MAMBO Modern approaches to the monitoring of biodiversity

FACT SHEET

Insect camera traps for monitoring of diurnal pollinators

DESCRIPTION

This tool identifies and localises insects in images and video recordings captured by camera traps focused on pollinators in natural environments, integrating methods developed across the MAMBO project. Cameras are mounted to face vegetation surfaces and record images of flowering plants alongside the insects visiting and moving across them. Within MAMBO, a standardised plant community consisting of different species of Sedum, succulents planted in plastic trays suitable for green roofs and wide geographical distribution, was used to enable like-for-like comparison of pollinator communities across sites. Natural vegetation has also been used, which is harder to standardise but more ecologically relevant.

The image analysis pipeline combines motion-informed object detection, colour and semantic segmentation, hierarchical classification of insects across three taxonomic ranks, and tracking designed specifically for low-framerate recordings. The system processes time-lapse images and video from camera traps with both natural and artificial floral backgrounds, recording images on a fixed schedule, in MAMBO, every minute from 8 am to 8 pm. It generates detailed outputs, including CSV files with temporal, taxonomic, and spatial information, labelled videos, insect crop images, and track visualisations. Extensive annotated datasets are incorporated, and new taxa groups can be added for specific research needs.

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BENEFITS OF USING THE TECHNOLOGY

The tool provides a unified and automated workflow that significantly reduces manual annotation efforts by detecting, classifying, and tracking insects across multiple taxonomic levels simultaneously. Its ability to classify up to 80 taxa groups at genus or species level, combined with robust tracking and visualisation, offers high-resolution insight into insect activity across diverse environments. The use of standardised flower beds enables correction for short-term variation in weather conditions and floral resource availability, ensuring comparable results across sites. The system supports a wide range of detailed ecological analyses, including occupancy modelling, abundance assessments, phenology studies, and research into pollinator and plant interactions. Scalable from individual plots (30 cm x 40 cm) to landscapes and biogeographical regions, and capable of exceeding 100,000 recordings per season per camera trap, the tool has strong potential to support the EU Pollinator Monitoring Scheme and broader initiatives to assess and address insect and pollinator declines.

TARGET USERS

- Entomologists, ecologists, and researchers working in biodiversity monitoring
- Field researchers relying on camera trap imagery for long-term ecological monitoring and habitat assessment
- Scientists studying plant-pollinator interactions
- Projects requiring detailed datasets for extending or refining insect classification models
- Researchers and land managers seeking scalable, non-invasive pollinator monitoring tools