BEECONECT: a connected “flower” to measure the effects of radioactive contamination on the cognitive health of insect pollinators

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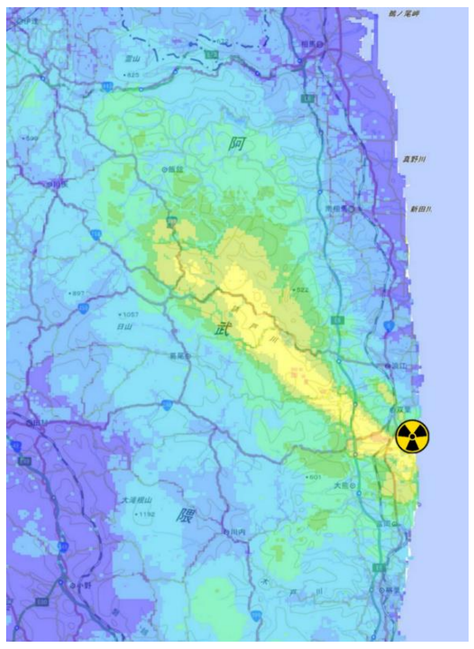
CONTEXT

- **Insect pollinators**, such as bees, flies, and butterflies, are **declining worldwide**. This is alarming since these animals are **vital** to the **maintenance** of **terrestrial ecosystems** and global **food security**.
- **Pollinators** heavily rely on **learning** and **memory** to **forage** on flowers. However, these cognitive abilities can be easily **disrupted** by a range of **environmental stressors**, even at **low exposure levels** (e.g. insecticides, heavy metals).
- If and/or learning processes often only has immediate subtle effects on individual behaviour, this can have long-term **dramatic consequences on populations**, if **food supply** is compromised.

OBJECTIF

The aim of **BEECONECT** is to study the **effects** of **radioactive contamination** on the **cognitive health** of **pollinators** (honeybees and other wild insects) in the **Fukushima Prefecture** (Japan).

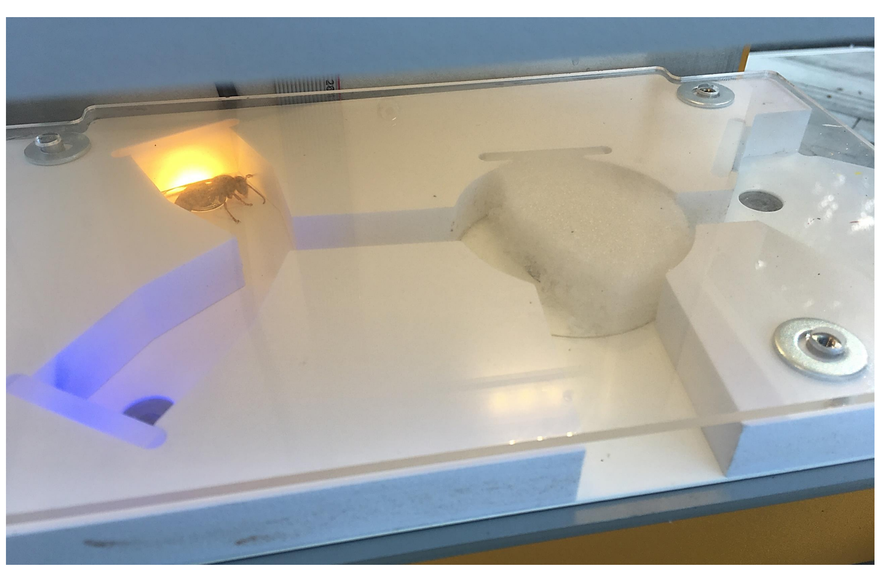


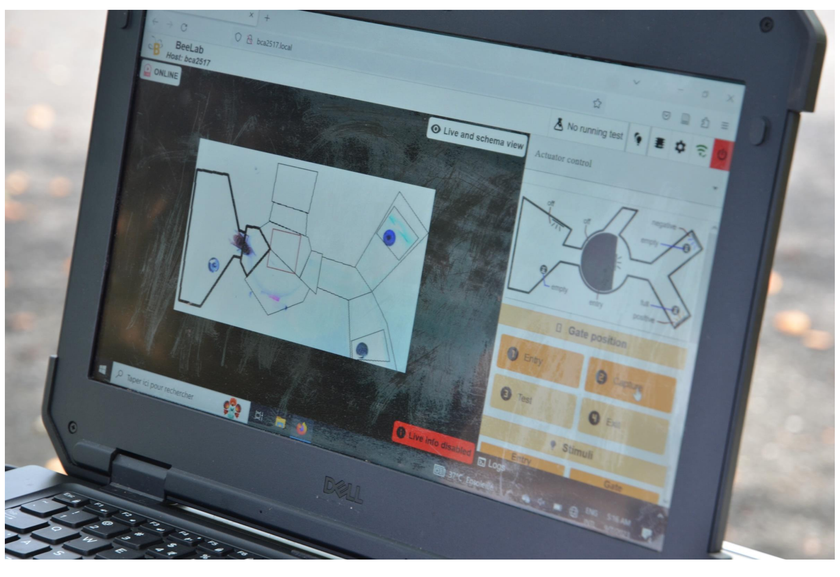
HYPOTHESES

Following the example of recent work on other environmental stress factors (e.g. neonicotinoid pesticides, heavy metals), we hypothesize that exposure to **radioactive pollution**, even at **very low levels**, can have **sub-lethal effects** on individual **cognitive abilities** with critical consequences on populations.

MATERIALS & METHODS

- To assess the cognitive health of pollinators in the field, we will run **mass phenotyping** of thousands of pollinators (bees, hornets…) using a newly developed **automated** and non-invasive method: a connected “flower” in which the **insect must solve a task in a Y-maze** to obtain a **nectar reward**.
- Our system uses on-board **artificial intelligence**, enabling **recognition of individual bees and species**.
- The **learning performance** of each insect is **recorded**, then **sent to** a dedicated **server** for online data analysis.
- This device is the **first automated cognitive test ever deployed to measure cognition in insects**, and more broadly in invertebrates.





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