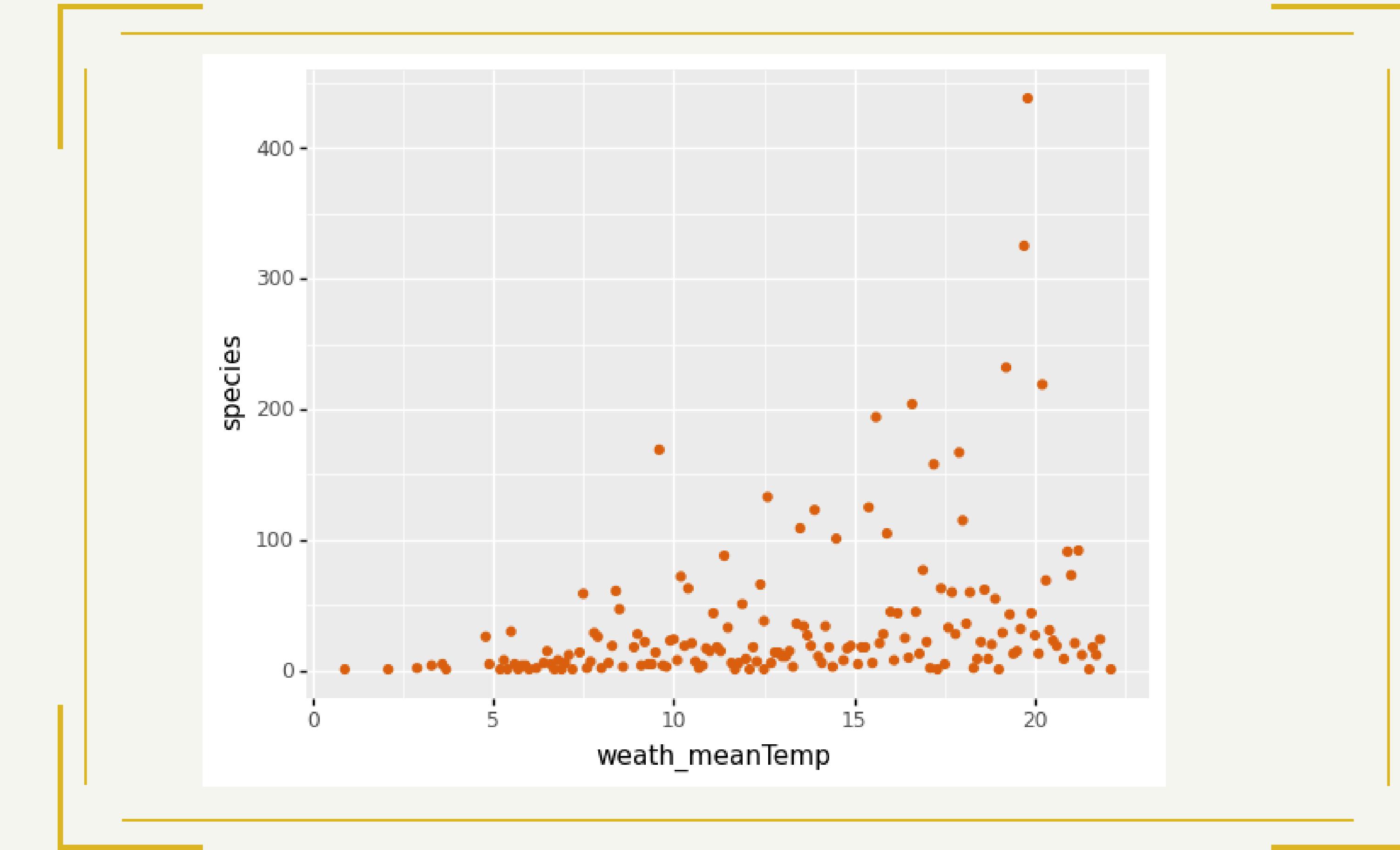


HOW'S THE WEATHER?

WHAT IS NEEDED FOR VESPA VELUTINA TO THRIVE?

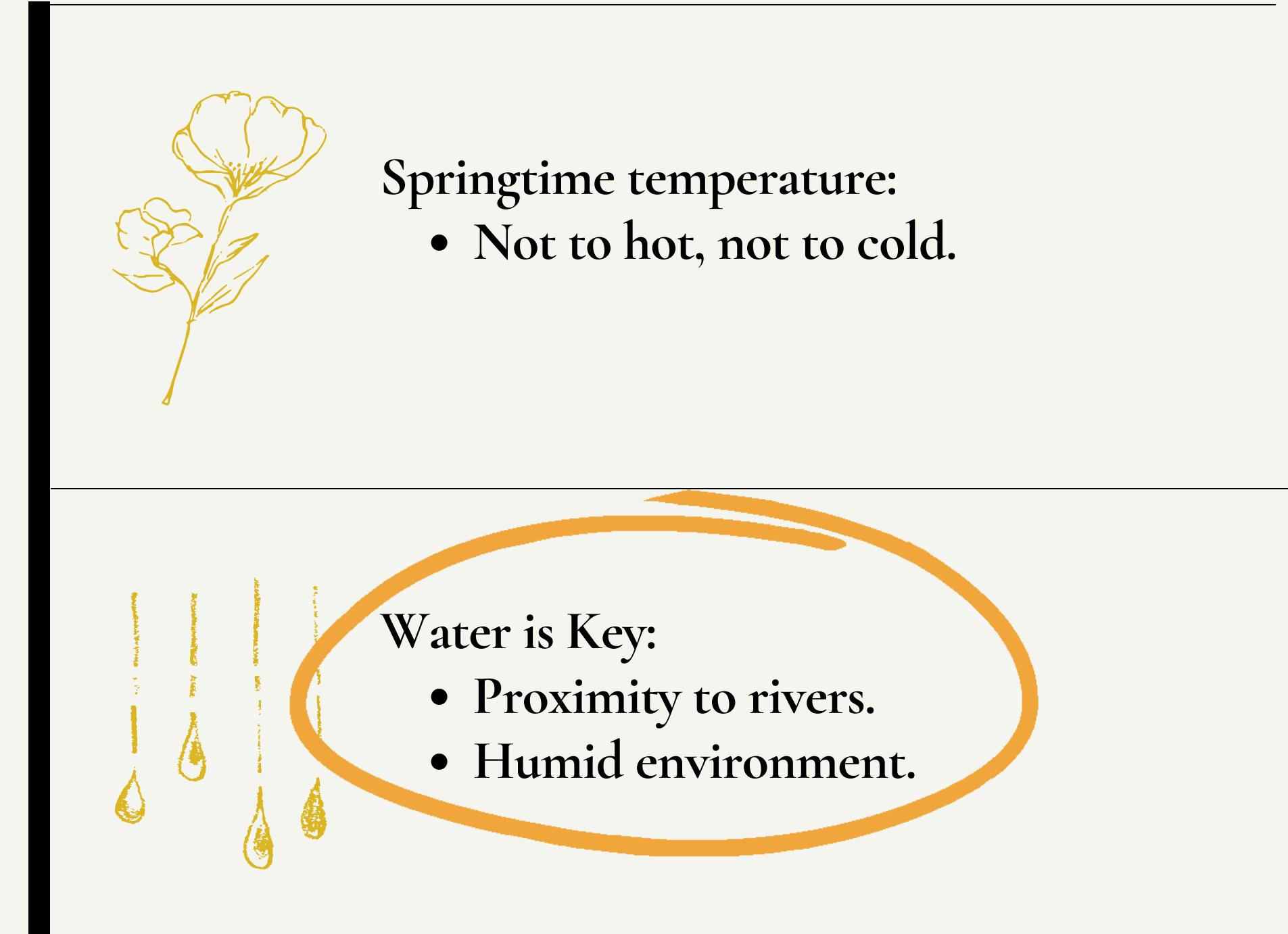


WEATHER: NESTS VS MEAN TEMP.

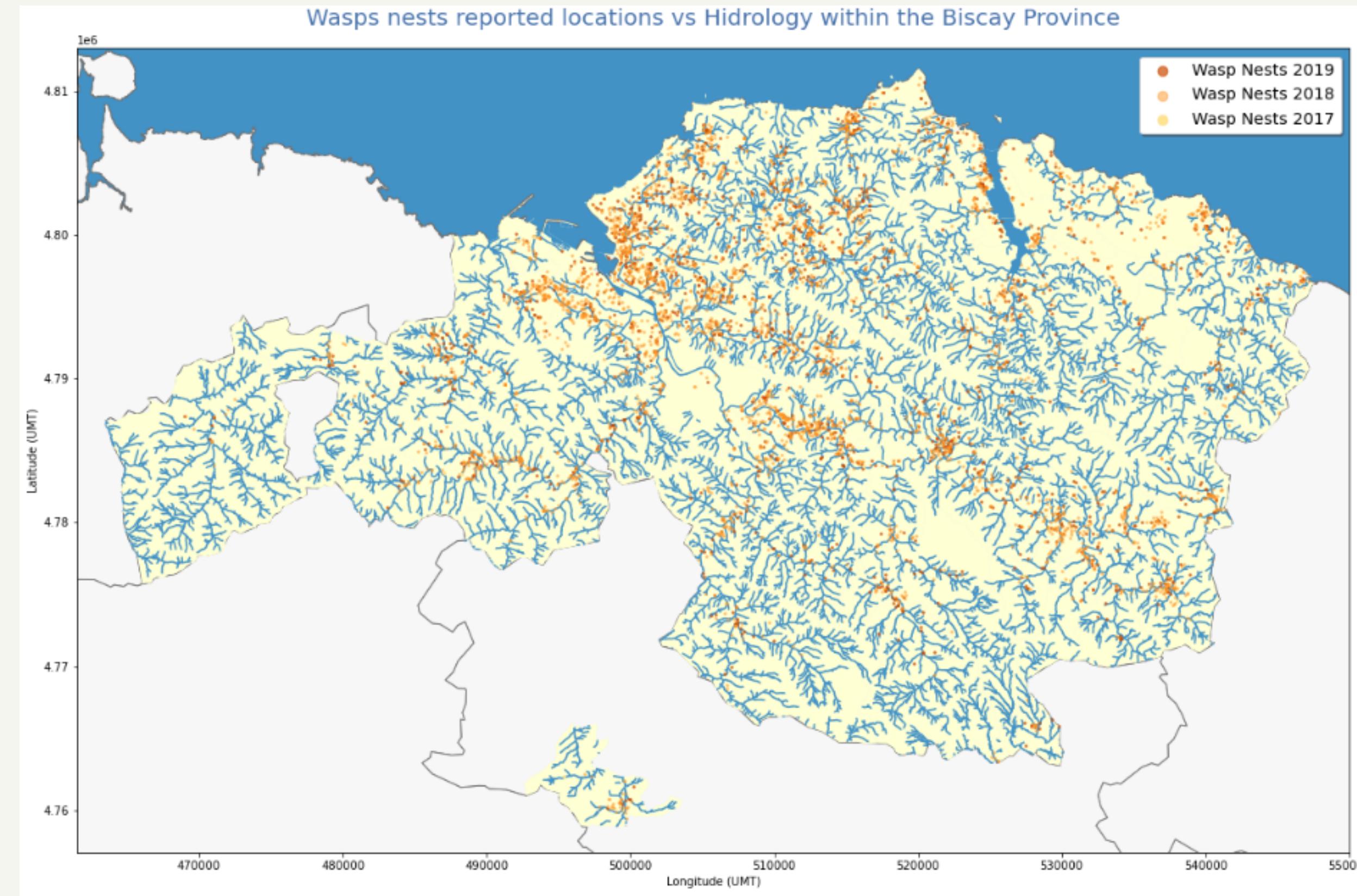


HOW'S THE WEATHER?

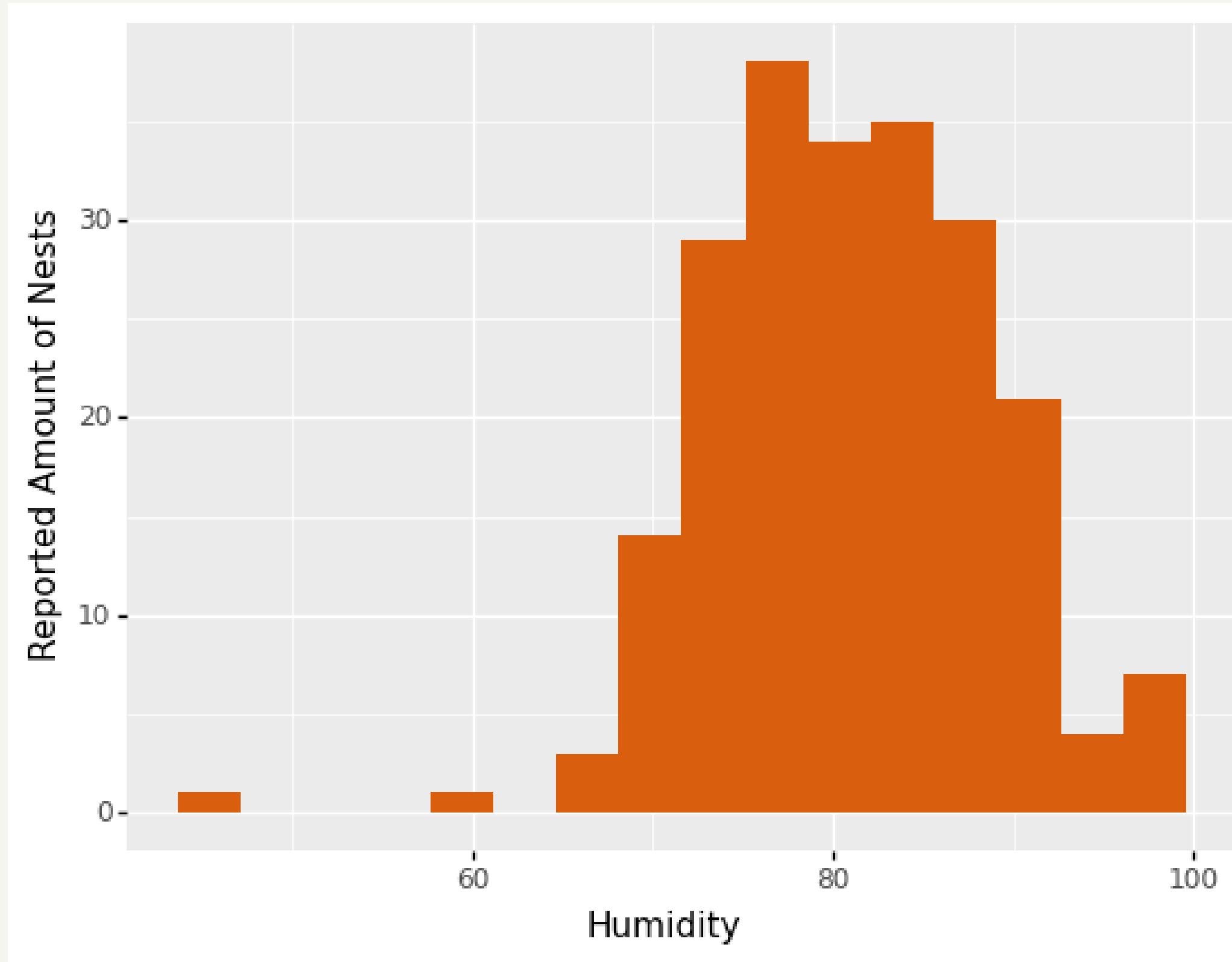
WHAT IS NEEDED FOR VESPA VELUTINA TO THRIVE?



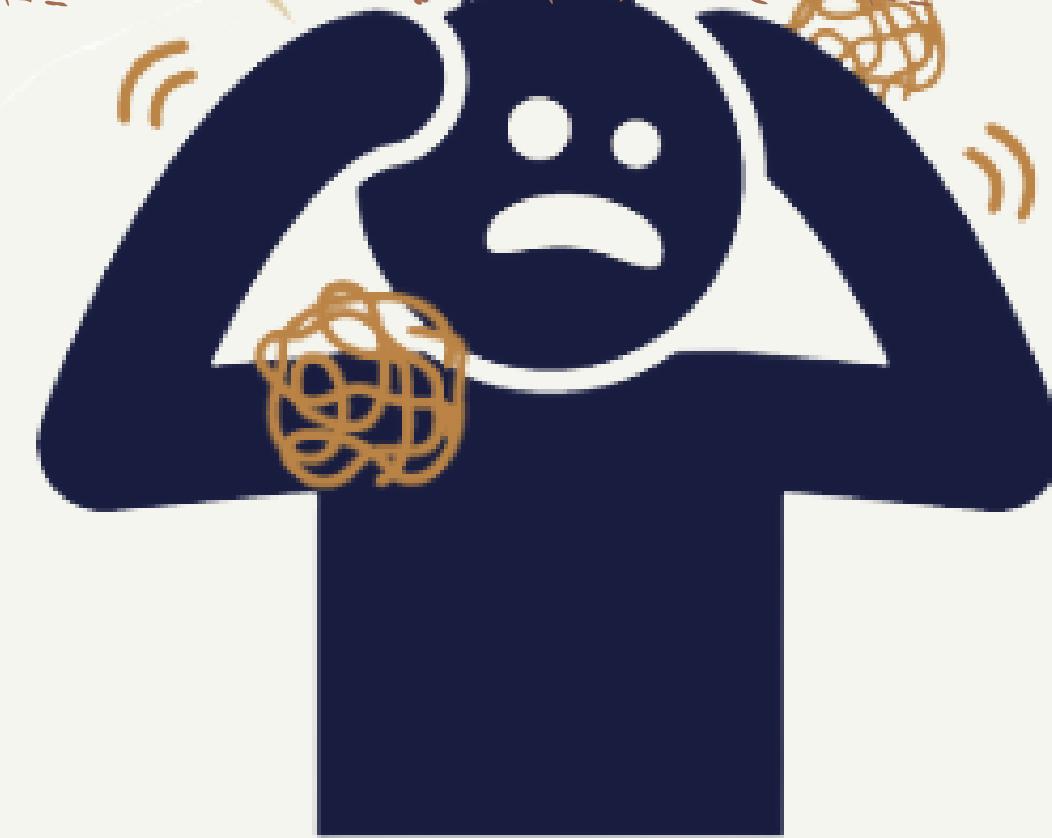
HYDROGRAPHY



WEATHER: NESTS VS % HUMIDITY



$B \lim_{x \rightarrow 1} \frac{ctgx - 2}{2\pi(1-x)} Q''$ $\int(x \pm a^4) \sum = n-1$ $A-C = B \lim_{x \rightarrow 1} \frac{ctgx - 2}{2\pi(1-x)} Q''$ $\int(x \pm a^4) \sum = n-1$ $A-C =$
 $+y^2 = Z$ $S_3 = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ $\phi = \sqrt{\sum (x-m)^2}$ $S = \int_0^\pi 5t dt$ $x + y^2 = Z$ $S_3 = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ $\phi = \sqrt{\sum (x-m)^2}$ $S = \int_0^\pi 5t dt$
 $\pi \approx 3,1415$ $y = \sin x$ $y = \frac{\Delta x}{\Delta z}$ $\pi \approx 3,1415$ $y = \sin x$ $y = \frac{\Delta x}{\Delta z}$
 $P = r^2 \pi$ $(x+y)^2 = \left(\frac{y}{2}\right)^2$ $\frac{\Delta x}{\Delta y} = \lim_{n \rightarrow \infty} \frac{\Delta x + 2}{\Delta y - 1}$ $P = r^2 \pi$ $(x+y)^2 = \left(\frac{y}{2}\right)^2$ $\frac{\Delta x}{\Delta y} = \lim_{n \rightarrow \infty} \frac{\Delta x + 2}{\Delta y - 1}$
 $\Delta t = T - \frac{3a}{x}$ $\delta_x = h - 3y^2$ $(x+a)^2 = x^2 + 2ax + a^2$ $f_x = (x-y^2)$ $\delta_x = h - 3y^2$ $(x+a)^2 = x^2 + 2ax + a^2$ $f_x =$
 $(x-y^2)$ $y = 2x^2 + 3x$ $y = 2x^2 + 3x$
 $\int \frac{x+a^2}{x} dx$ $e = 2,79$ $e = \cos x + \tan y \tan(2a) - \frac{2\tan(a)}{1+\tan^2(a)}$ $\int \frac{x+a^2}{x} dx$ $e = 2,79$ $e = \cos x + \tan y \tan(2a) - \frac{2\tan(a)}{1+\tan^2(a)}$
 $P = \sum_{i=0}^{+\infty} X_i^a$ $y = \frac{\Delta x}{\Delta z}$ $\ln = \sqrt{axb}$ $P = \sum_{i=0}^{+\infty} X_i^a$ $y = \frac{\Delta x}{\Delta z}$ $\ln = \sqrt{axb}$
 $= (y-1)^2$ $(x+h)^n \sin a = b$ $n = 0$ $(x+h)^n \sin a = b$ $n = 0$ $(x+h)^n \sin a = b$

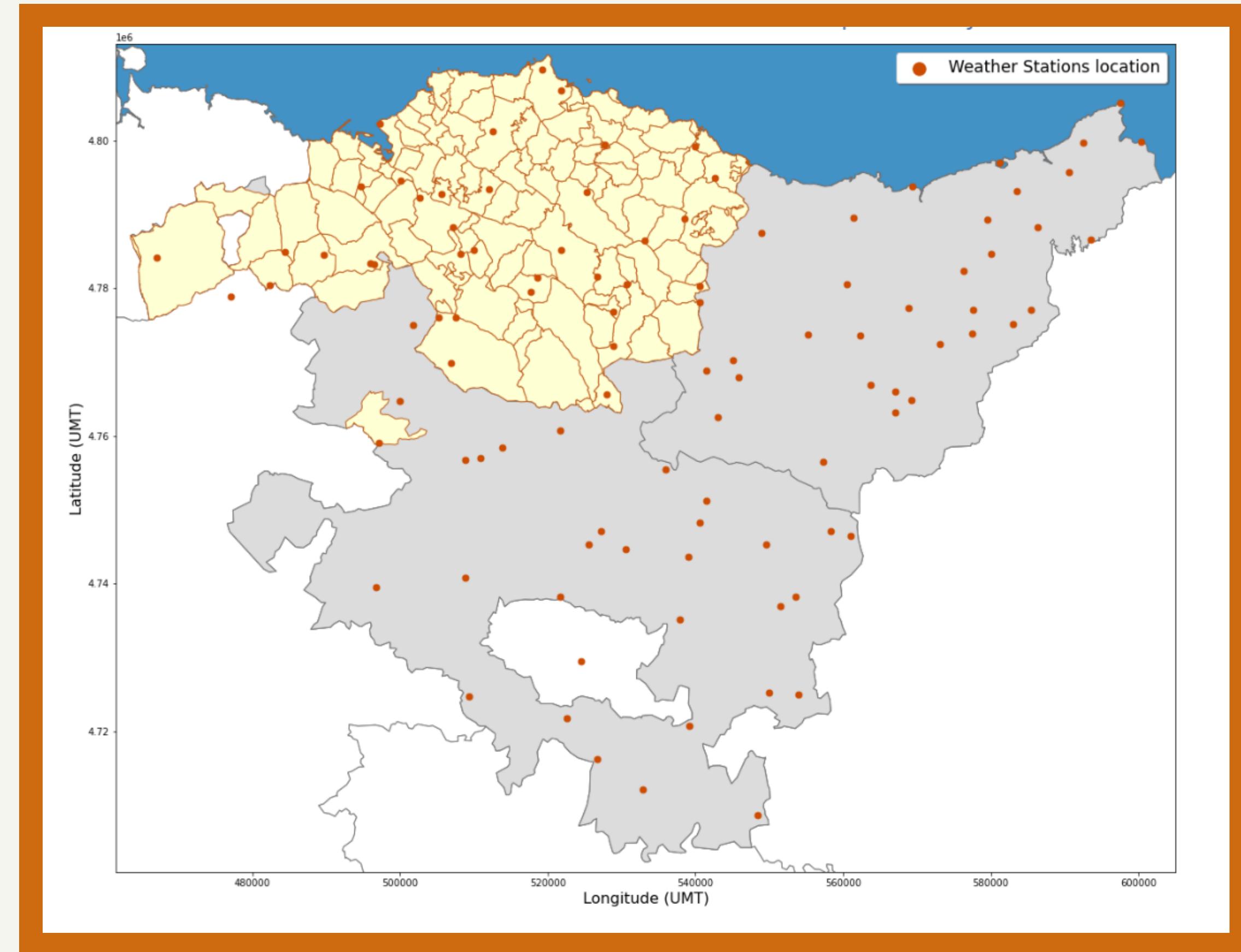


WHICH WEATHER STATION?

LOCATION OF WEATHER STATIONS WITHIN THE BASQUE COUNTRY

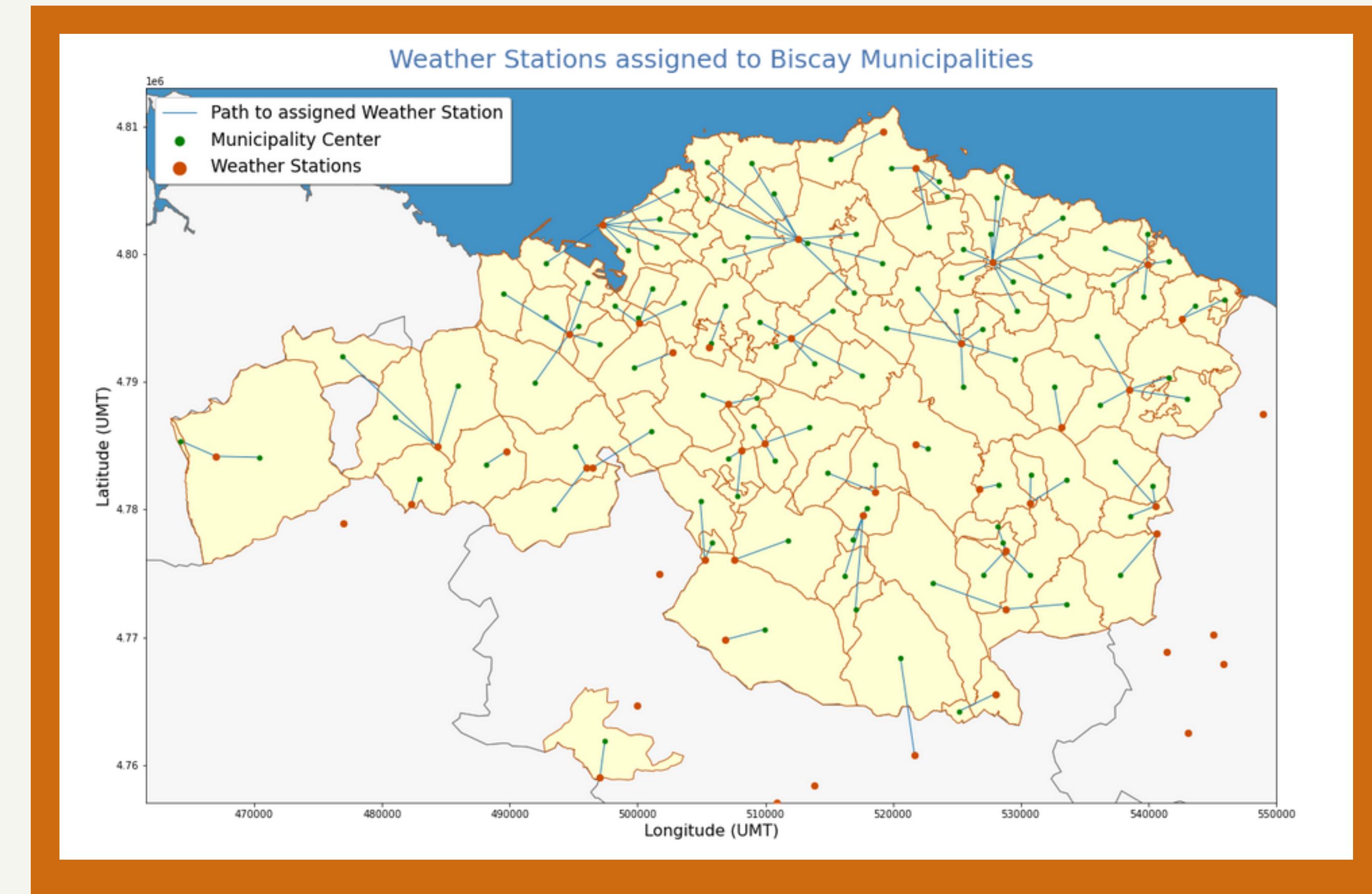


- Only 30% weather stations lie within the Biscay Province.
- 25% of Biscay Municipalities lack a Weather Station.



WEATHER STATIONS ASSIGNED TO BISCAY MUNICIPALITIES

- All 112 Municipalities have been assigned the closest Weather Station.
- This will allow to have more accurate weather data for our model.



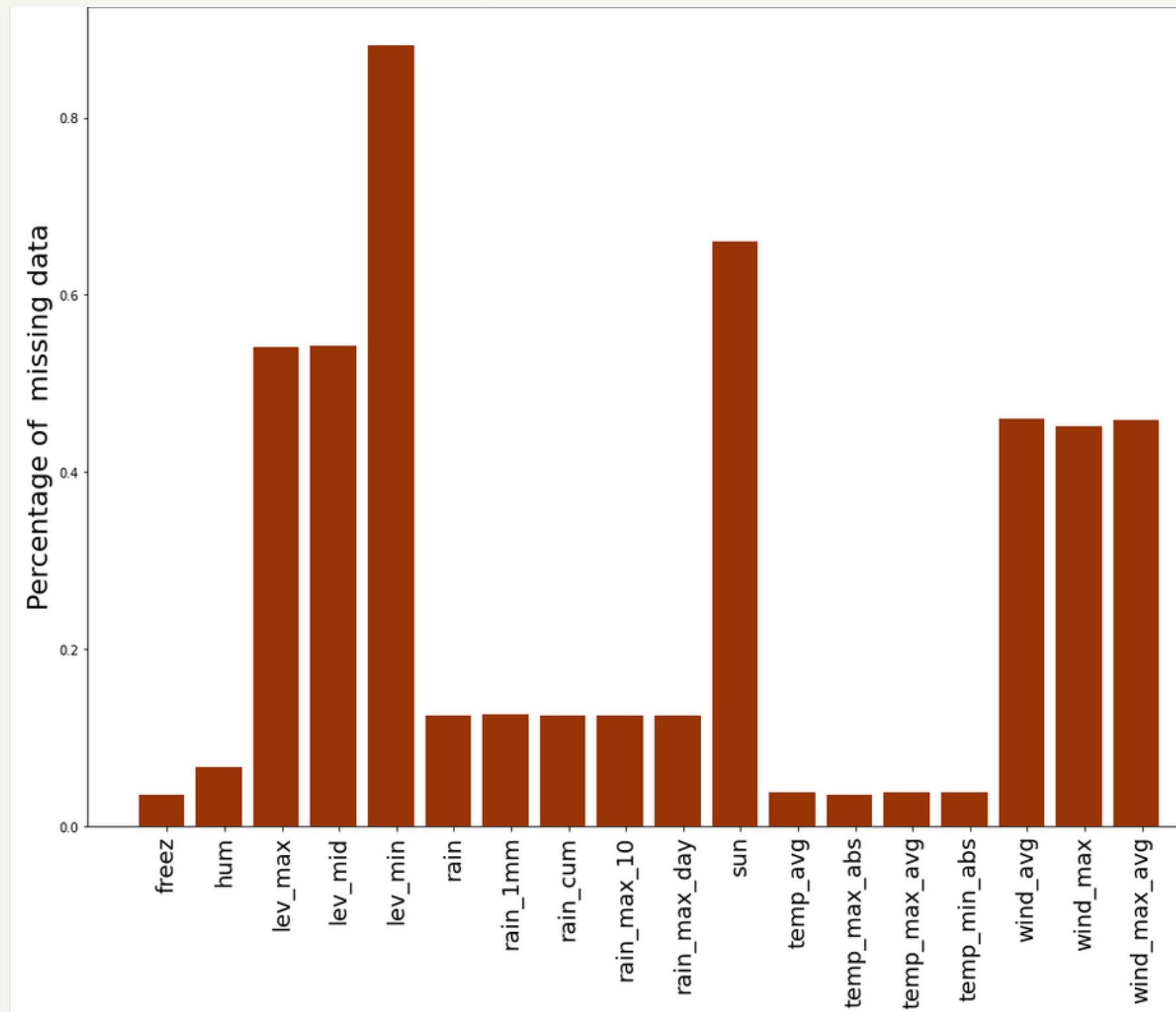


HOW TO DEAL WITH MISSING VALUES?

COMPLETENESS ANALYSIS OF WEATHER DATA



MISSING VALUES IN STATIONS DATA



18
Columns

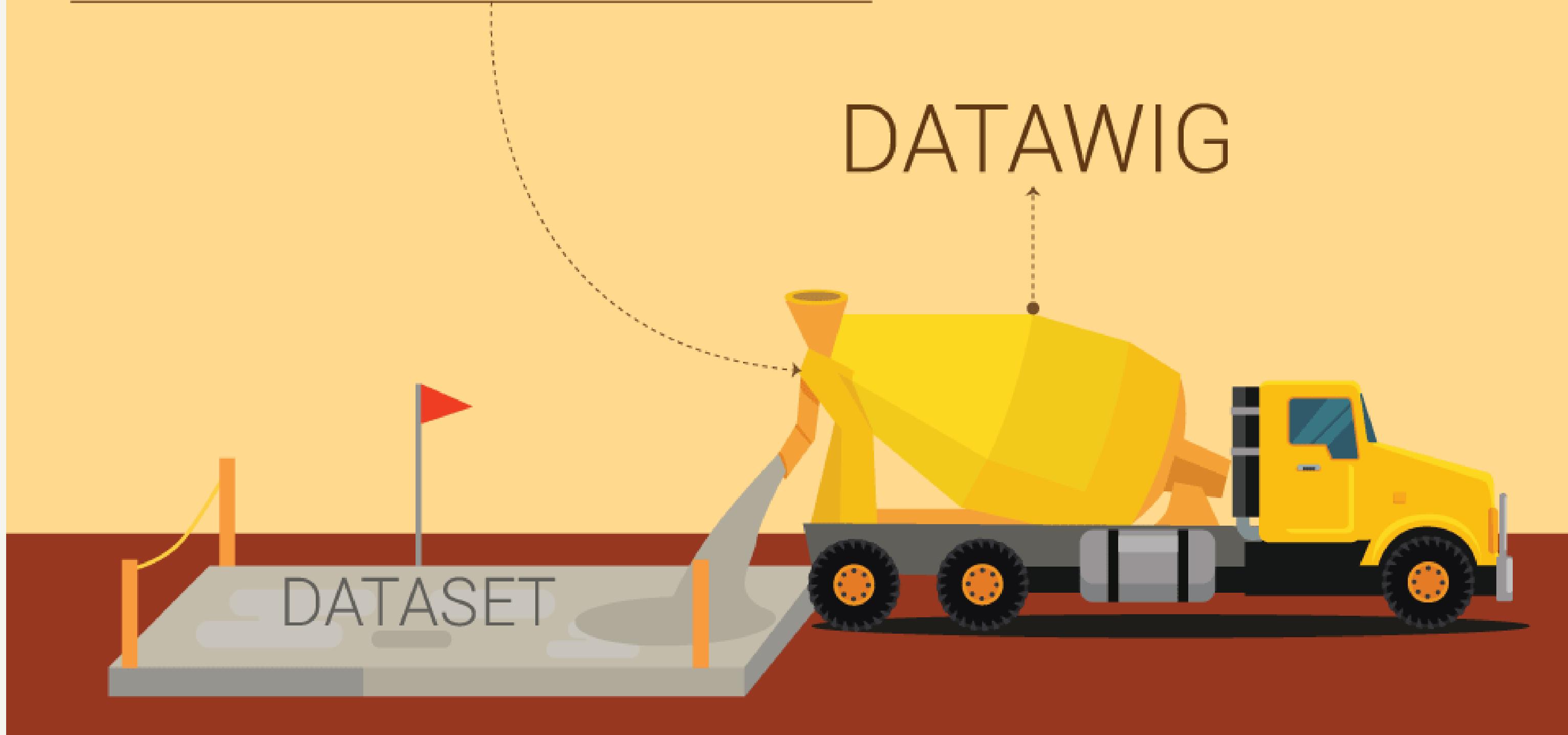
5 040
Total rows

24 558
Total NaN values

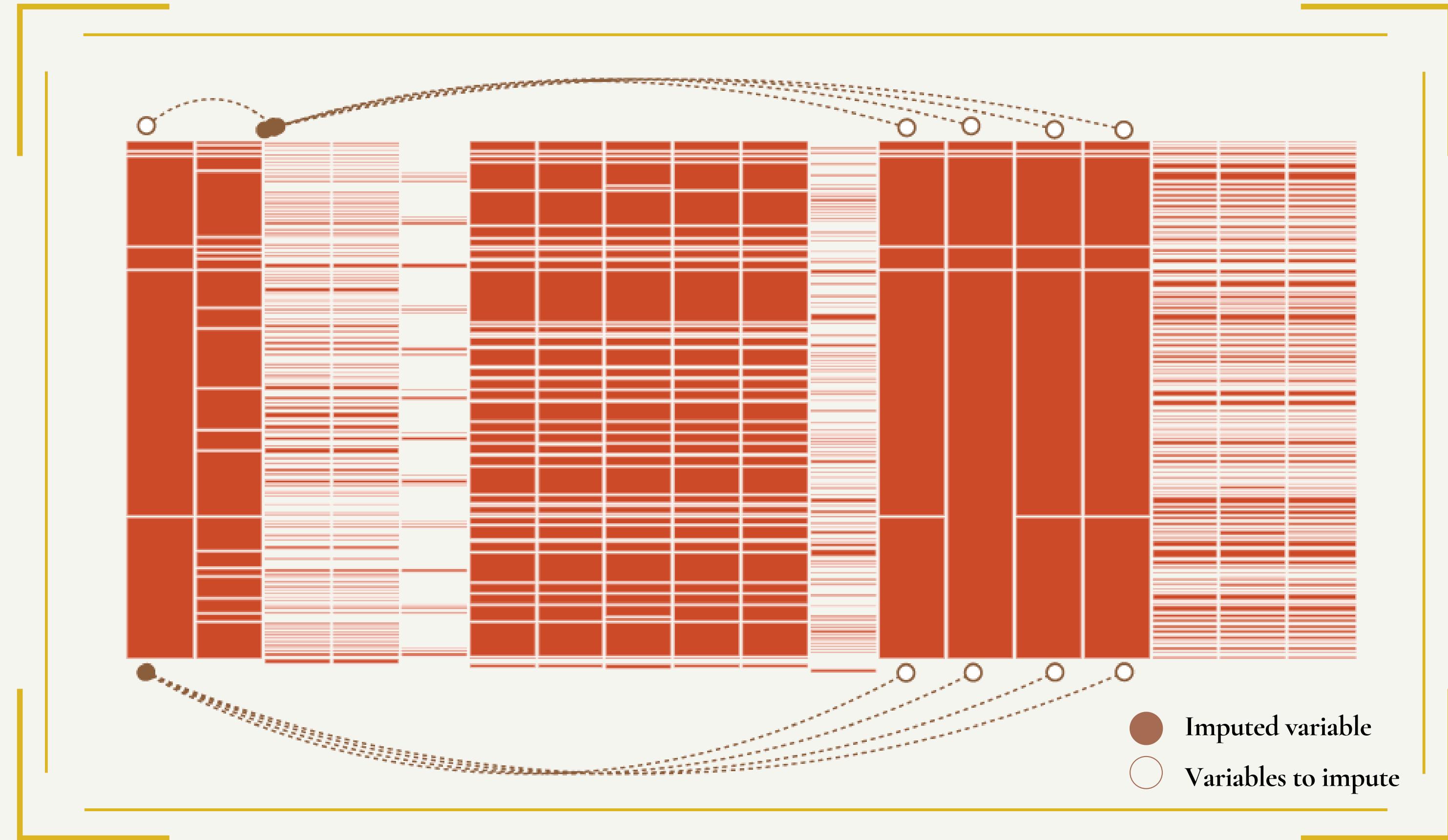
1364
On average
per column

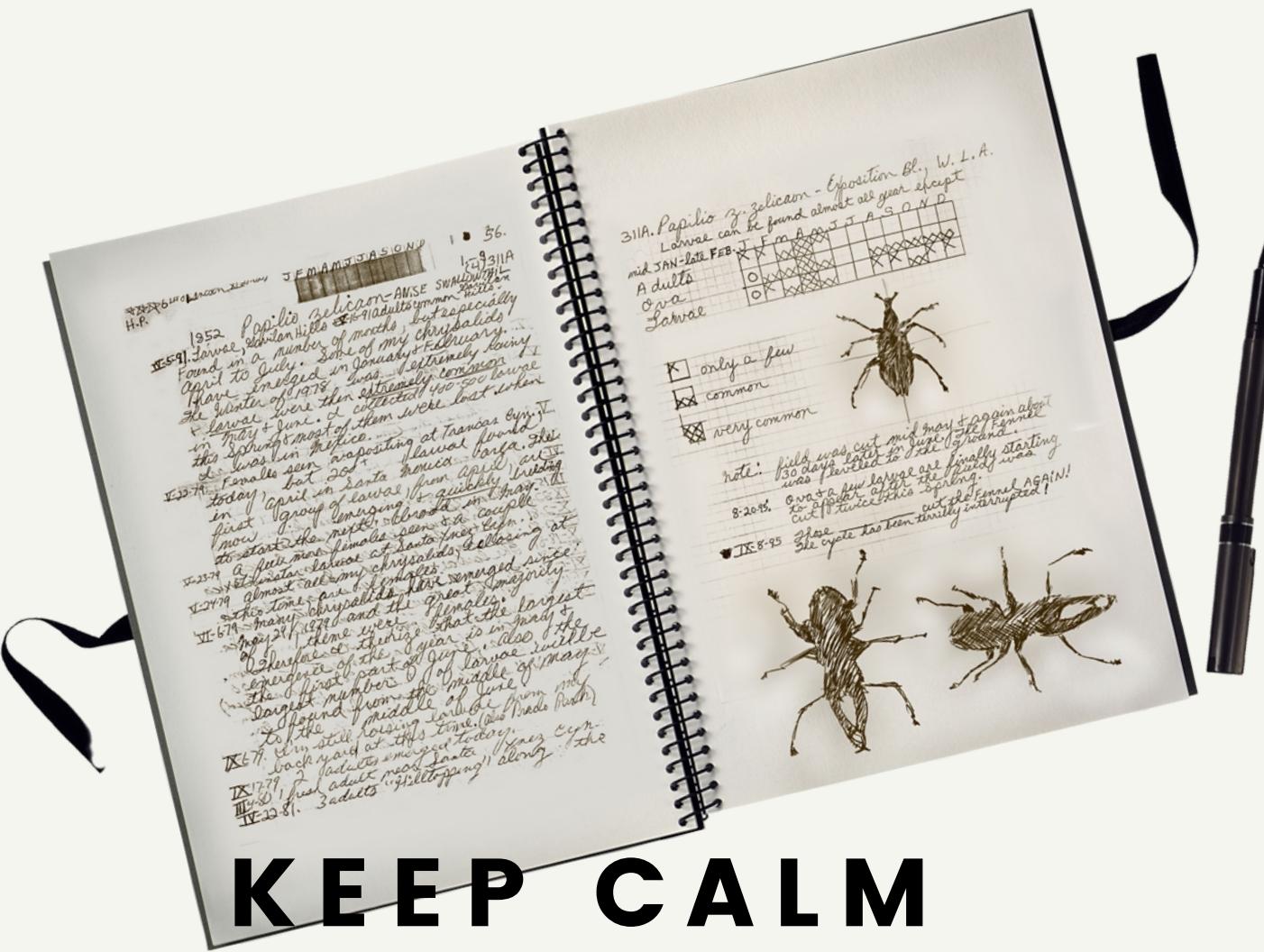
27%
On average
per column

Imputation method



IMPUTATION PROCESS





**KEEP CALM
AND DATA
SCIENCE**

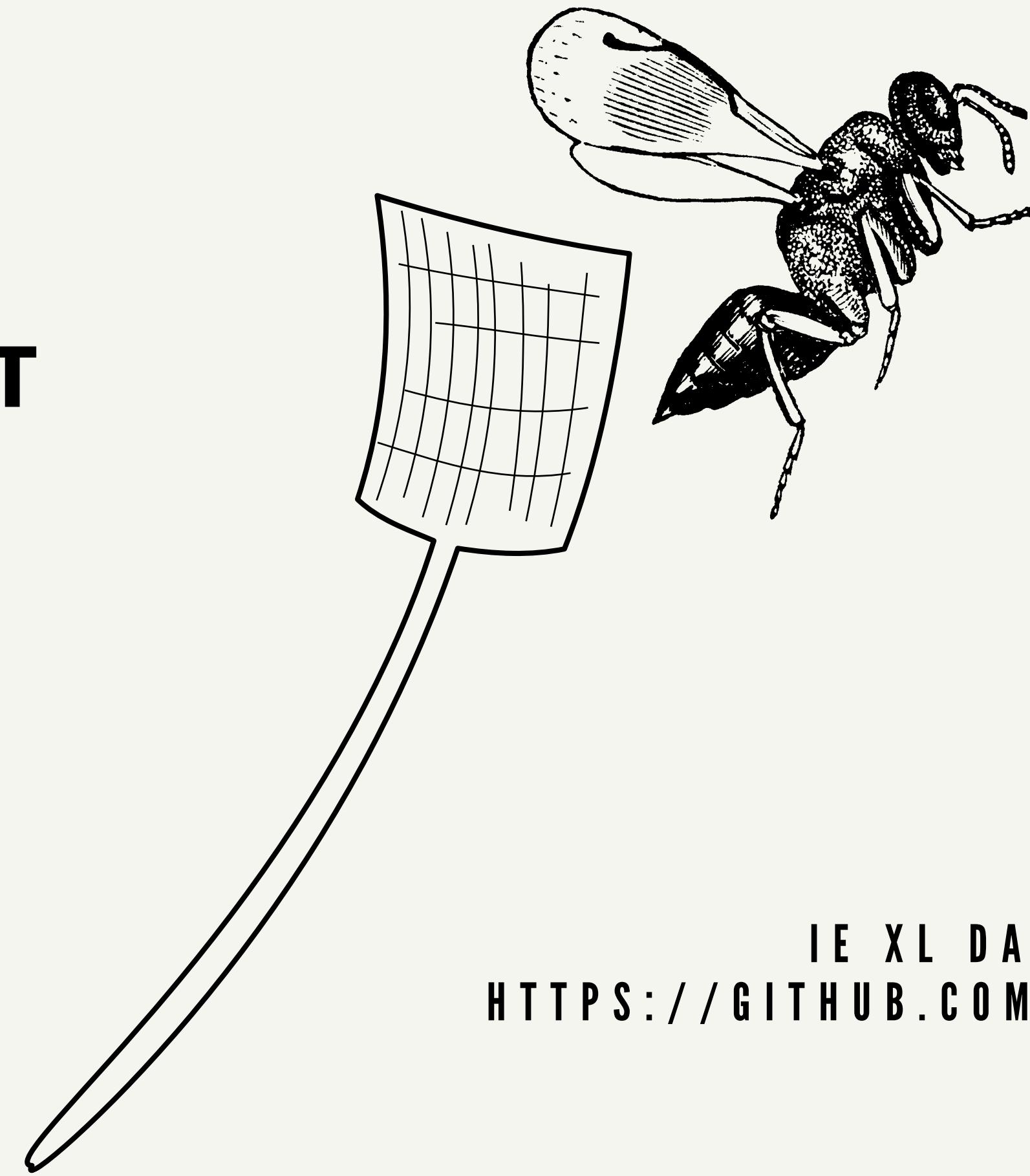


Next challenge: What to do about Bilbao (no data)

Prediction: What to feed The Machine

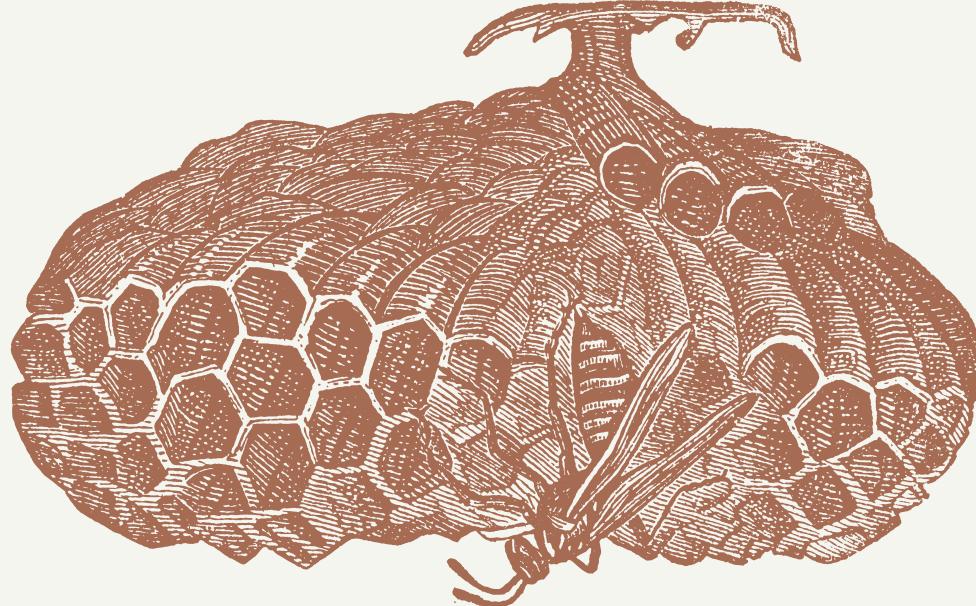
To have an impact: "Mean Square Error" and Dashboard

LET'S BUST
SOME
WASPS!

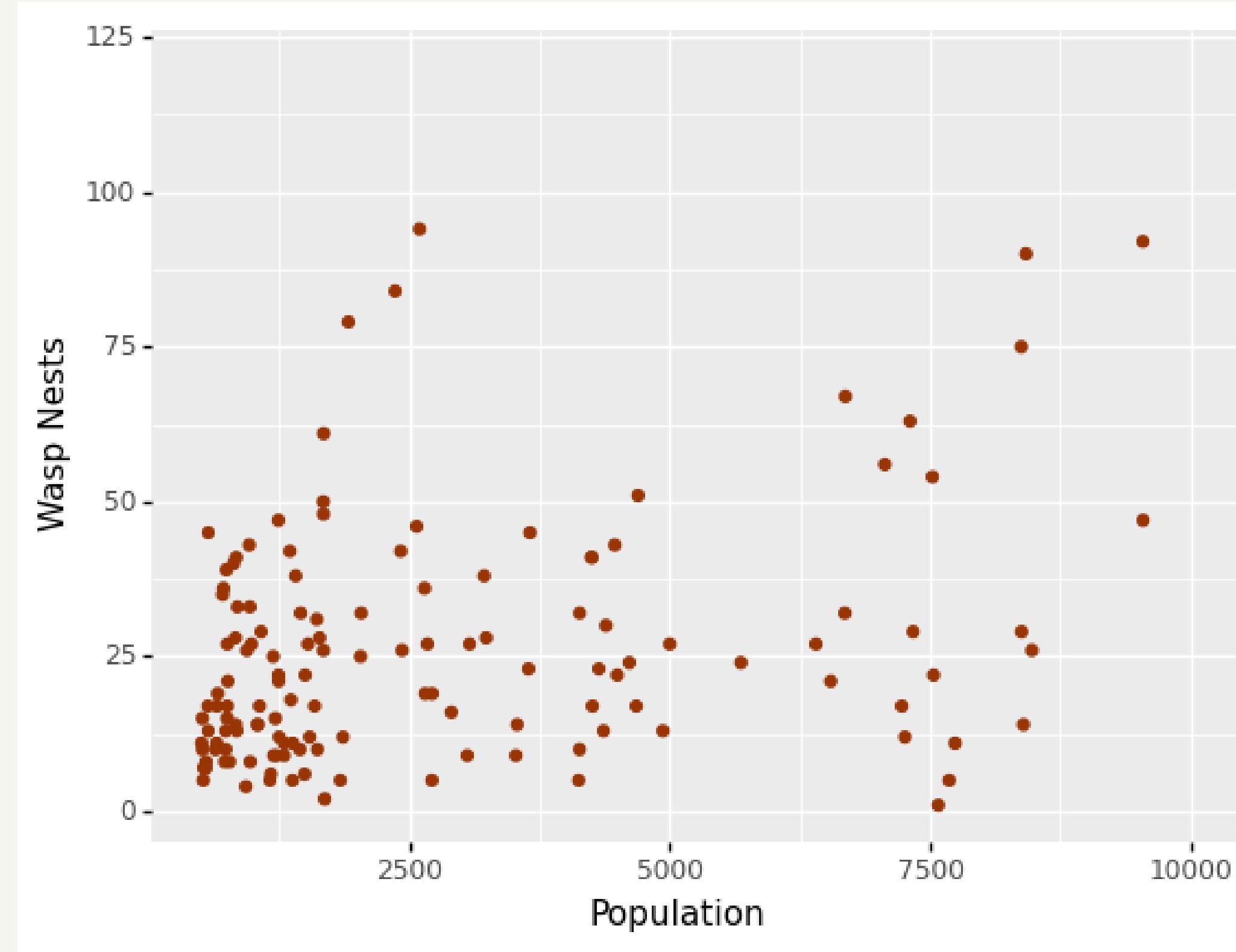


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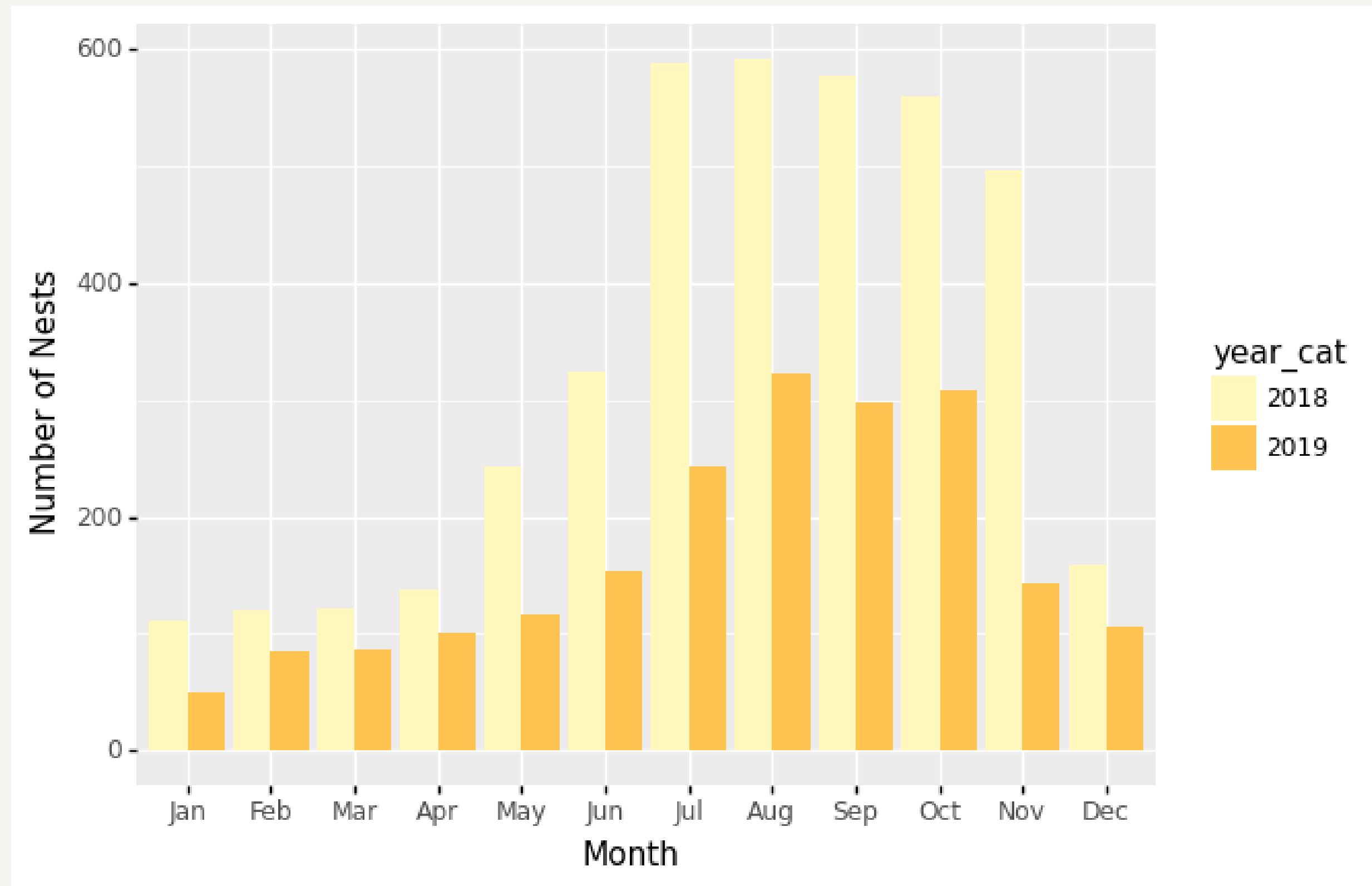
ANNEXES



NESTS VS MUNIC. POPULATION

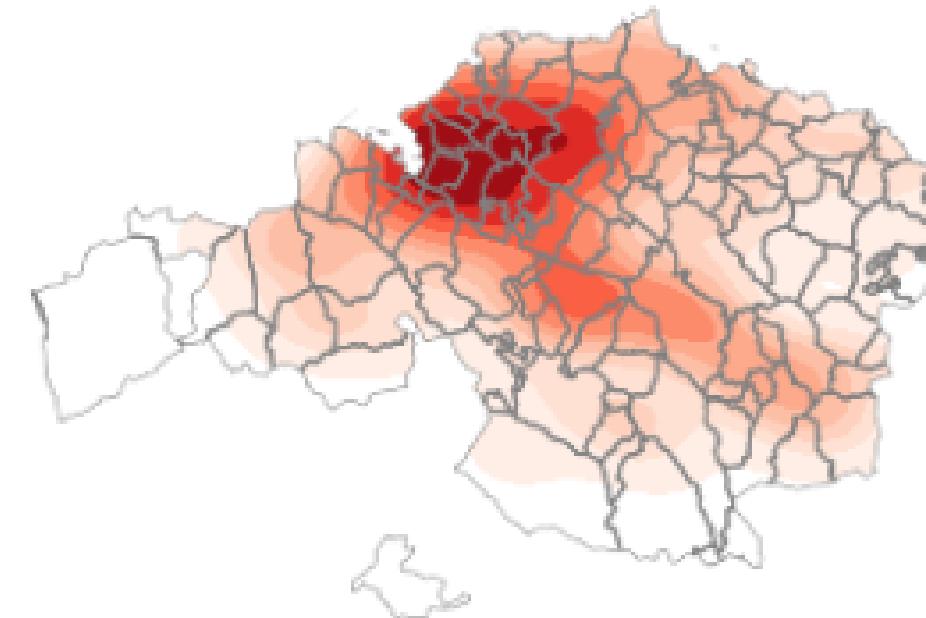


AMOUNT OF REPORTED NESTS BY MONTH

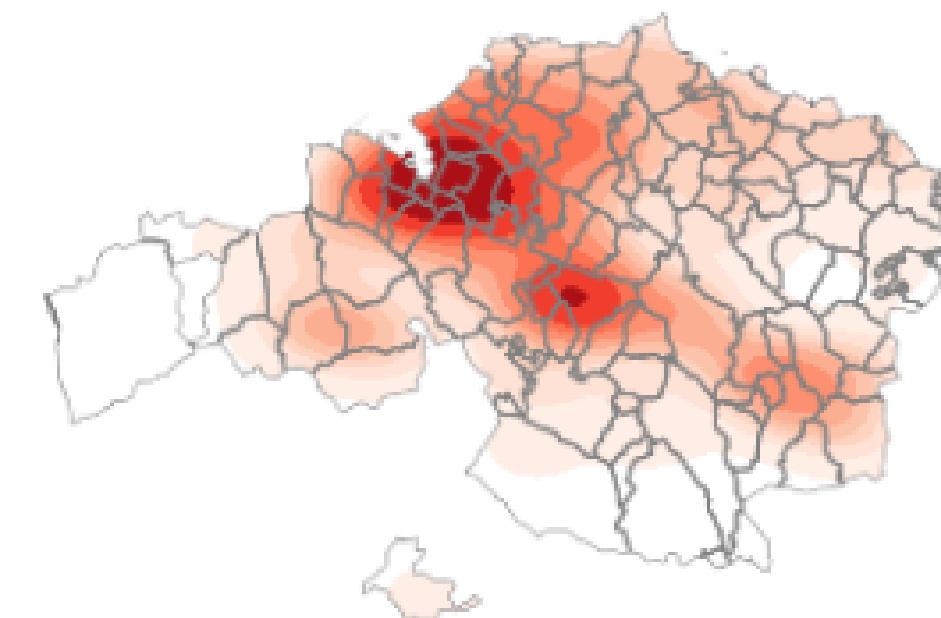


DISPERSION OF REPORTED NESTS LOCATION

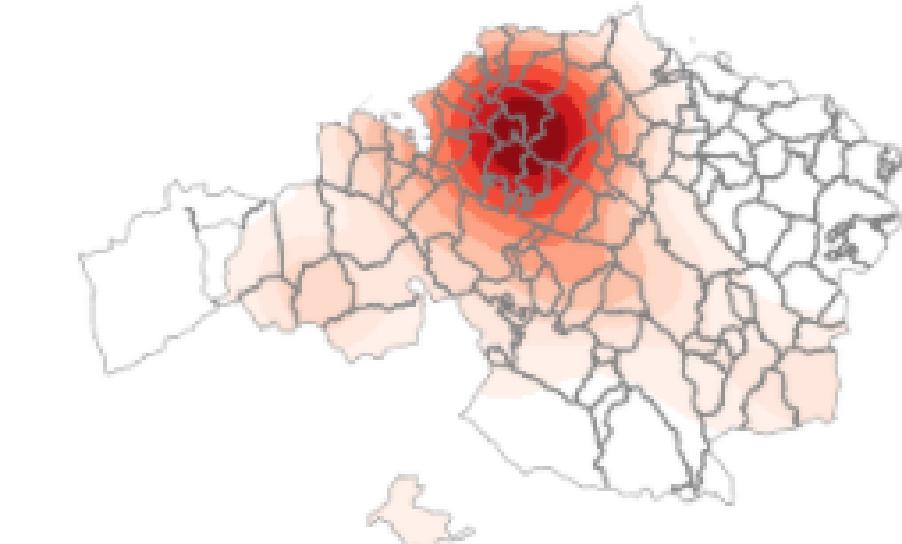
Location of Wasps Nests in the Biscay Region, 2019



Location of Wasps Nests in the Biscay Region, 2018

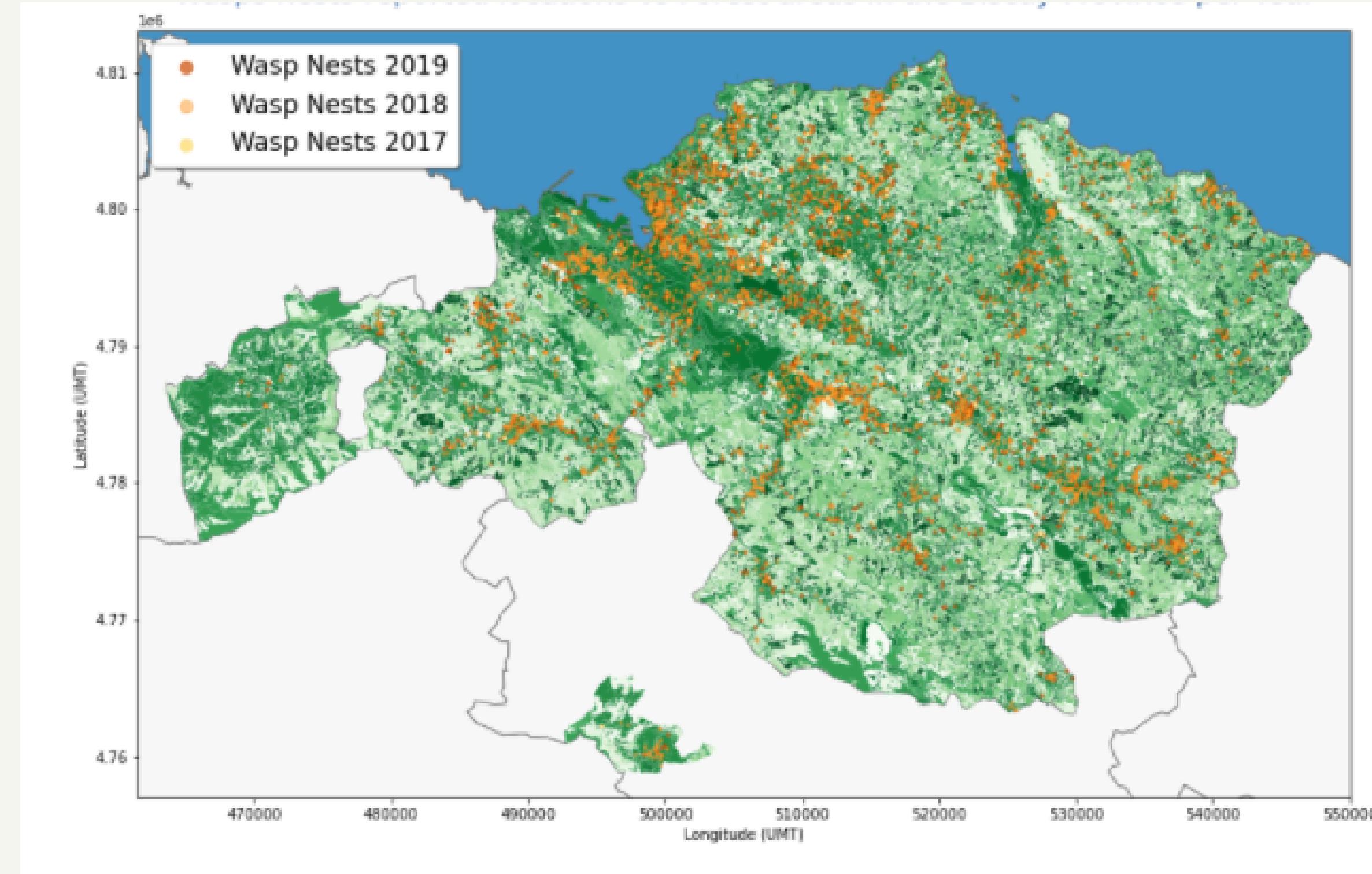


Location of Wasps Nests in the Biscay Region, 2017



Reported nest locations do not change drastically per year
and tend to proliferate around certain areas.

WASP NEST LOCATIONS VS FOREST AREAS IN THE BISCUY PROVINCE PER YEAR



Proliferation of nests around dense forest areas -> Wasps seek shelter