iHORNETS

A European citizen science project for monitoring hornet abundance in apiaries

iHORNETS is a mobile application designed to monitor the abundance of hornet species in apiaries using a simple and standardized methodology.

By collecting observations from apiaries across Europe, the project aims to better understand:

- seasonal hornet dynamics,
- differences in abundance between regions,
- and the expansion of invasive hornet species.

The information collected through the app will help researchers generate European-scale monitoring maps and improve scientific knowledge about hornet pressure on apiaries.

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iHORNETS

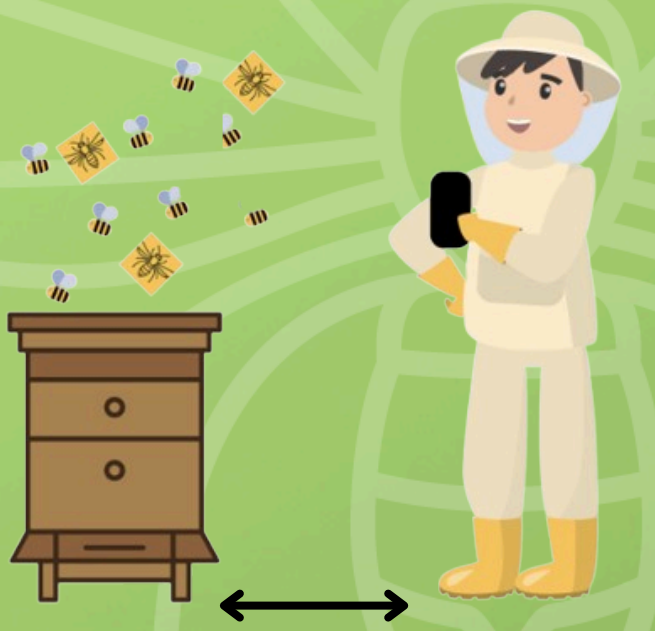
How does iHORNETS app work?

1. Register your apiary

Add your apiary location (or simply the municipality) using the mobile application.

2. Count hornets

Stand in front of a SINGLE hive and count the hornets flying in front of the hive for 30 seconds.



Stand 1-2 m from the hive

3. Repeat the process

Repeat the count on additional hives (covering at least 5 hives per apiary) and repeat the survey on different weeks (preferably every 2 weeks from mid-August to mid-November). Hives can be selected randomly on each sampling day.

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How to count hornets correctly?

- Observe ONE hive for 30 seconds. Count only the hornets associated with that hive, not the whole apiary.
- Count hornets present in front of the hive, whether they are flying, hunting, or simply hovering.
- Do not count hornets that are nearby but not interacting with the hive (e.g. on the ground collecting dead insects).
- If you are sure that a hornet leaves and returns during the 30 seconds, count it only once. If you cannot tell whether it is the same individual, count each observation as a new hornet.
- If no hornets are observed at that hive, submit 0, even if hornets are present at other hives. Zero counts are just as important as positive counts and should always be submitted.



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Target species

iHORNETS focuses on hornets belonging to the genus *Vespa*, including both native and invasive species present in Europe.

The project mainly aims to monitor species commonly associated with apiaries, such as:

Vespa velutina



Didier Descouens CC BY-SA 4.0

Vespa orientalis



Sandy Rae CC BY-SA 4.0

Vespa bicolor



portioid CC BY-SA 4.0

Vespa crabro



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Using the iHORNETS app

In the following pages, you will find step-by-step information and images explaining how to use the iHORNETS mobile application.

The tutorial will guide you through:

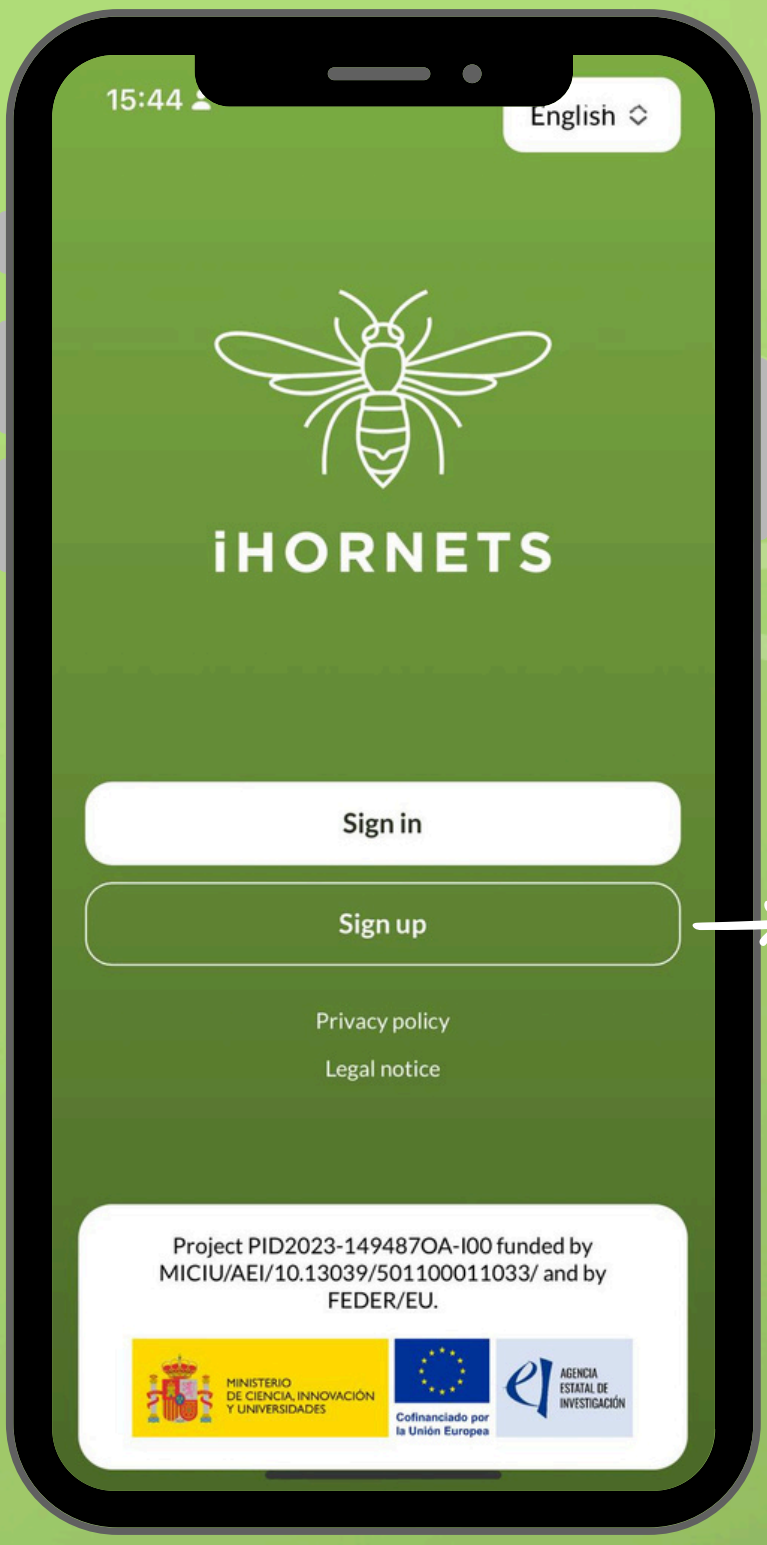
- Sign up (p6)
- Create a settlement (p8)
- Edit a settlement (p11)
- Delete a settlement (p12)
- Start counting (p14)
- Save a count (p21)
- Continue counting (p23)
- Delete a counting (p25)
- Home page (p26)

The application has been designed to be simple, fast, and accessible to all beekeepers.



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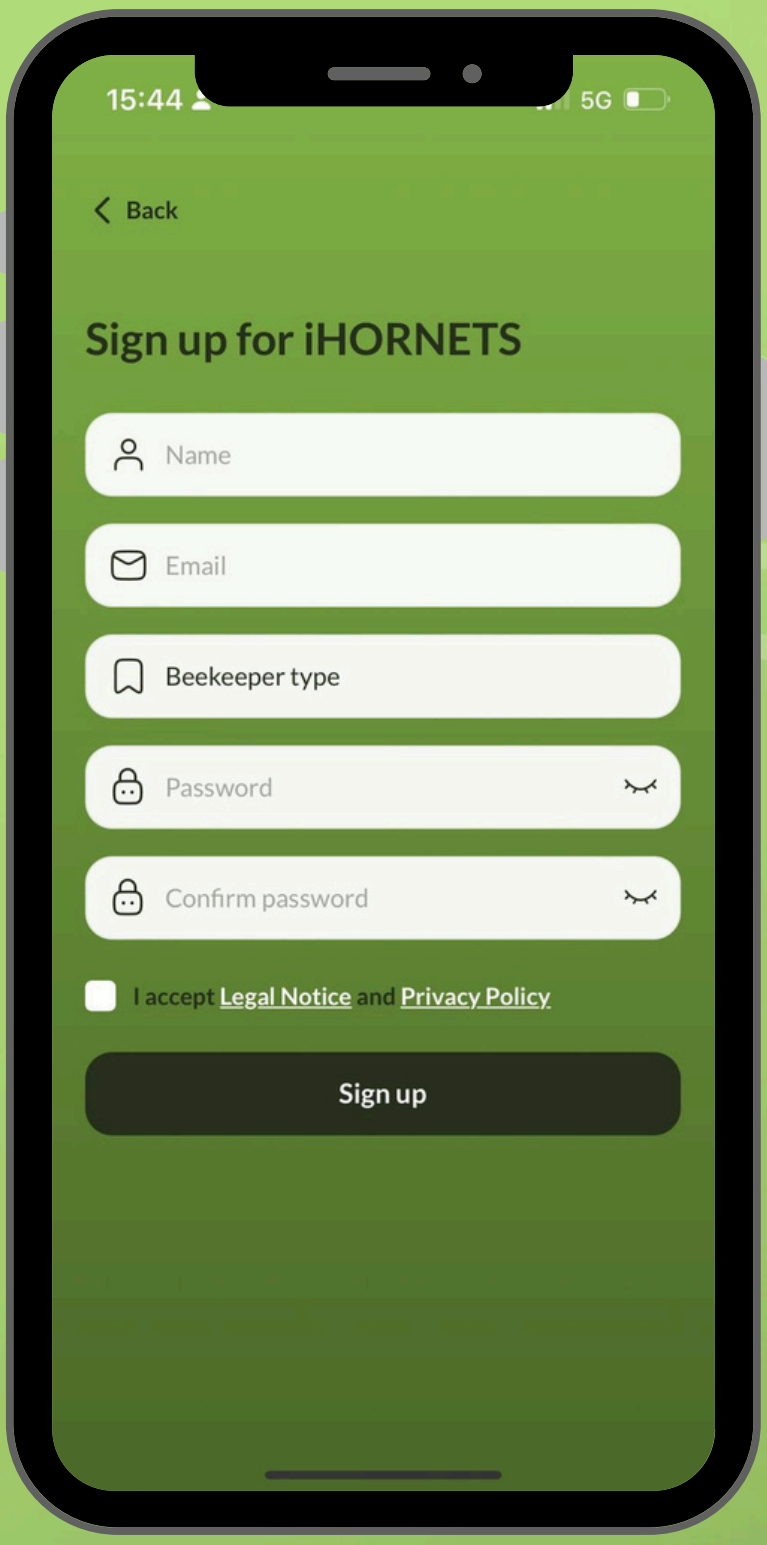
1. Sign up



Sign up to register

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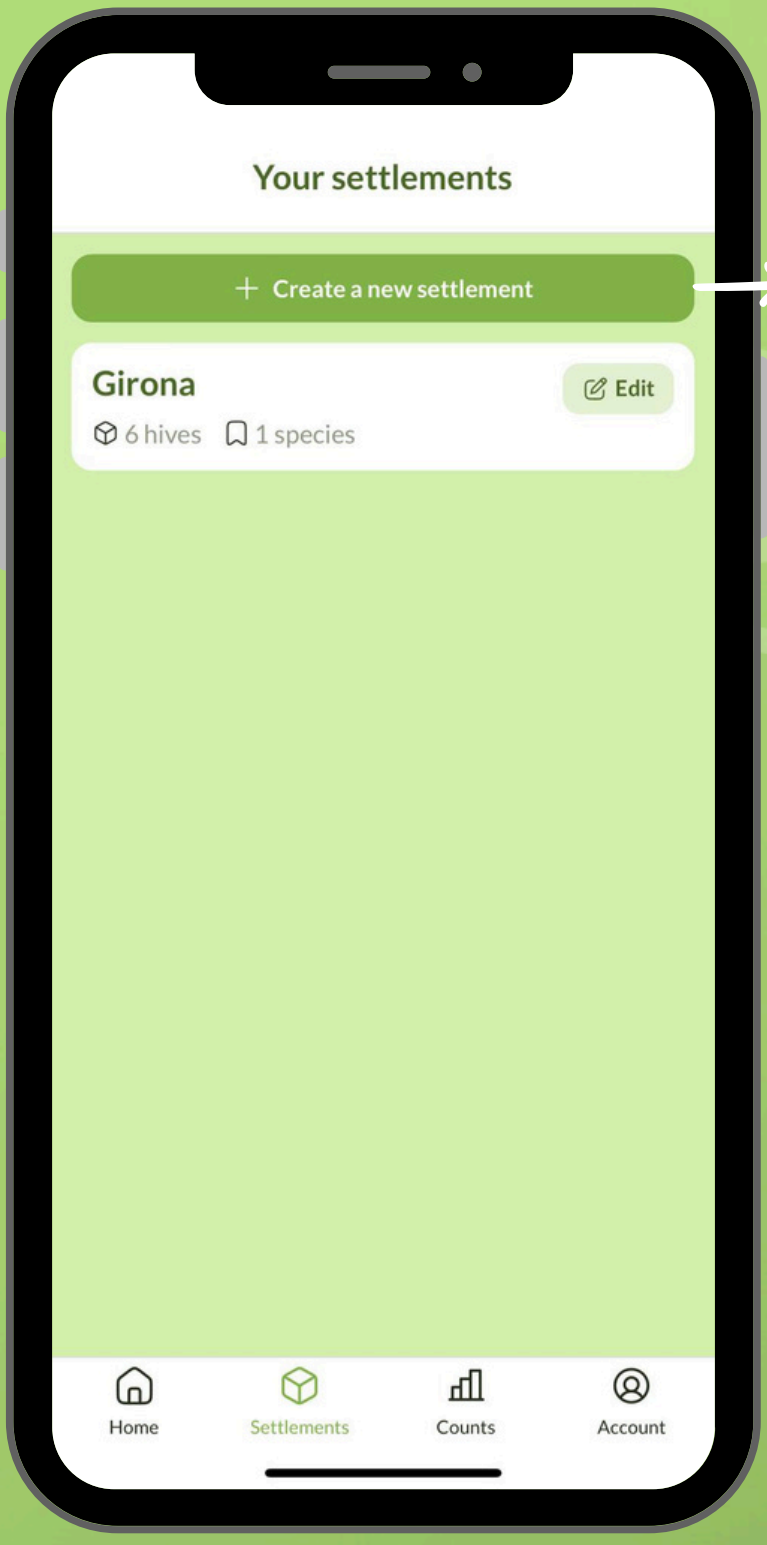
1. Sign up



Enter your **name**, **email**, and **password**, select your **beekeeper type** (*professional*, *non-professional*, or *self-consumption,* based on the number of hives), and click **sign up** to create your account

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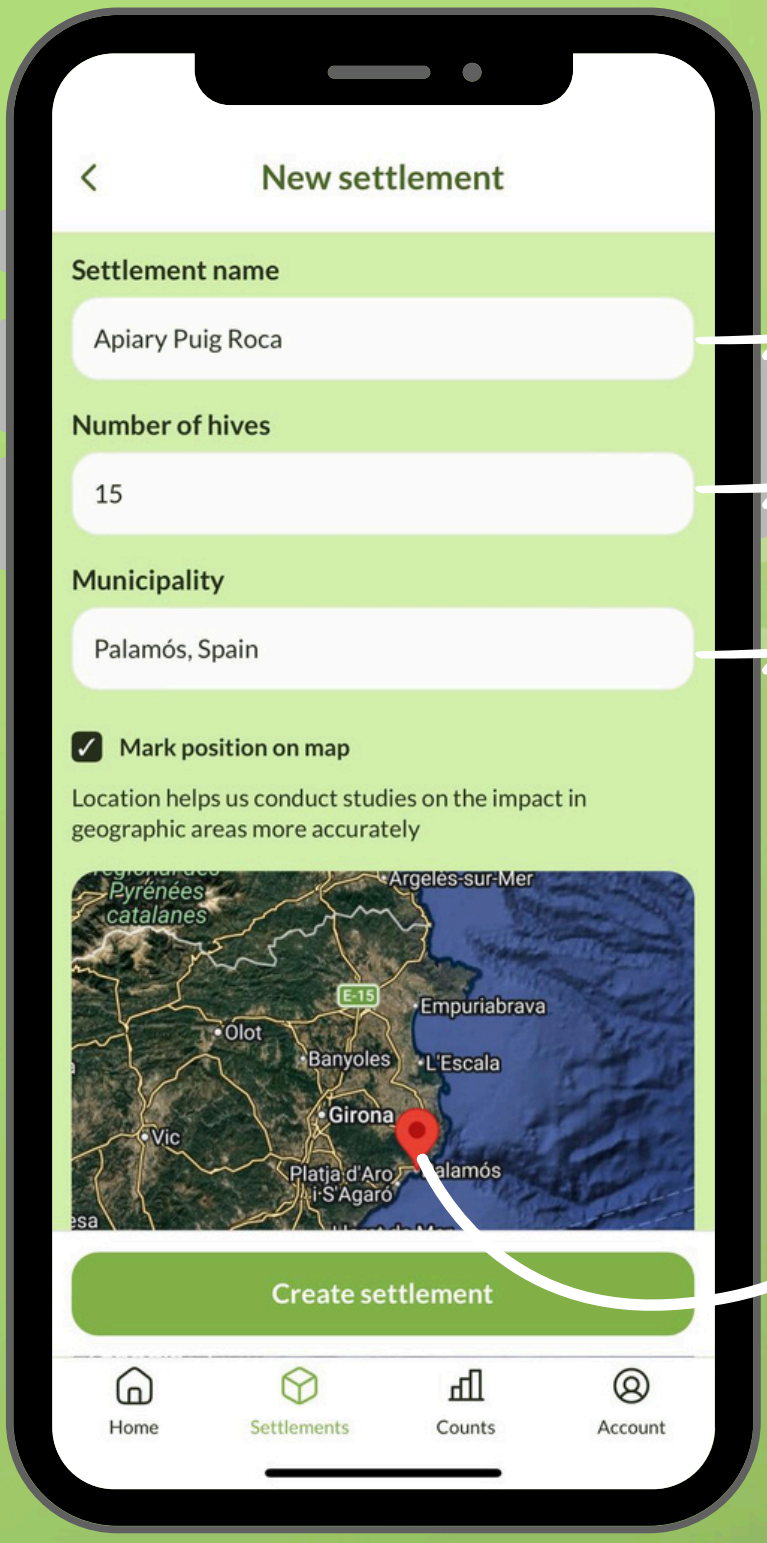
2. Create a settlement



Start creating a settlement by clicking “**Create a new settlement**”

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2. Create a settlement



Give your settlement a name

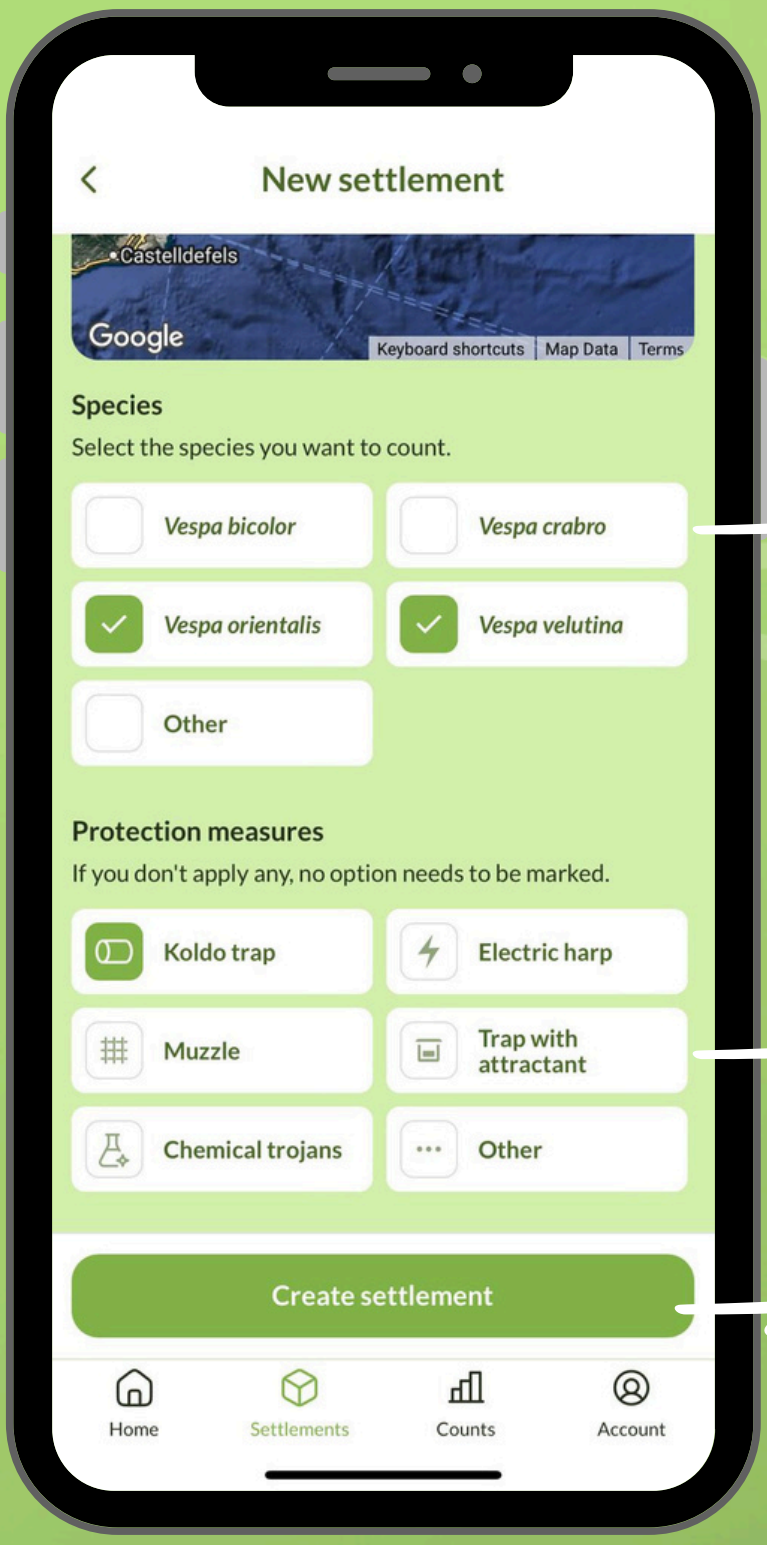
Enter the number of hives

Enter the municipality

OPTIONAL: You can mark the exact location on the map by **moving the red pointer**

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2. Create a settlement



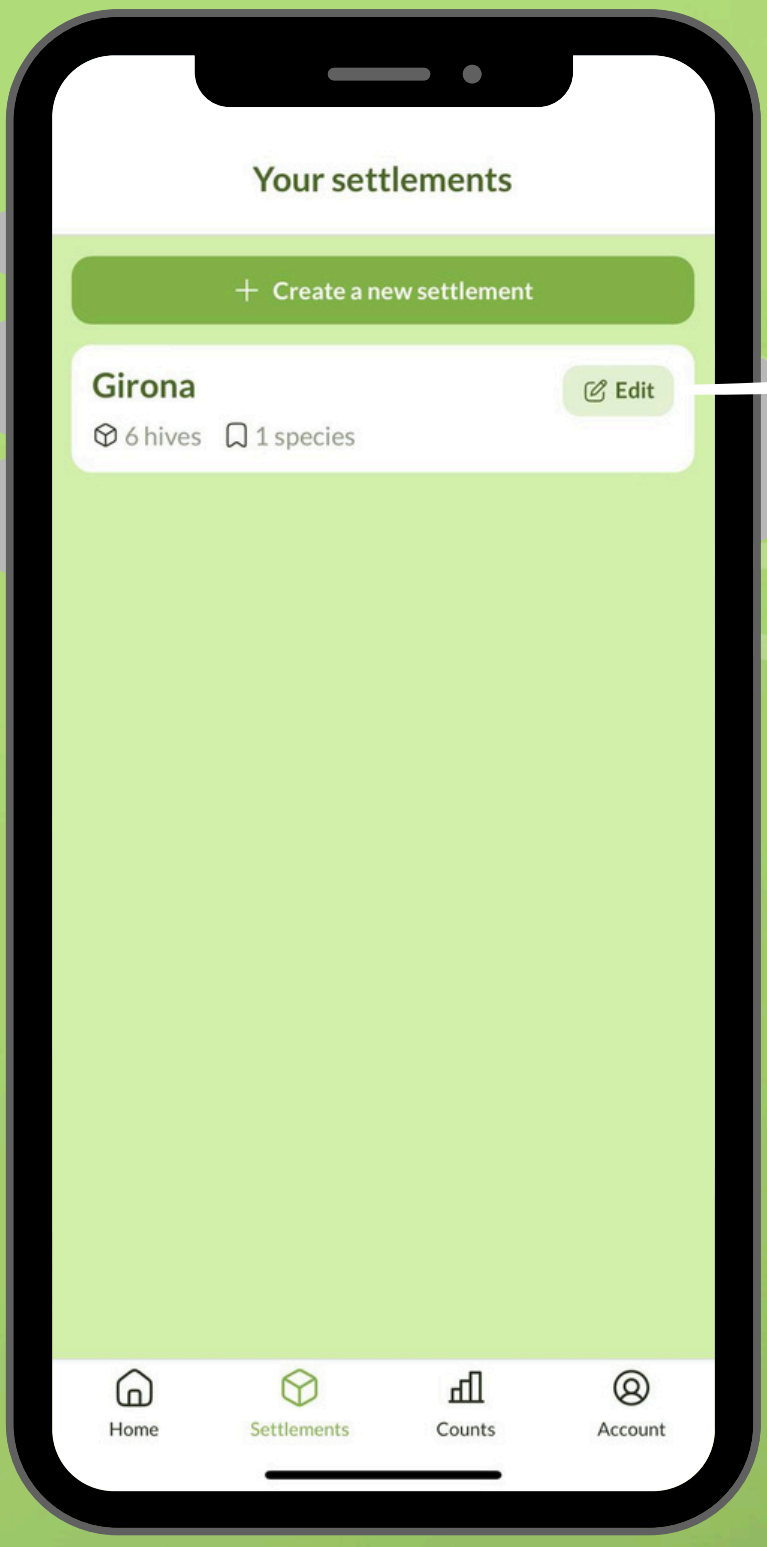
Select the **hornet species** in the apiary. If a species is not listed, select “Other” and provide its name

Next, select the **protection method** used in the apiary. If none applies, leave the field blank. If the method is not listed, select “Other” and specify it

Finally, click “Create settlement”

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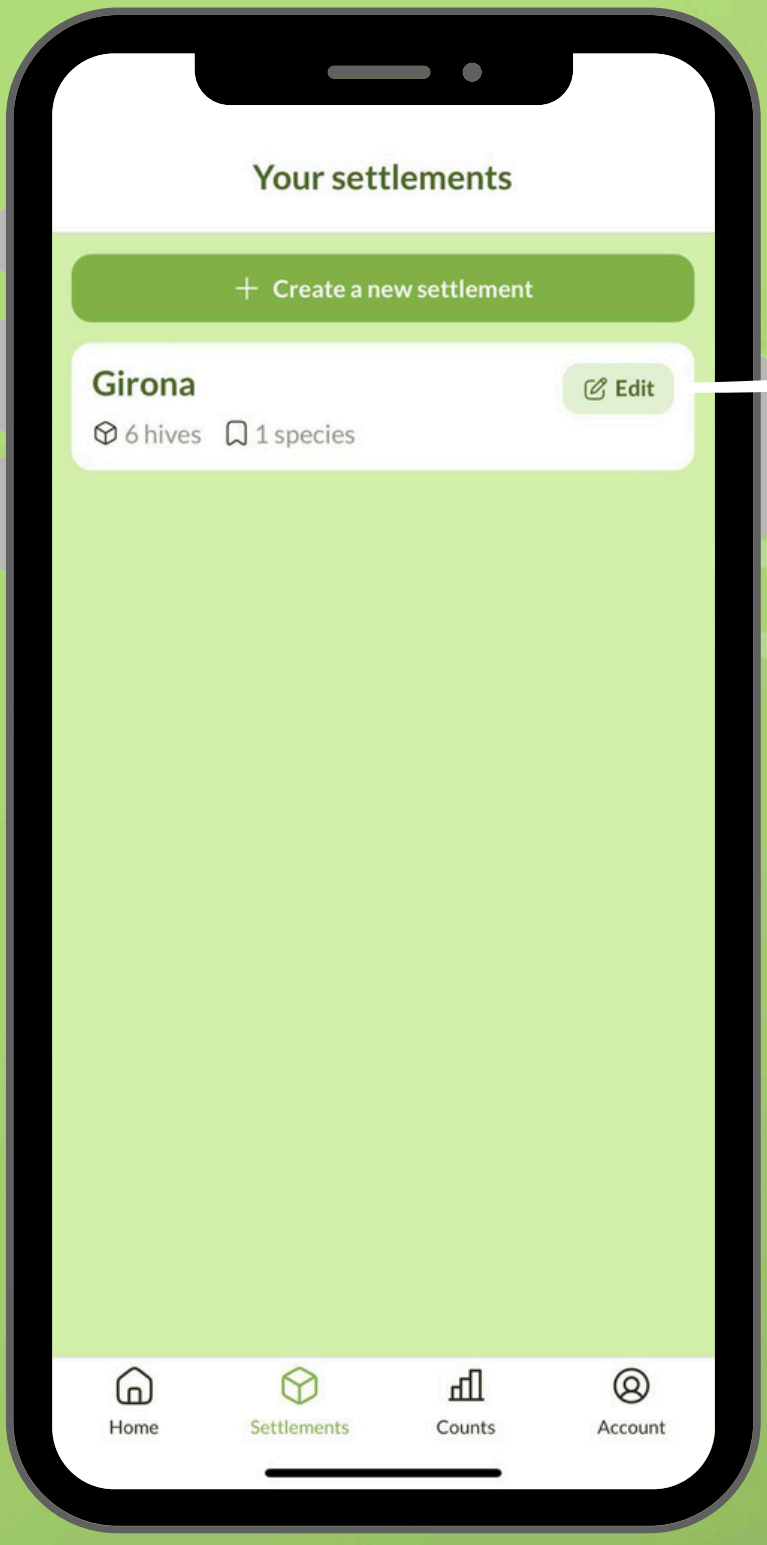
3. Edit a settlement



To modify an existing apiary, click the **Edit** button on the right

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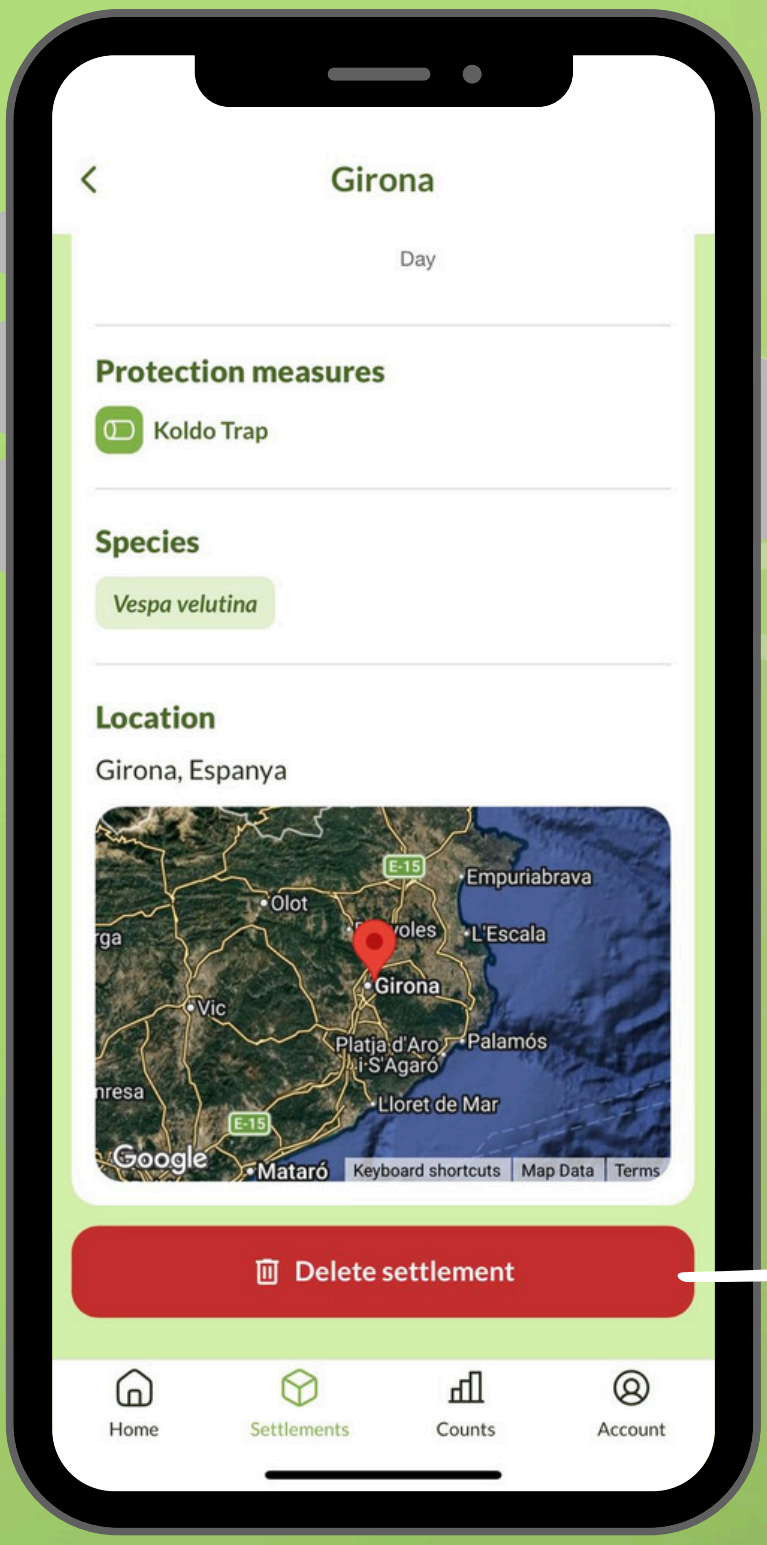
4. Delete a settlement



To **delete** an existing apiary, click on it and scroll to the bottom of the next screen

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4. Delete a settlement

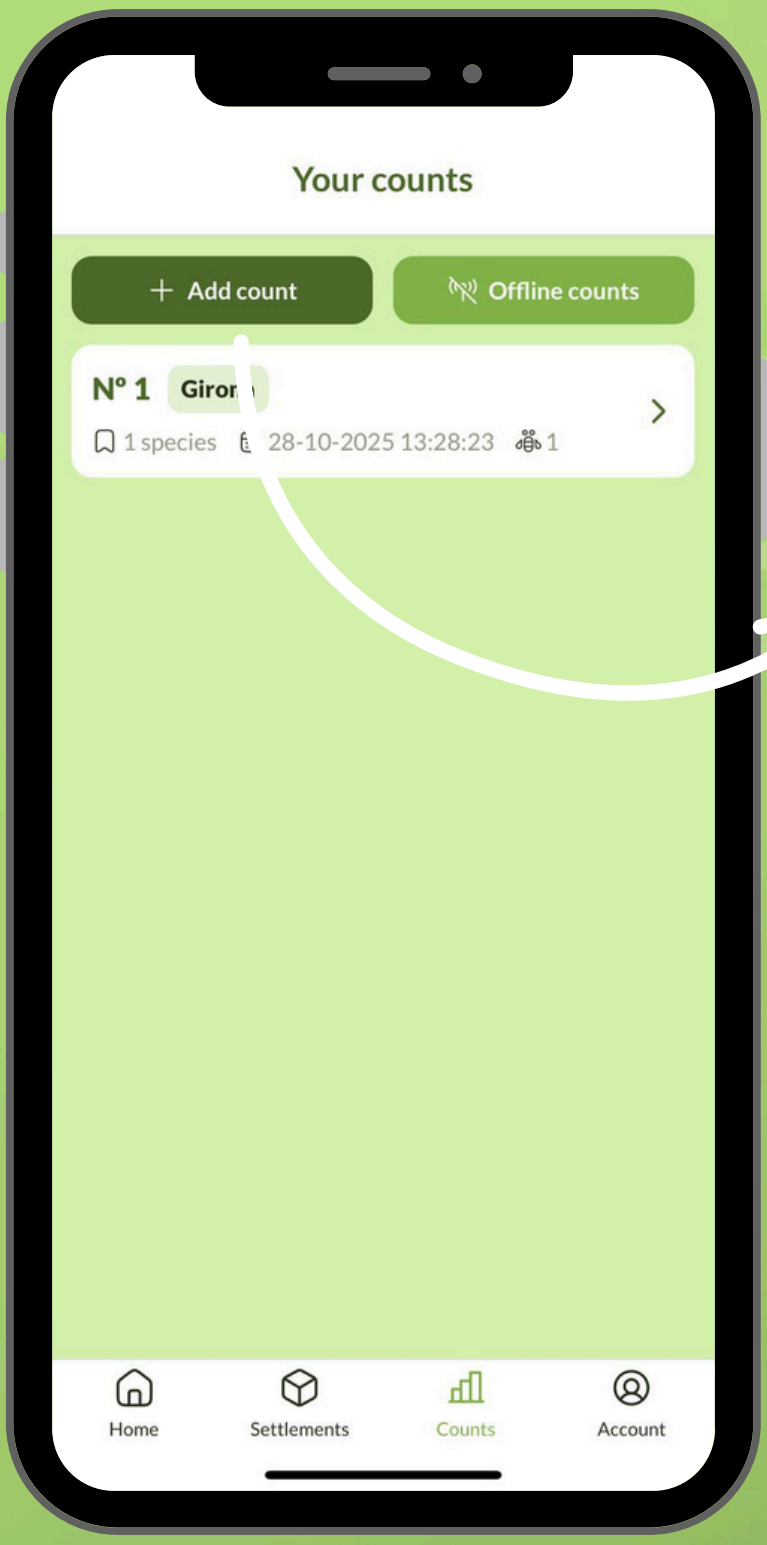


WARNING: Deleting a settlement will permanently delete all associated counts. Before proceeding, make sure you really want to do this. This action cannot be undone.

Press the “Delete settlement” button to remove the settlement and all the associated data

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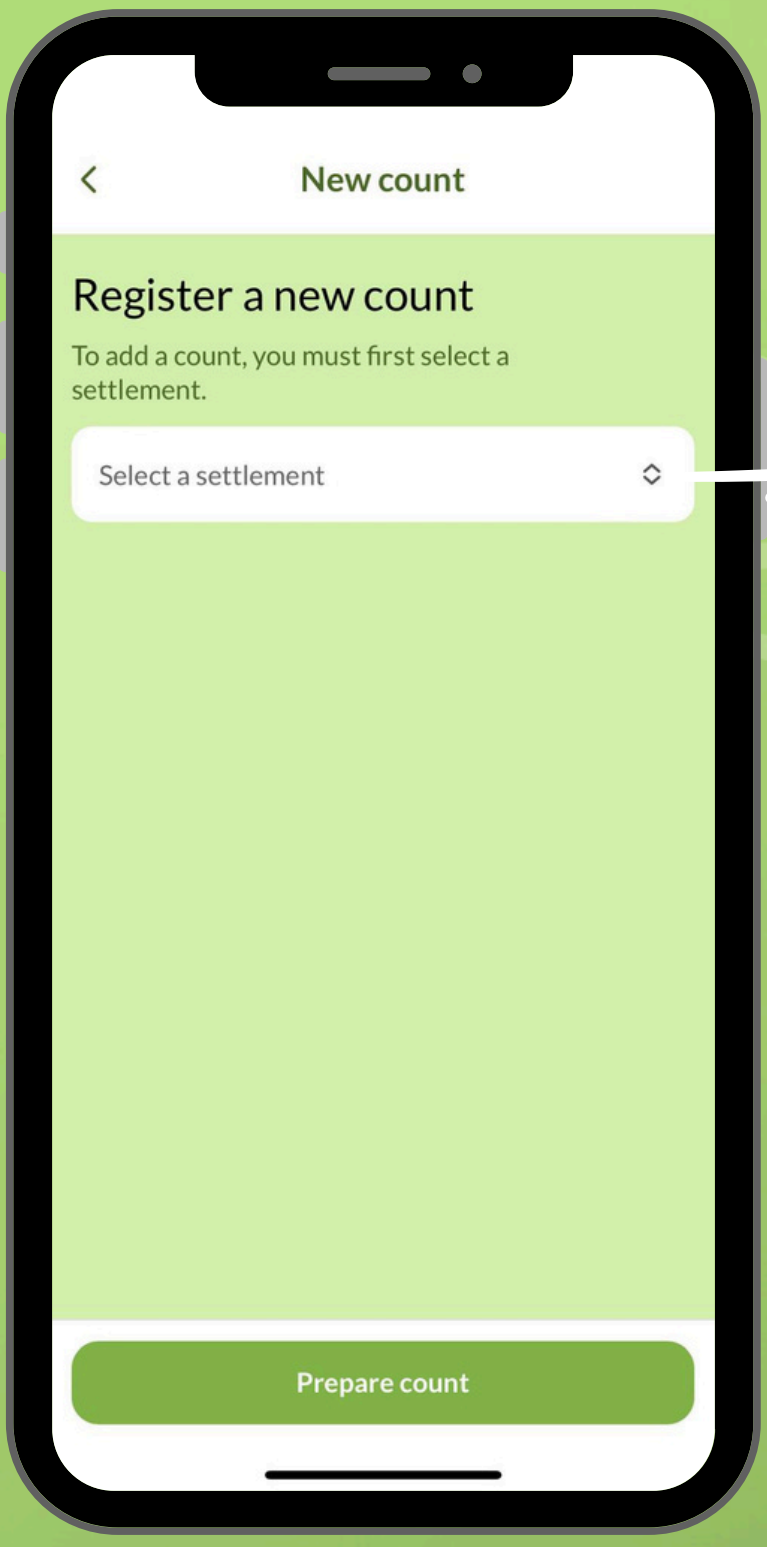
5. Start counting



Start a count by clicking
Add count

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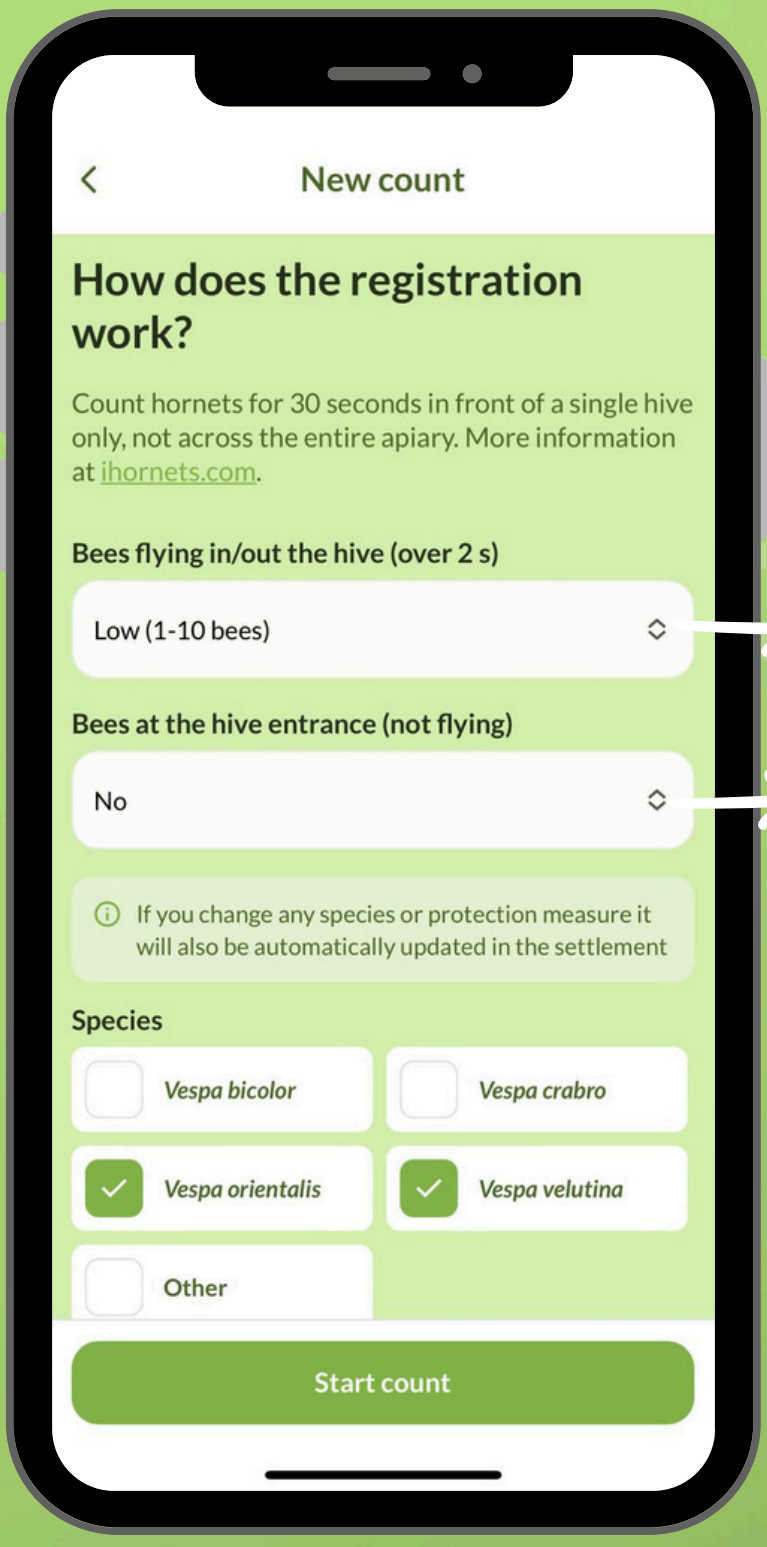
5. Start counting



Next, select the settlement in which you want to perform the count

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5. Start counting



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Select the level of observed **bee activity** based on the number of bees flying in and out the hive:

- *Null* (0 bees)
- *Low (1-10 bees)*
- *High (>10 bees)*

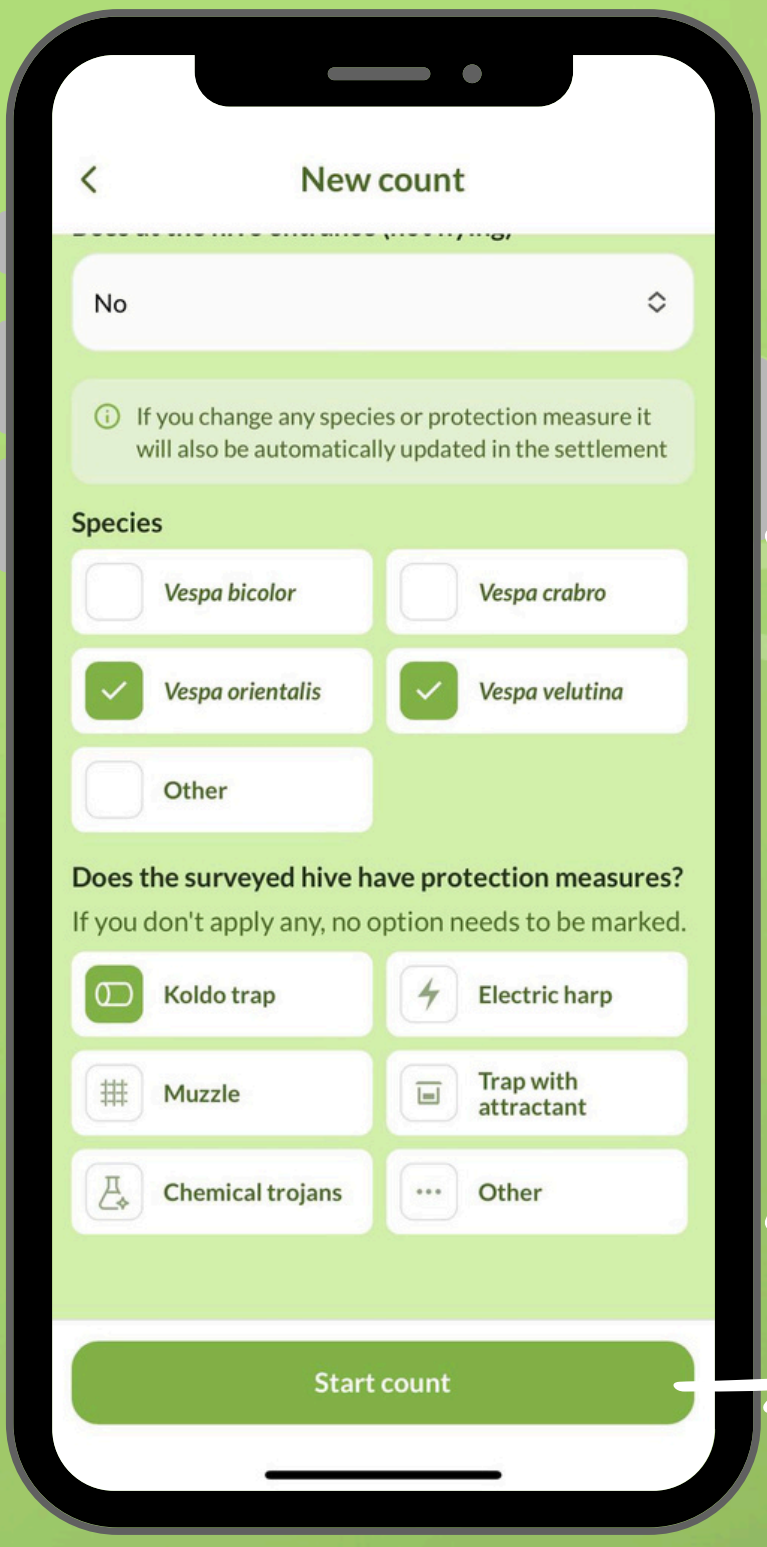
Indicate wether **bees are stopped at the entrance** of the hive:

- *Yes*
- *No*



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5. Start counting

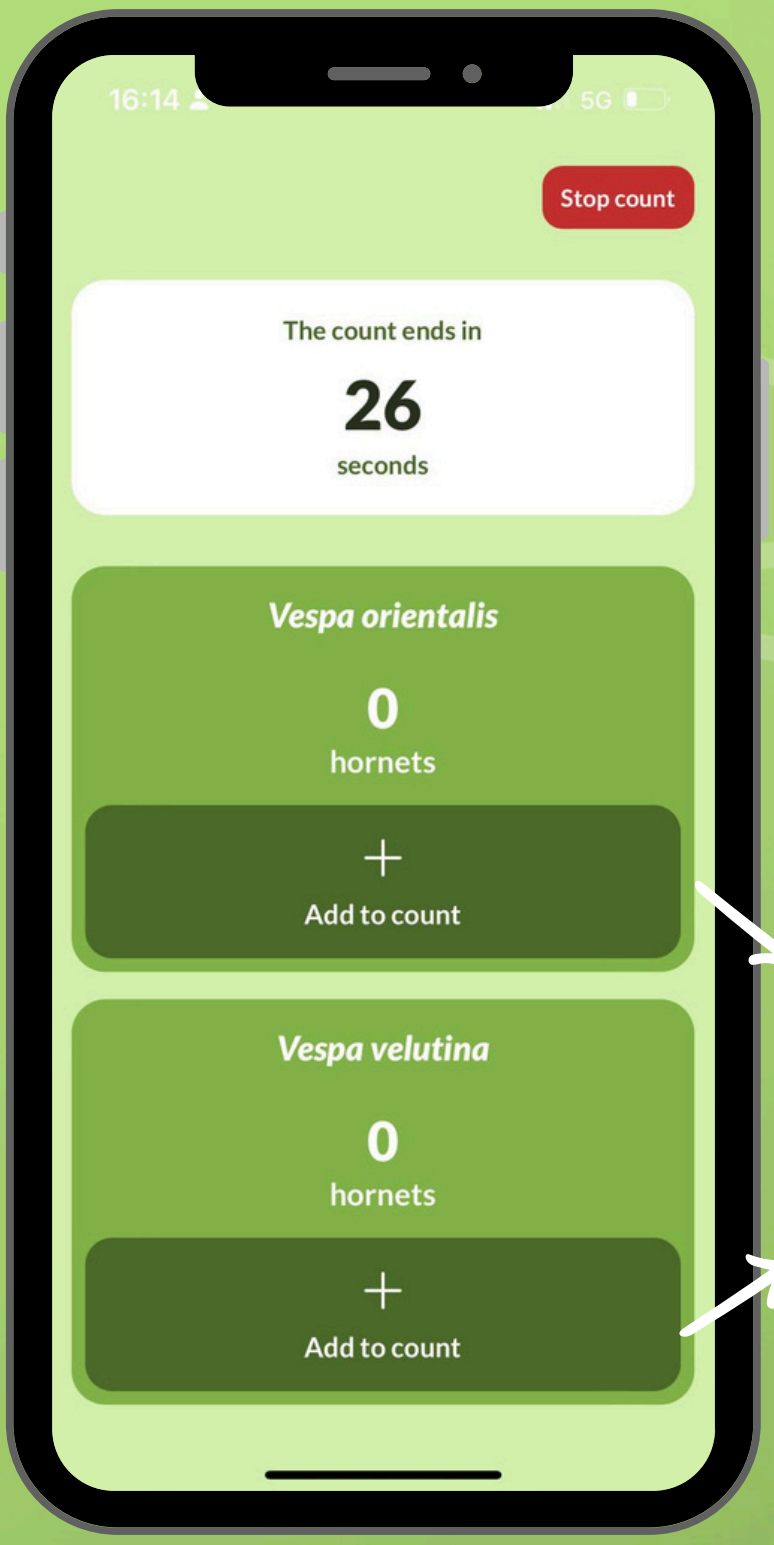


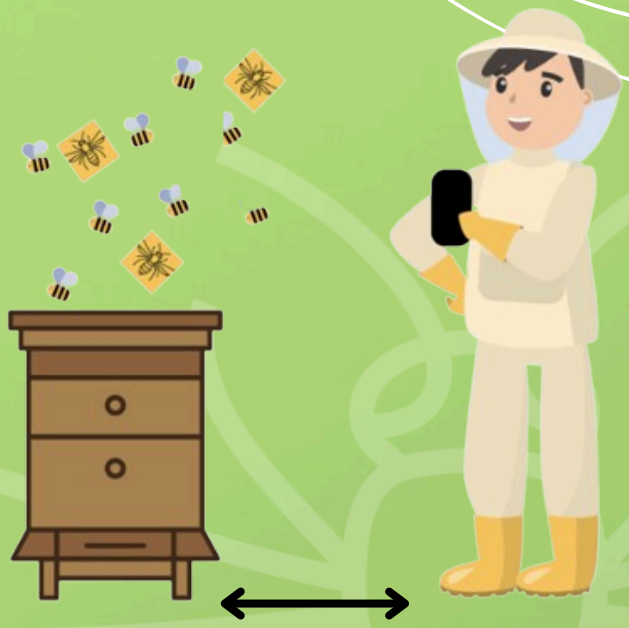
The hornet species and protection methods selected when creating the settlement are displayed here. Any changes made on this screen will be automatically updated in the settlement section

Click **Start count**

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5. Start counting



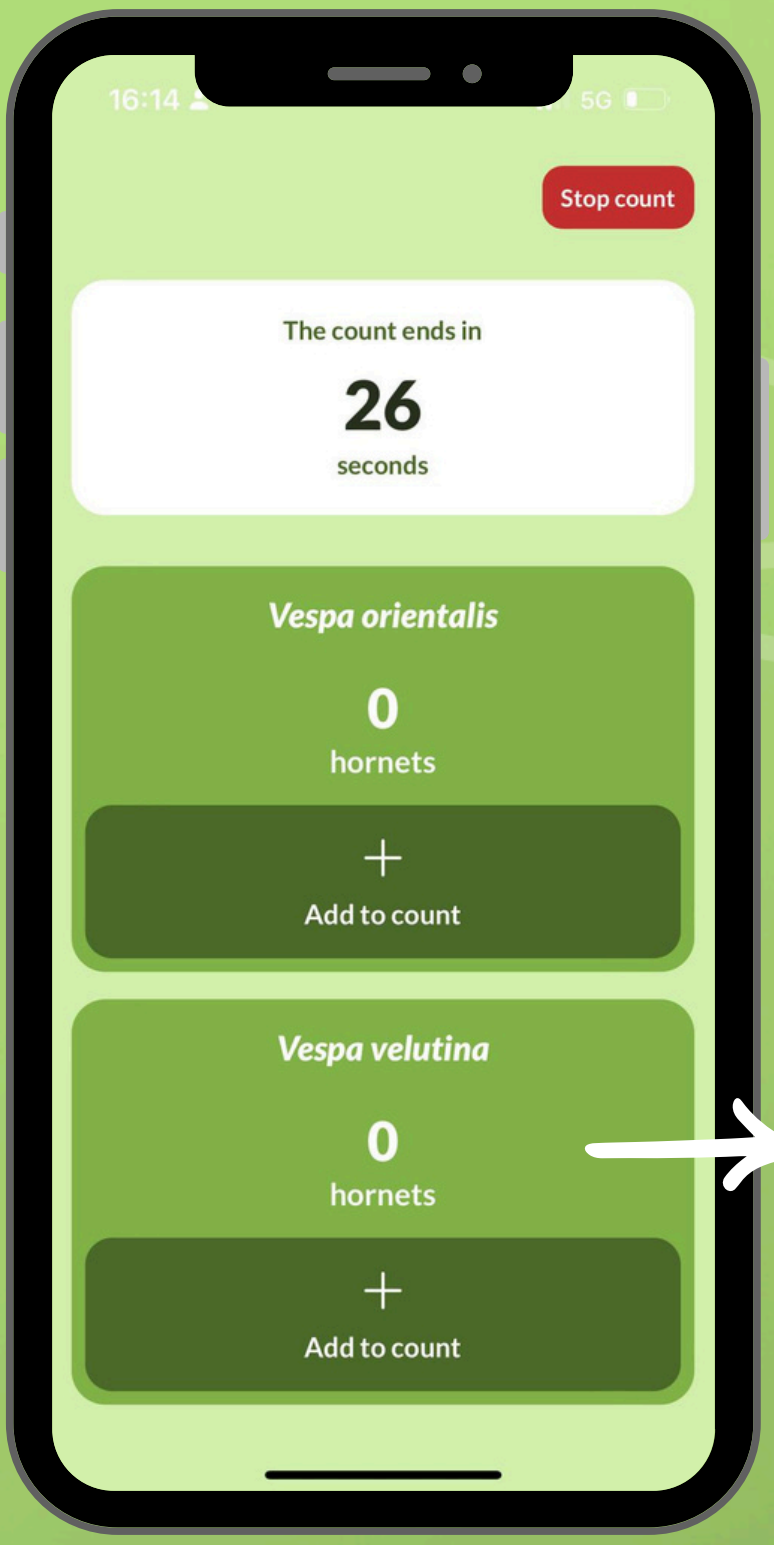


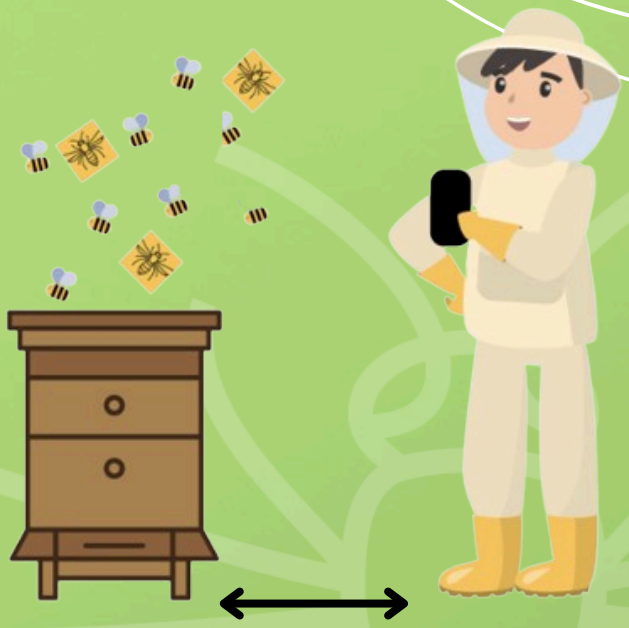
Stand 1-2 m from the hive

For 30 seconds, click the corresponding box each time you see a hornet of the selected species

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5. Start counting



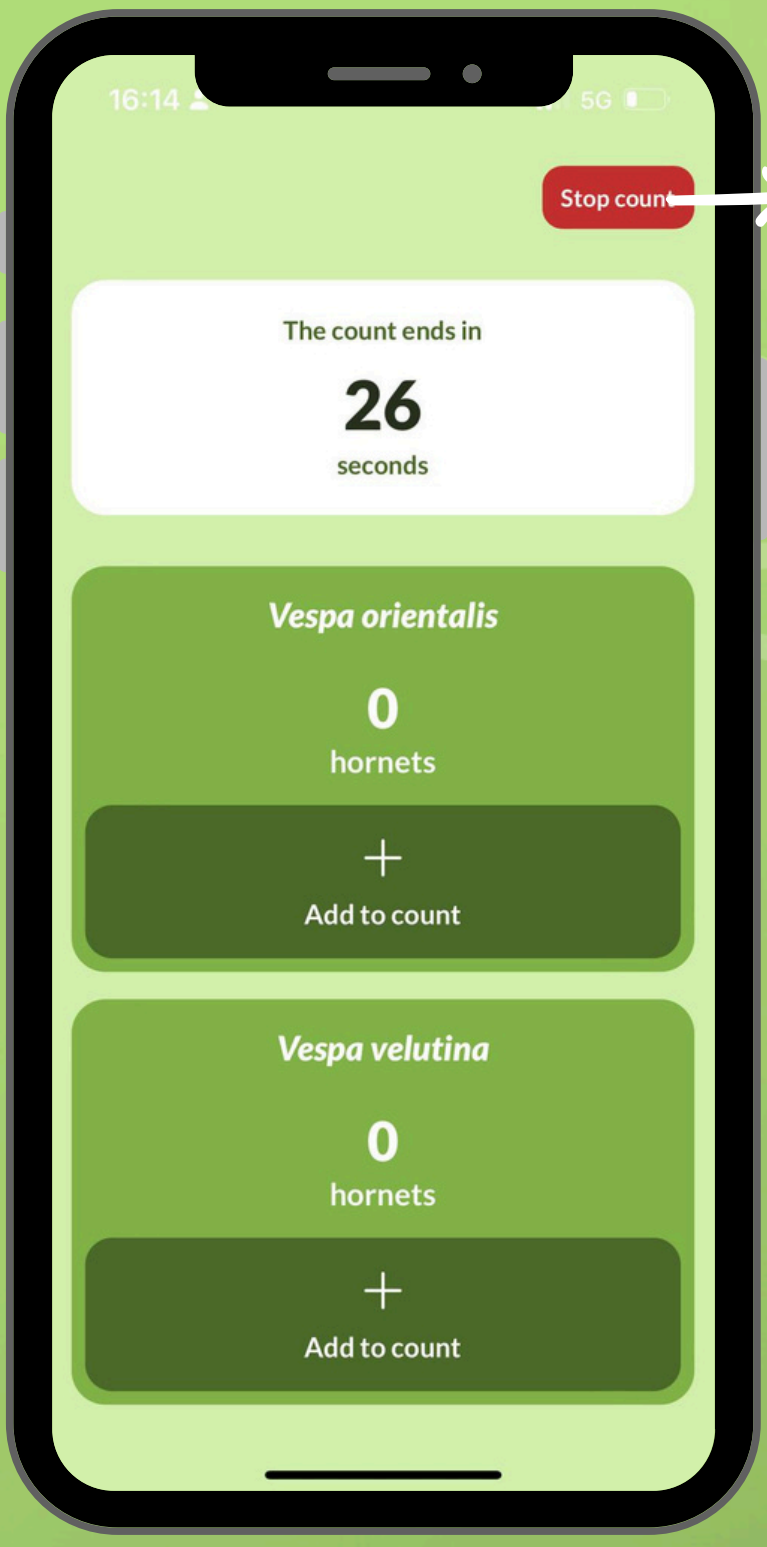


Stand 1-2 m from the hive

Please **limit your count to the hive in front of you**. If you do not observe any hornets during the 30-second counting period, this is still a valid and important result -even if hornets are visible near other hives. Remember, **zero counts matter** and are essential for detecting differences in hornet activity

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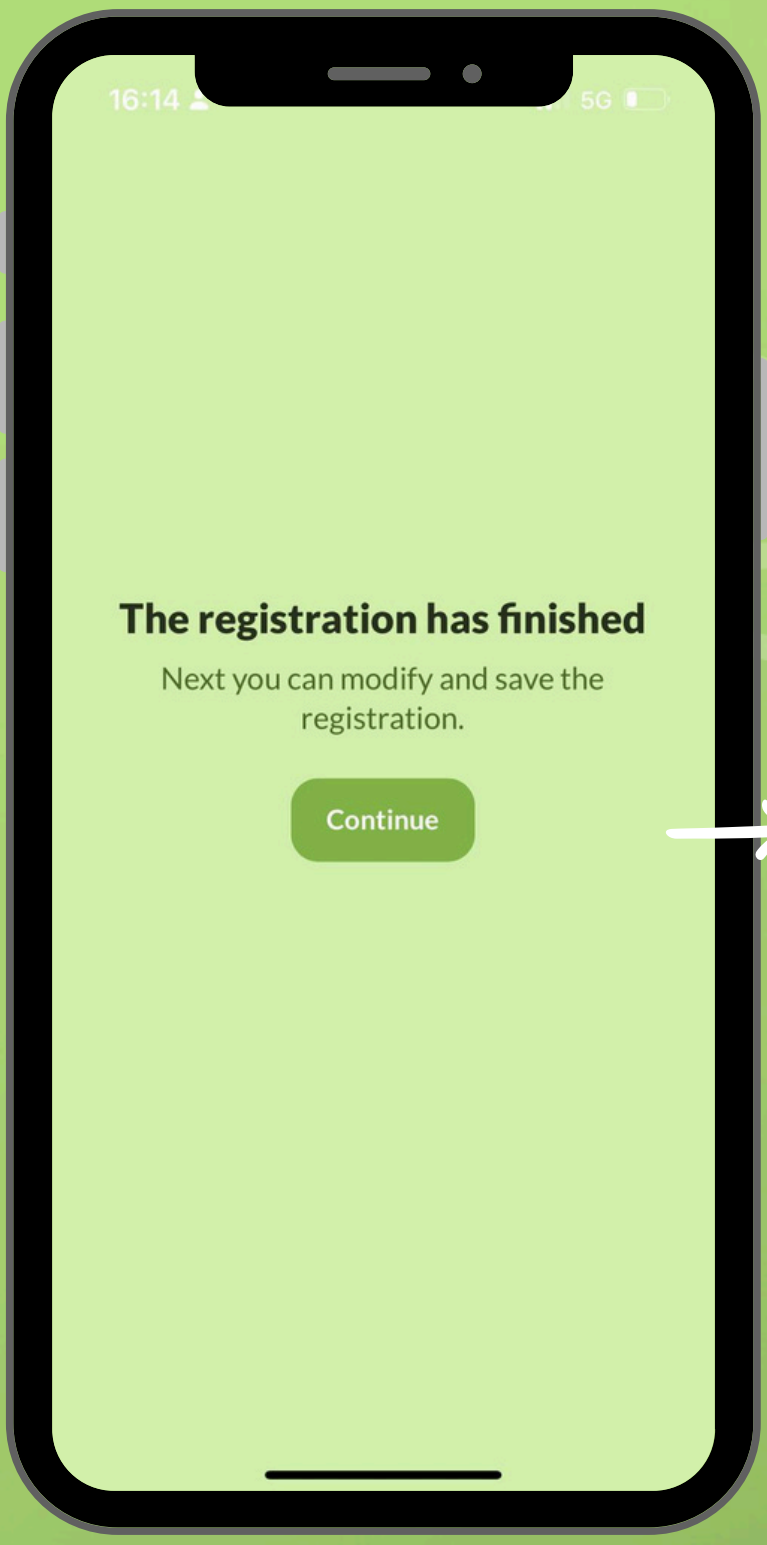
5. Start counting



You can stop the count at any time if you encounter a problem

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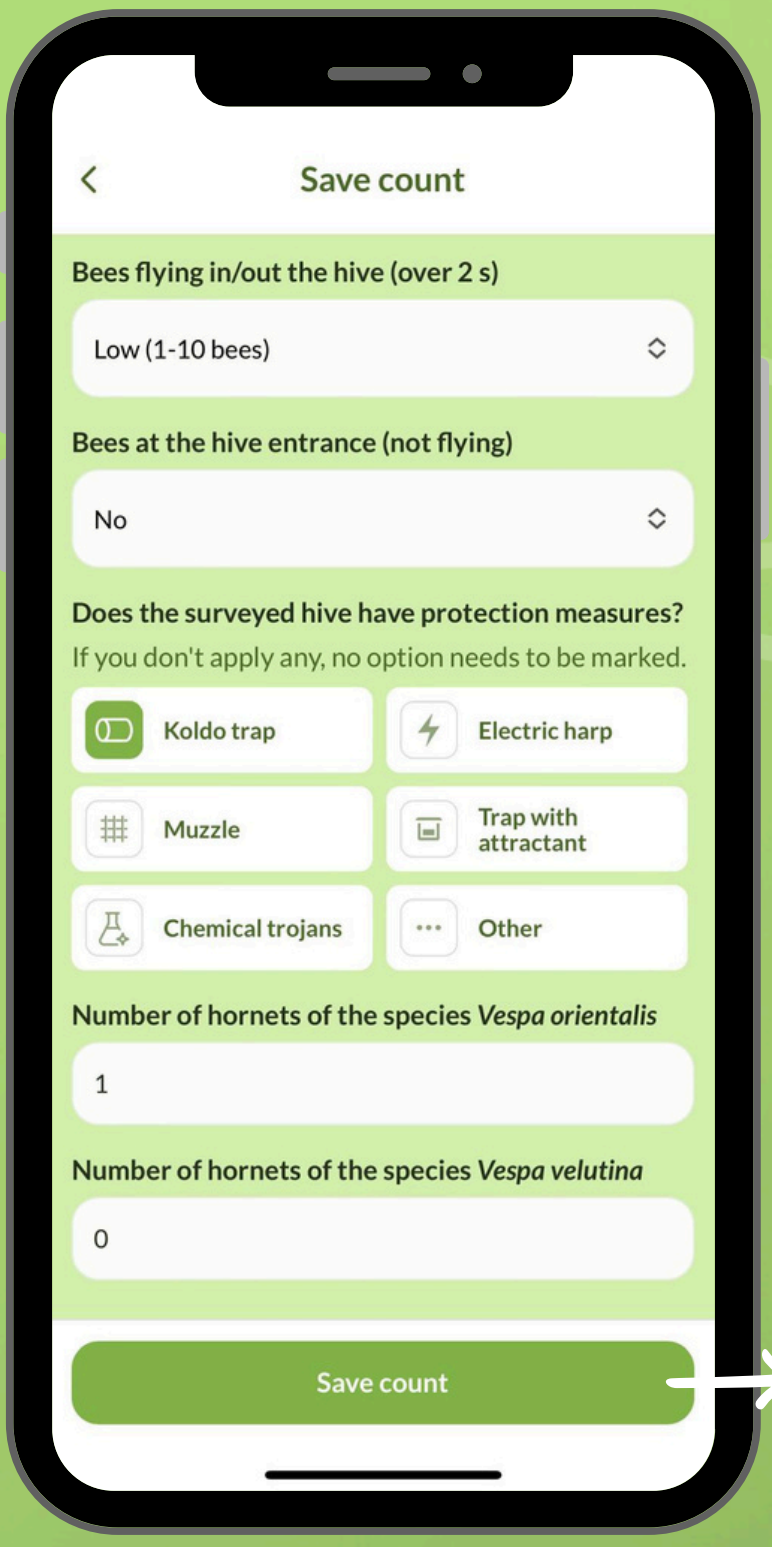
6. Save a count



Once the 30-second count is complete, review the information and make any necessary changes before saving. This helps ensures that the record is accurate

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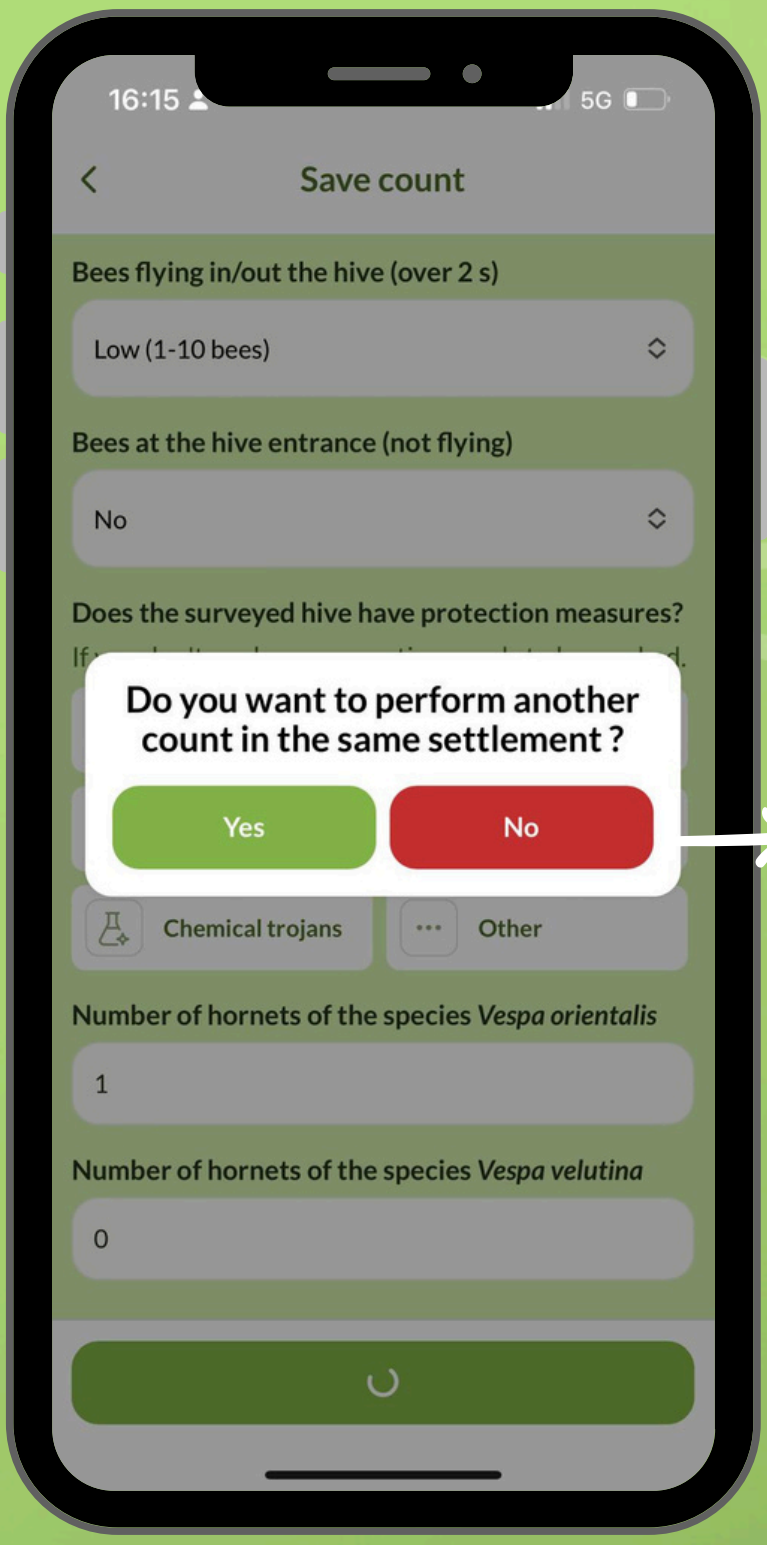
6. Save a count



You must click **Save count** to ensure the count is recorded

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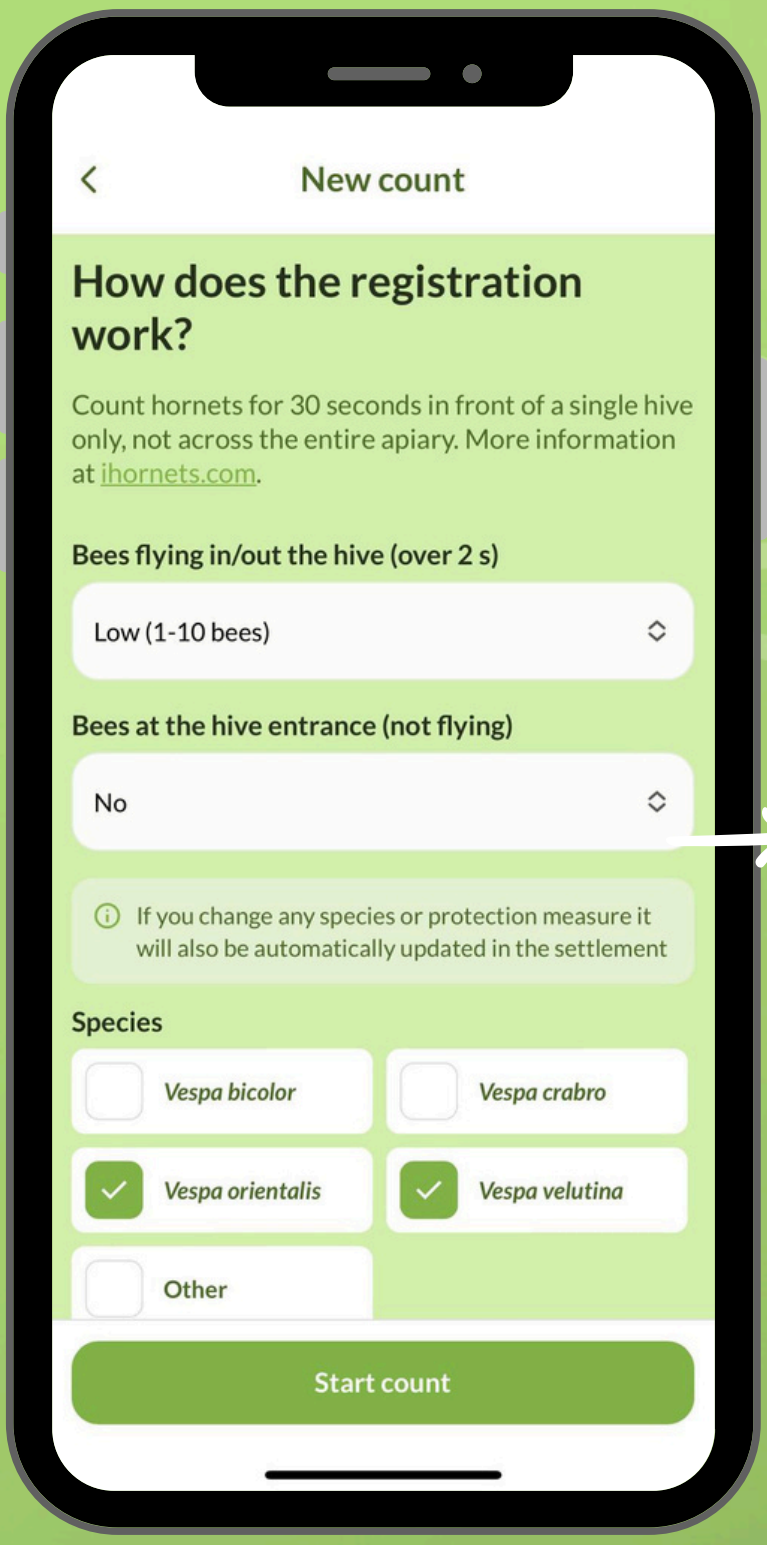
7. Continue counting



Once the count has been saved, you will be asked whether you want to **record another count**

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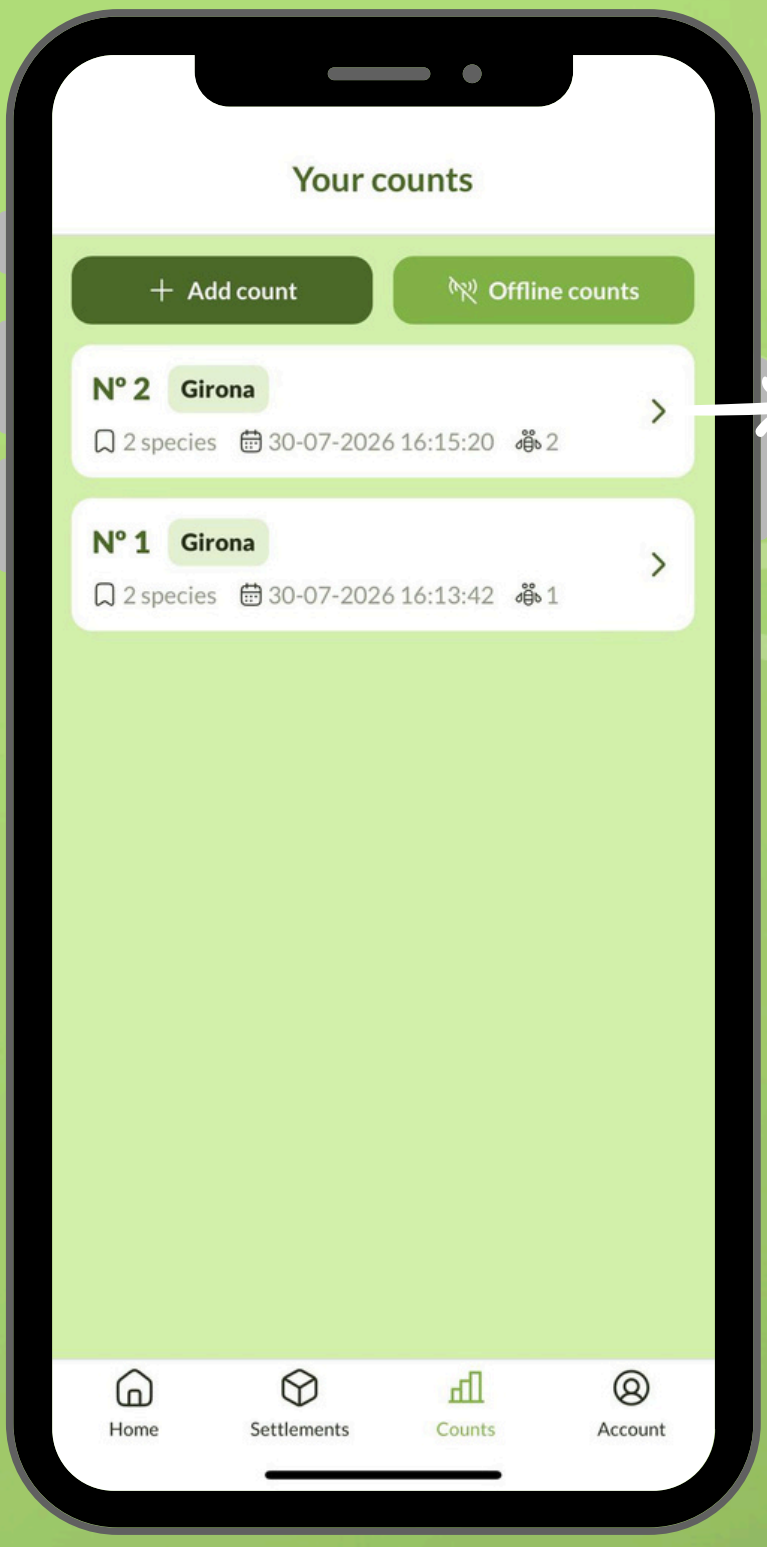
7. Continue counting



To make data entry easier, the new count will inherit the information from the previous one. You can modify it before starting the next count

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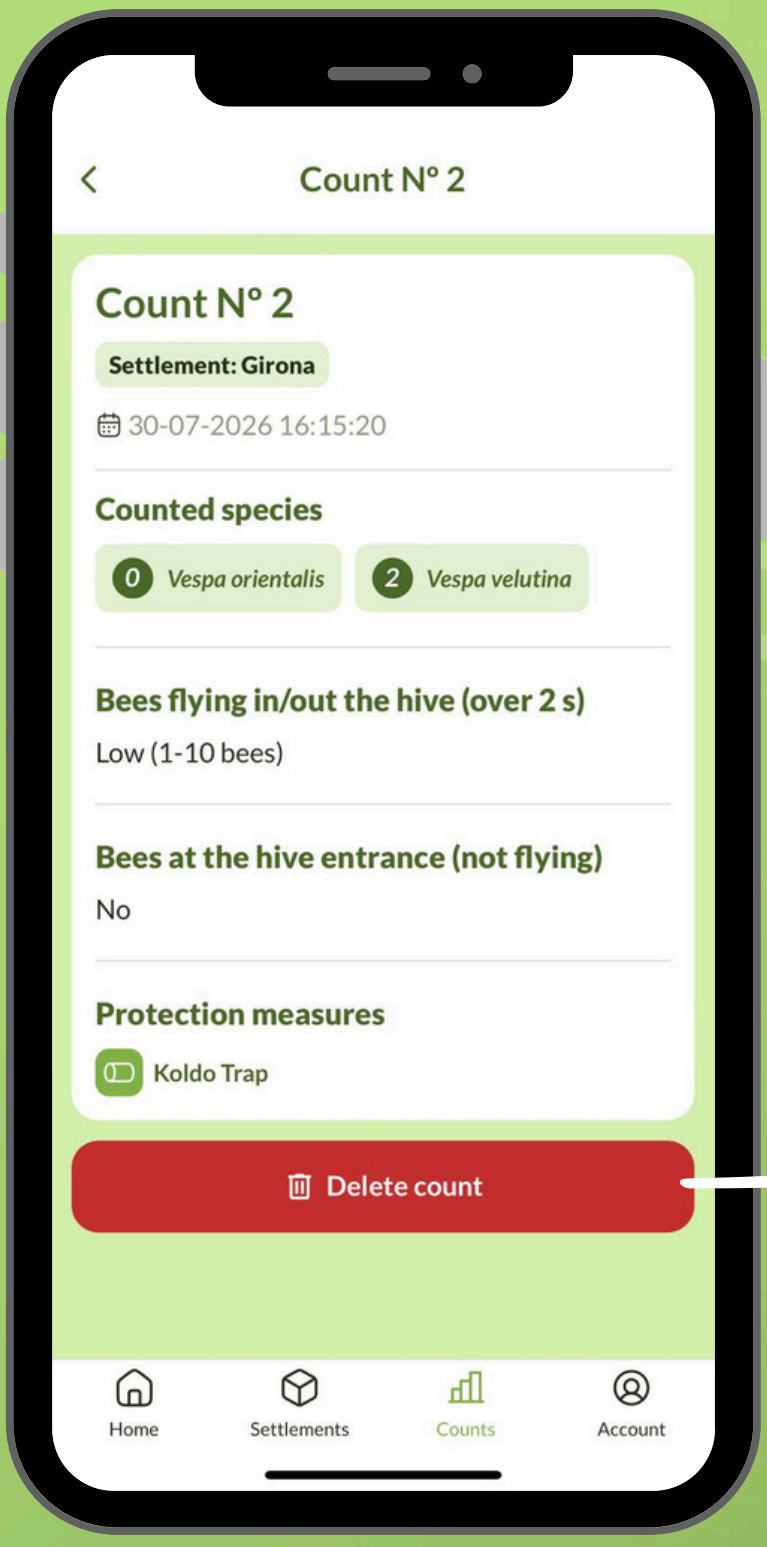
8. Delete a counting



If you realize that you made an error during the count after you have already saved it, you can delete the count by selecting it from the list of counts

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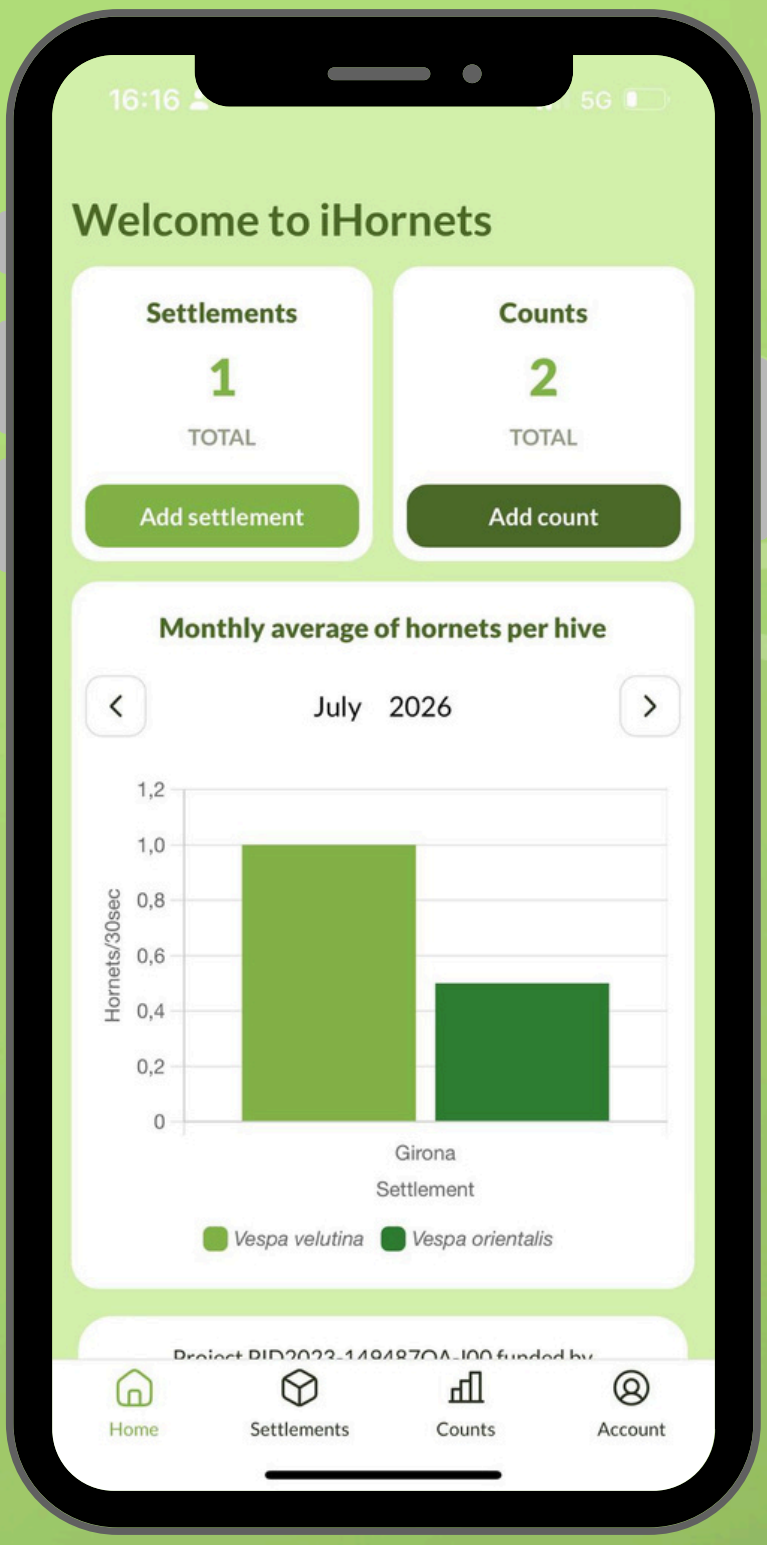
8. Delete a counting



Once the count is selected, click the **Delete count** button

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9. Home page



The home page displays a **summary of the created settlements and recorded hornet counts**, as well as a graph showing the average monthly hornet activity for each apiary

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10. Doubts?

If you have any questions about using the app or encounter any problems, please contact us at:

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Funding

Developed by:

Universitat de Girona

UIB Universitat de les Illes Balears

CTFC

in collaboration with:

ipb Instituto Politécnico de Bragança
Bragança Polytechnic University

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CIMO Centro de Investigação de Montanha

UT université de TOURS

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