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## **First results from Yellow-bellied toad's (*Bombina variegata*) radiotracking in forest landscape**

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# First results from Yellow-bellied toad's (*Bombina variegata*) radiotracking in forest landscape

## Species

**Name :** Yellow-bellied toad

**Distinguishing features :**

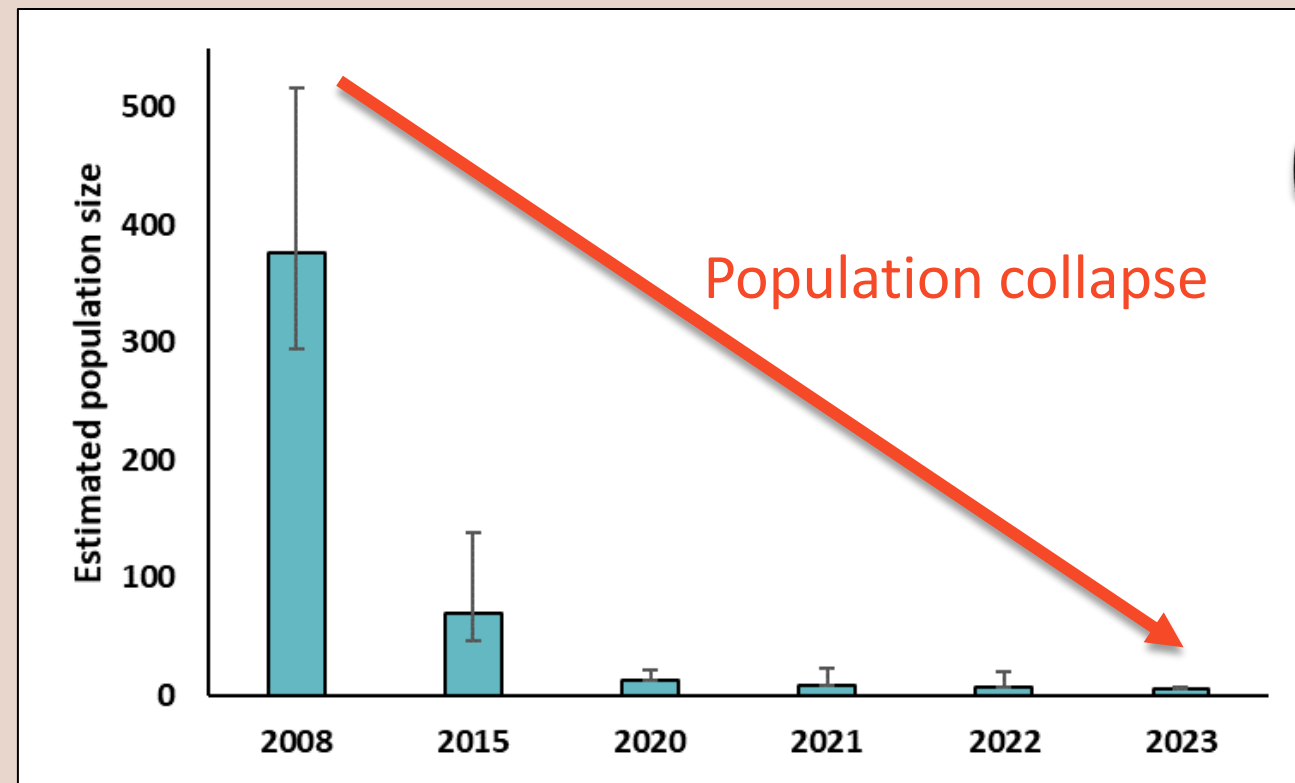
- brown pustular back
- ♥ shaped pupils
- rounded snout
- yellow belly with black spots



WANTED

## Background

Size of the last Ardennes population very small!



Supplementation program planned

Need for **preliminary studies**, particularly on habitat use during and outside the breeding season → **radiotracking**

Transmitters outfitting on toads in a healthier population

**Aim of the study: better understand habitat use, particularly the terrestrial habitat during and outside the breeding season**

## Materials

### Radiotracking

Toads fitted with transmitters<sup>2</sup> at two different times: **Spring** and **Summer**

15 toads: 7 ♂ and 8 ♀      14 toads: 7 ♂ and 7 ♀

Locations : **2 times a day** (day and night) **every day** for 25 days and 22 days

**Weather measurement** at the start of each session :

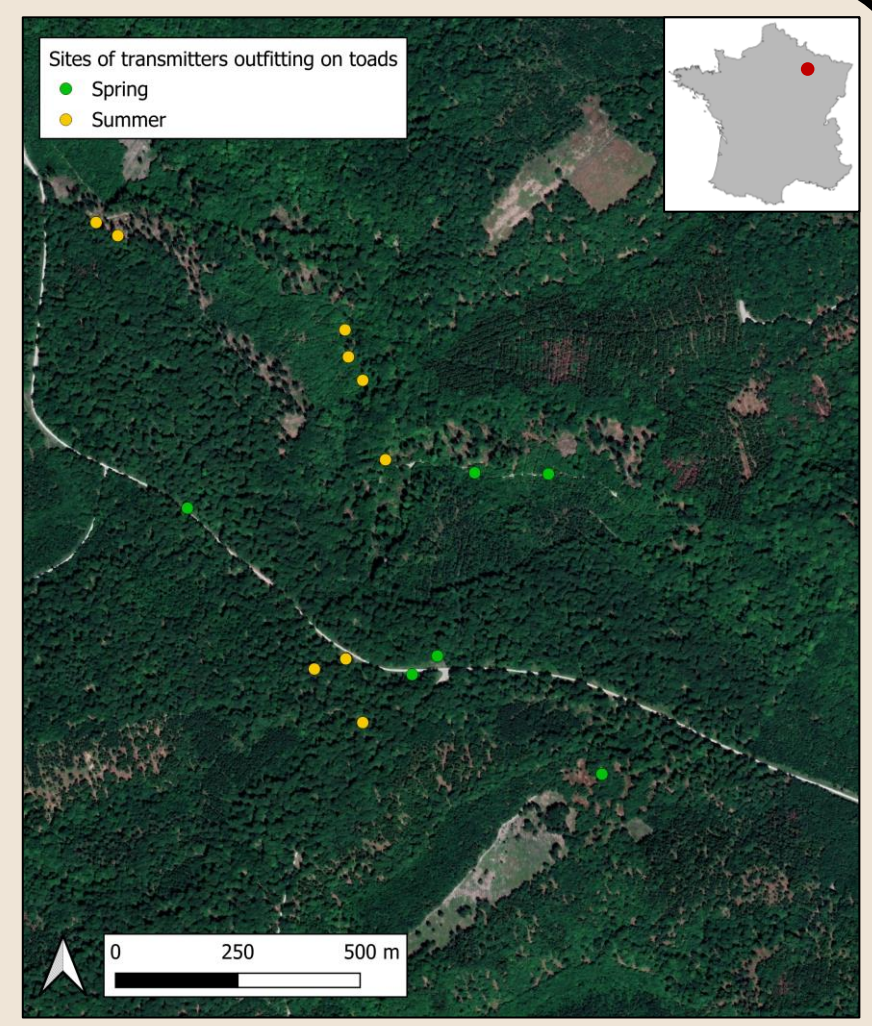
Temperature Atmospheric pressure Humidity Rainfall

If location in terrestrial shelter, **measurement of micro-habitat structural components:**

Holes presence Water presence Tree cover  
Substrate Woody fragments cover Distance to water

within a 1m radius around the location point: **selected habitat**

and around a random point created within a 5m radius of the location: **available habitat**<sup>3</sup>



Toad fitted with transmitter

### Analysis

#### Habitat use

Habitat = binary variable: aquatic (A) or terrestrial (T)

Comparison of **A/T use between seasons**  
Comparison of **A/T use between sex in each season**

→ Fisher exact test

Effect of weather on habitat use : **GLMM** with individuals as random effect

A/T ~ Temperature + Humidity + Rainfall + random\_effect

#### Movements

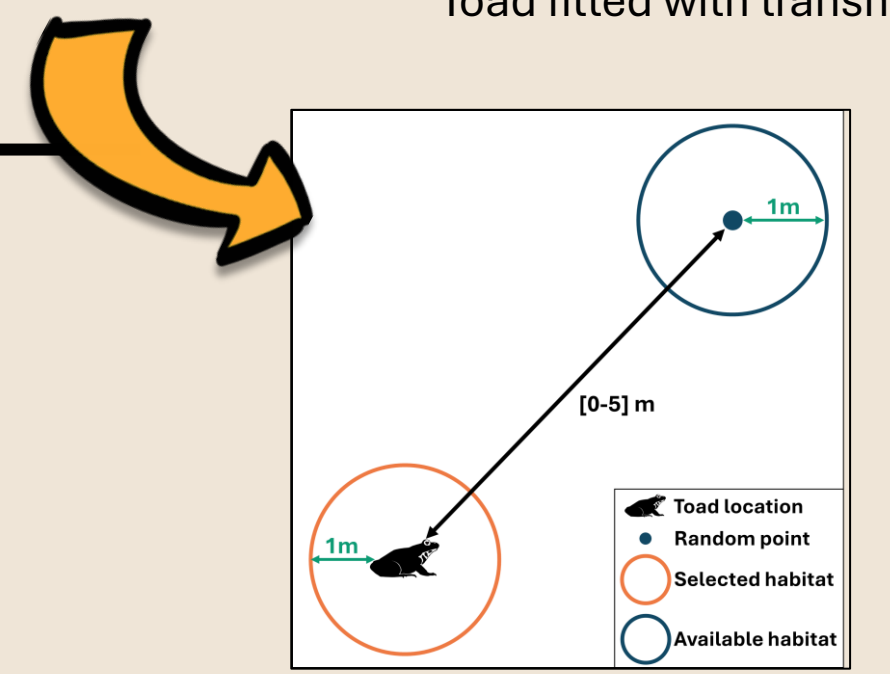
Movement = difference in location between two consecutive points (except within the same aquatic site)

Comparison of **average movement distance between male and female in each season**

→ Student's t-test with paired data

Effect of weather on movements occurrence : **GLMM** with individuals as random effect

Movement ~ Temperature + Humidity + Rainfall + random\_effect



#### Terrestrial habitat selection

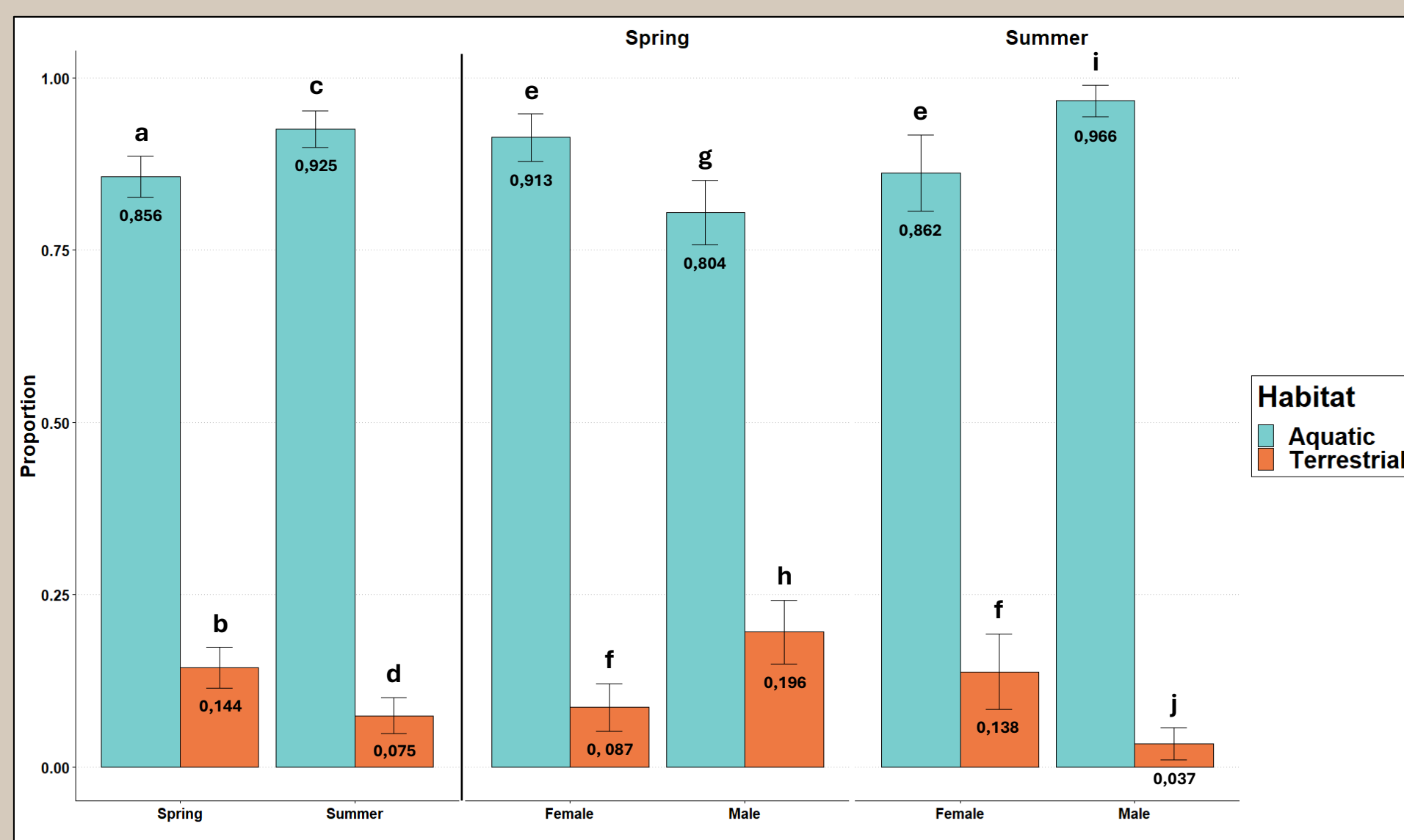
Effect of terrestrial shelter structural components on habitat selection : **GLMM** with individuals as random effect

Explained variable = Toad's presence

Toad\_pres ~ Holes + Woody fragments cover + random\_effect

## Results

### Habitat use



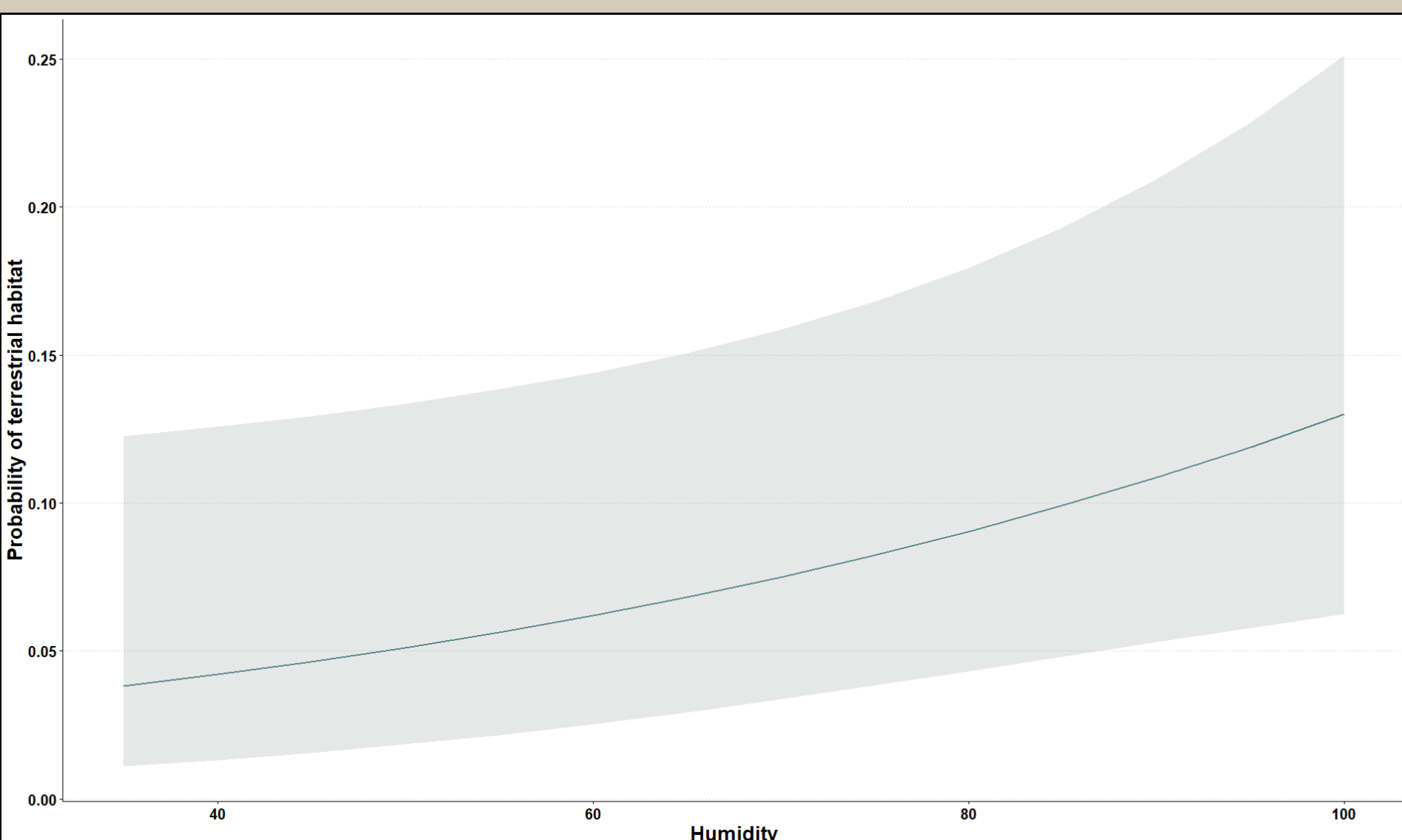
Proportion of aquatic and terrestrial habitats for each season and each sex in both seasons.

Spring / Summer difference ( $p\text{-value} = 0,001$ )

♂ / ♀ difference ( $p\text{-value} = 0,0003$ )

Difference between spring and summer is due to different habitat use for male in both season ( $p\text{-value} = 4,52e-09$ ).

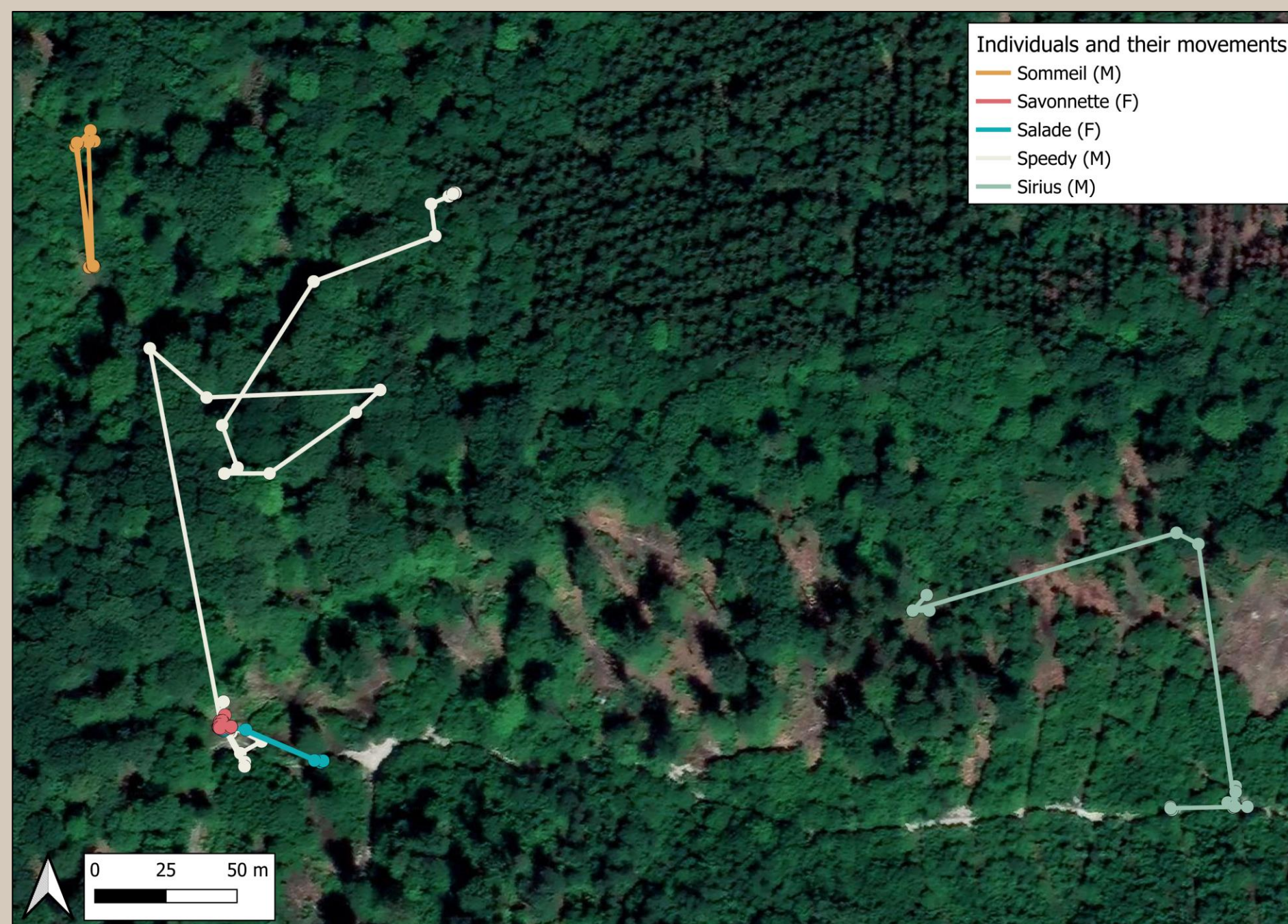
**Link with the weather :**



more chance of **terrestrial habitat in wet weather** ( $p\text{-value} = 0,033$ )

no observed effect of weather on habitat use

### Movements

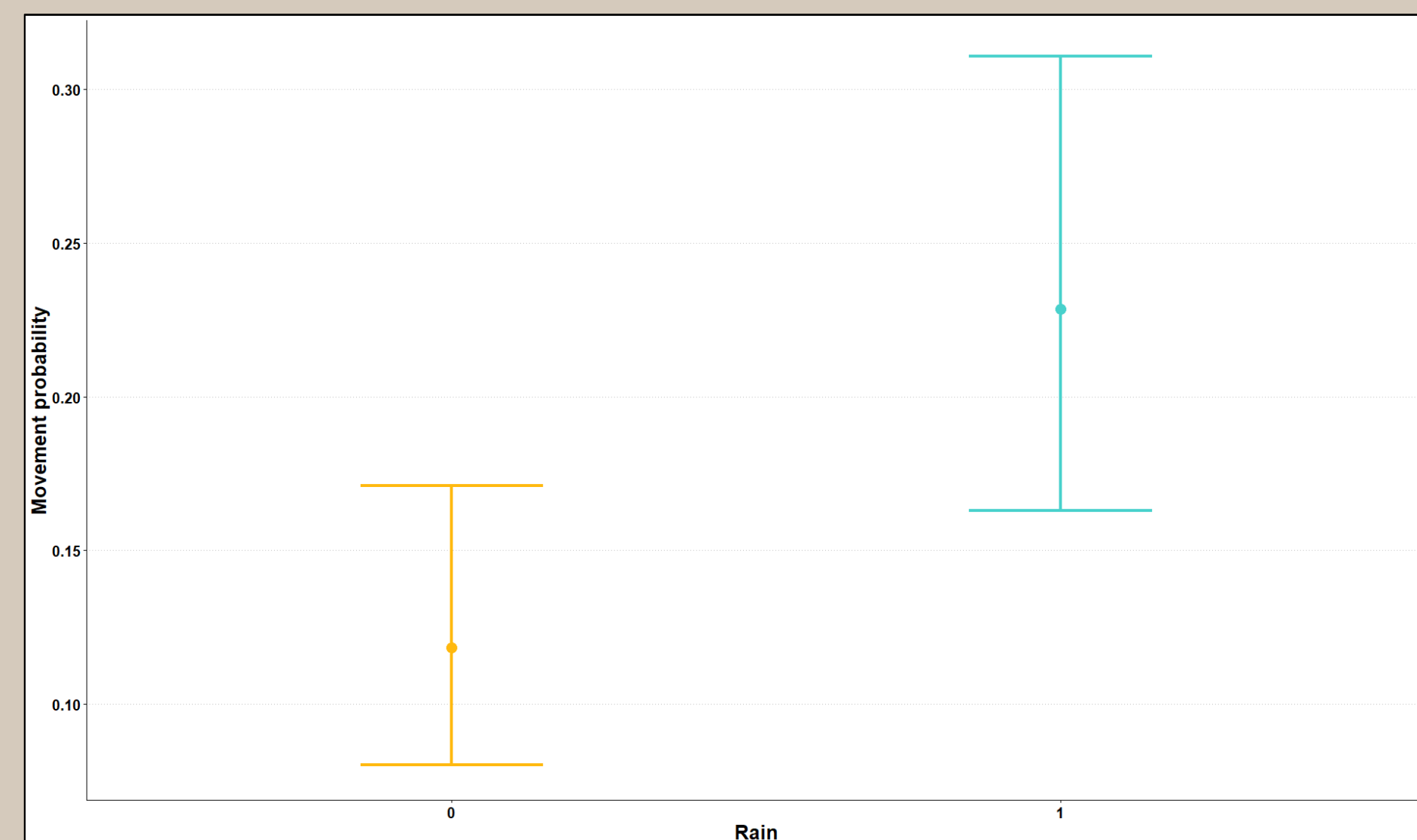


Example of movements for 5 individuals : 2 females (F) and 3 males (M)

Difference in average movement distance between males and females ( $p\text{-value} = 0,004$ )

♂ 5,16 m      ♀ 1,81 m

**Link with the weather :**



More chance to observe a **movement when it rains** ( $p\text{-value} = 2,09e-05$ )

### Terrestrial habitat selection



Examples of terrestrial shelters used by Yellow-bellied toad

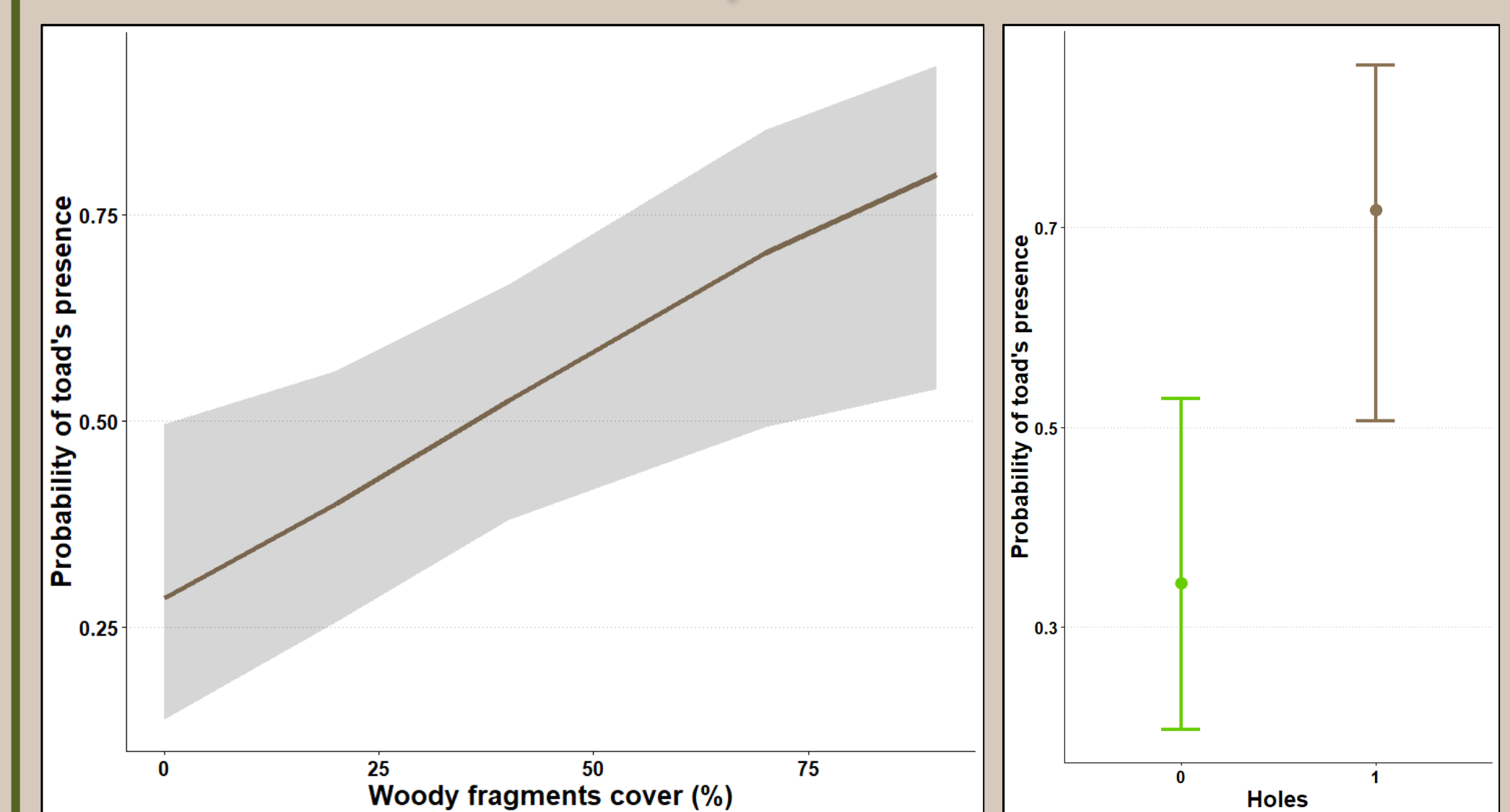
Proportion of locations in terrestrial shelters:

♂ 65,6%      ♀ 34,4%

Spring 87,5%      Summer 12,5%

Structural components with an effect on terrestrial shelters selection:

holes presence      woody fragments cover



Yellow bellied toad generally chose **terrestrial shelters with holes** ( $p\text{-value} = 0,009$ ) and **high level of woody fragments cover** ( $p\text{-value} = 0,01$ )

## Conclusion

Even though inter-individual variability seems very marked in habitat use and movements, our first results suggest that some individuals of Yellow-bellied toad regularly use terrestrial habitat, especially males at the early breeding period. This habitat use and the associated movements are mainly observed during wet weather, and the selection of terrestrial shelters is based on criteria allowing the preservation of humidity.

## References

1. Le Barh, M. & Alleman, C. *Suivis et Conservation Du Sonneur à Ventre Jaune (Bombina Variegata L.) En Forêt de La Croix-Aux-Bois (08), et En Argonne.* 50 (2023).
2. Holohil Systems. BD-2X Transmitter. <https://www.holohil.com/transmitters/bd-2x/>.
3. Hinderer, R. K., Litt, A. R. & McCaffery, M. Habitat selection by a threatened desert amphibian. *Ecology and Evolution* 11, 536–546 (2021).

