

Assessing *Aedes albopictus* Winter Activity Across a Latitudinal Gradient in Temperate Europe

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Background

Aedes albopictus (the Asian tiger mosquito) is a **highly invasive species** and a **competent vector of arboviruses** such as dengue, chikungunya, and Zika. Beyond its public health relevance, **its aggressive daytime biting makes it a major nuisance species** in many temperate regions. **Recent reports indicate that *Ae. albopictus* populations in southern Europe may remain active during winter**, challenging the long-held view of a complete diapause period in temperate climates. However, the timing of key phenological events, such as the cessation of oviposition in autumn and the onset of egg hatching in spring, remains poorly documented across different latitudes.

Objectives

This study aims to:

- Investigate **winter oviposition activity** of *Ae. albopictus* across a latitudinal gradient in Europe.
- Assess **geographical differences** in persistence and timing of winter activity.

Methods

A **cross-border, standardised ovitrap monitoring network** was established across **12 locations** from **Palermo (Italy) to Strasbourg (France)**, including sites in **Switzerland** and **Austria**.

- Period:** October 2024 – May 2025
- Frequency:** Weekly ovitrap collections
- Response variable:** Ovitrap positivity (presence/absence of eggs)
- Analysis:** Seasonal trends modelled using a **GAMM** with week of year and latitude as key predictors, and location as a random effect.

Preliminary Results

- Clear **latitudinal differences** emerged in winter persistence: southern populations (e.g., Palermo, Bari) maintained low but **continuous oviposition** during winter months (at least until early January)
- Variability in signal strength hints at potential **competition for breeding sites** and differing **population sizes** along the gradient.
- Interannual variability is not taken into account**, and this might play an important role in shaping the vector’s winter activity.

Implications & Outlook

These first results highlight the **plasticity and adaptability** of *Ae. albopictus* in temperate Europe. If **winter oviposition becomes more common** under warmer winters, this could **extend the biting and nuisance season** and complicate **vector control timing and effectiveness**.

Ongoing analyses will include **temperature, precipitation, and lagged effects** to better disentangle climatic drivers influencing winter activity.

By **harmonising surveillance protocols** across Europe, this effort supports improved understanding of *Ae. albopictus* phenology and provides a foundation for **timely and targeted vector control strategies**.

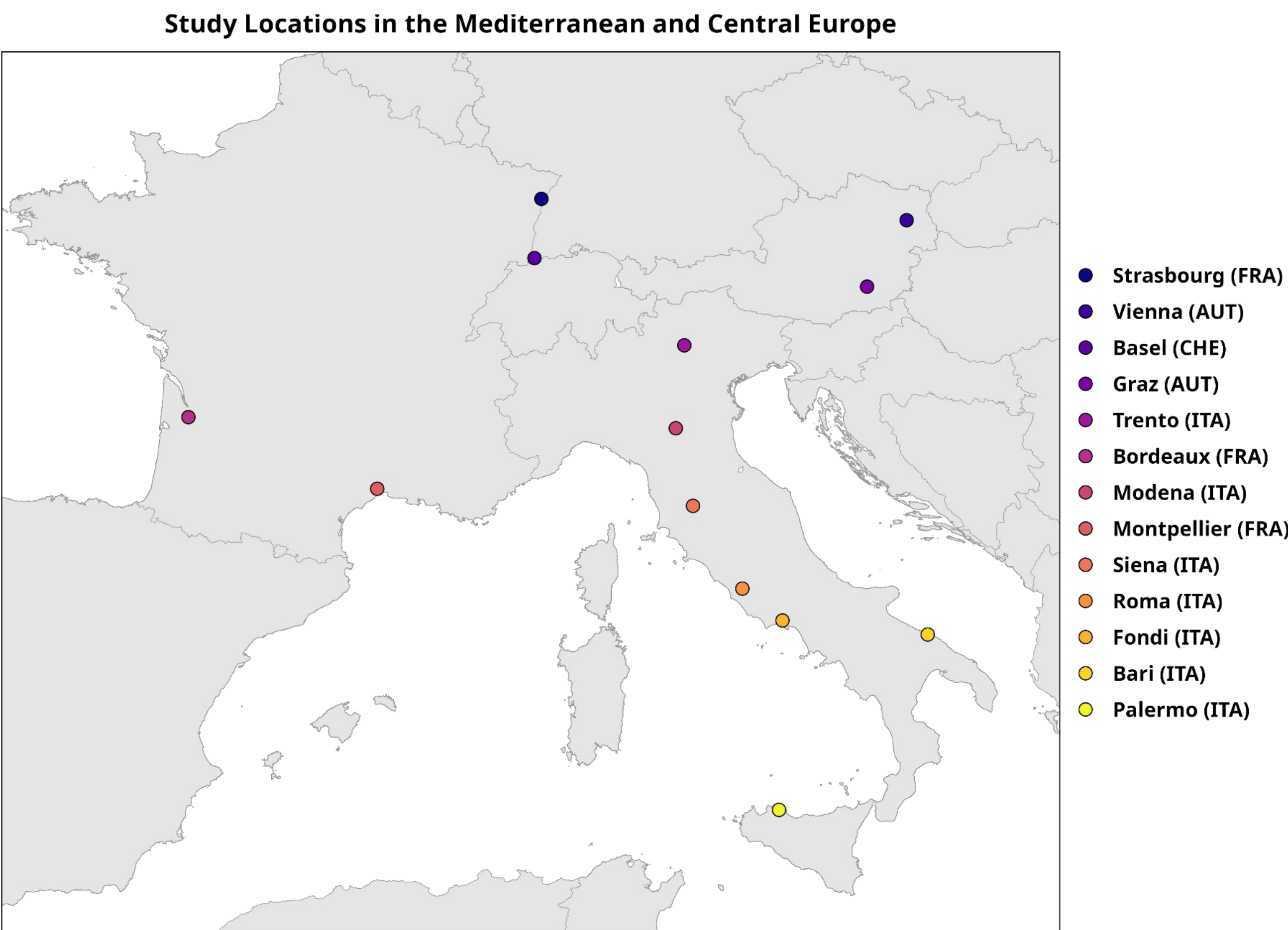


Figure 1. Geographical distribution of *Ae. albopictus* monitoring sites across the Mediterranean and Central Europe, spanning a pronounced latitudinal gradient from Palermo (Italy) to Strasbourg (France).

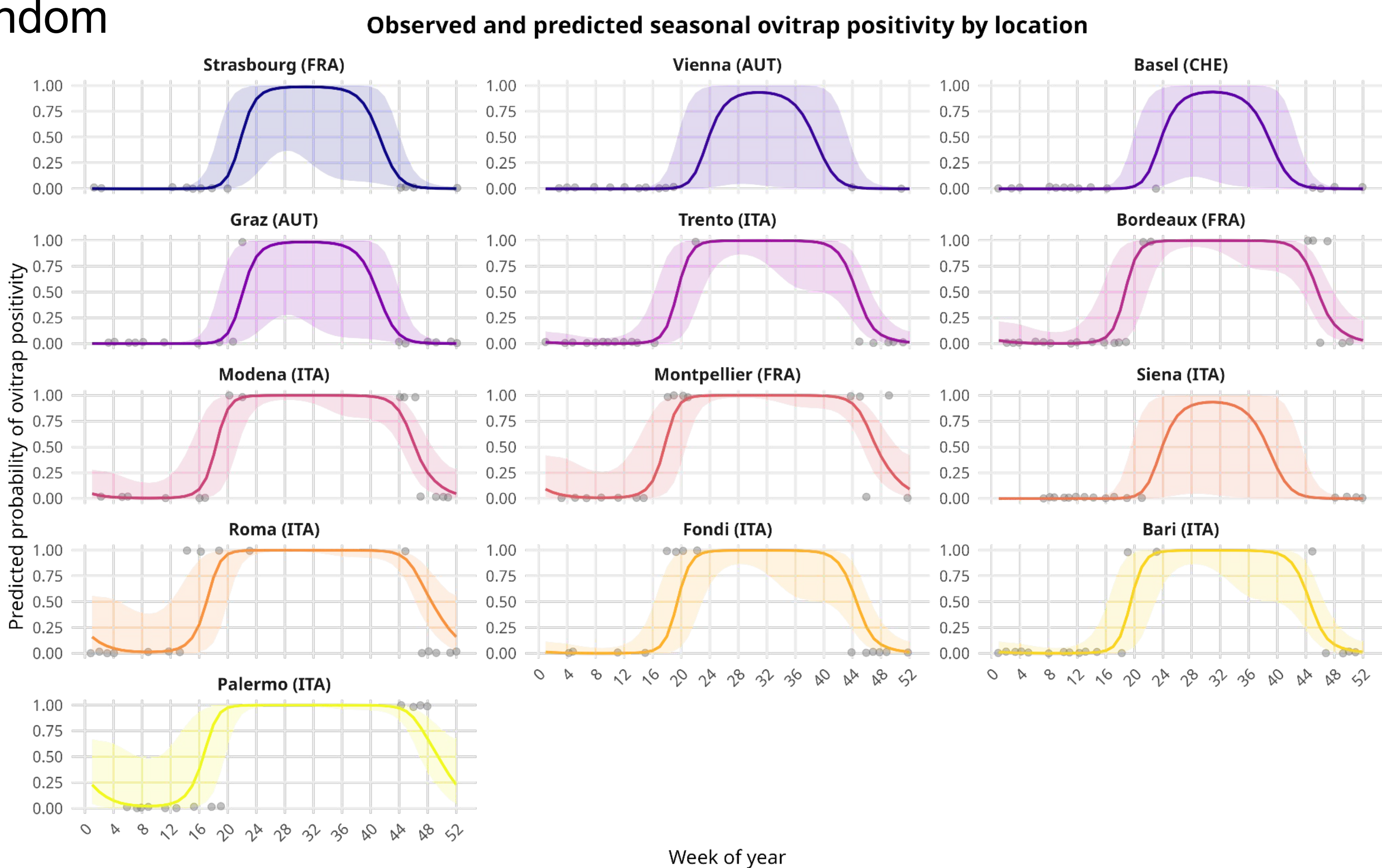


Figure 2. Observed (points) and modelled (lines, shaded confidence intervals) weekly ovitrap positivity for *Ae. albopictus* across European locations. Predictions were obtained using a Generalized Additive Model (GAM) with week of year as a smooth term and location as a random effect.

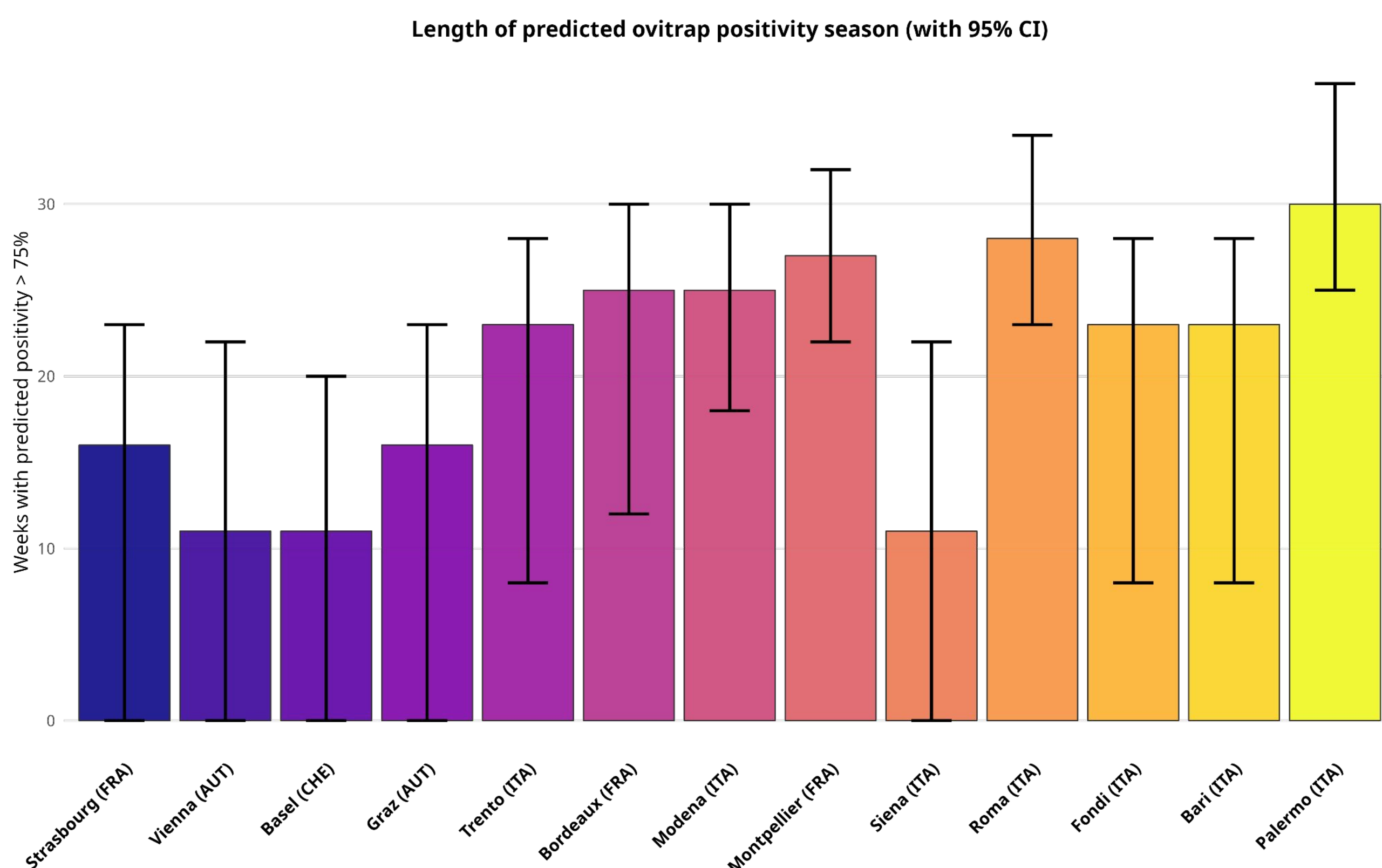


Figure 3. Estimated number of weeks with predicted ovitrap positivity >75% for each location (bars ± 95% CI).