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# A new archaeo-entomological approach from insect remains found in Newcaledonian cave-dwelling guanos



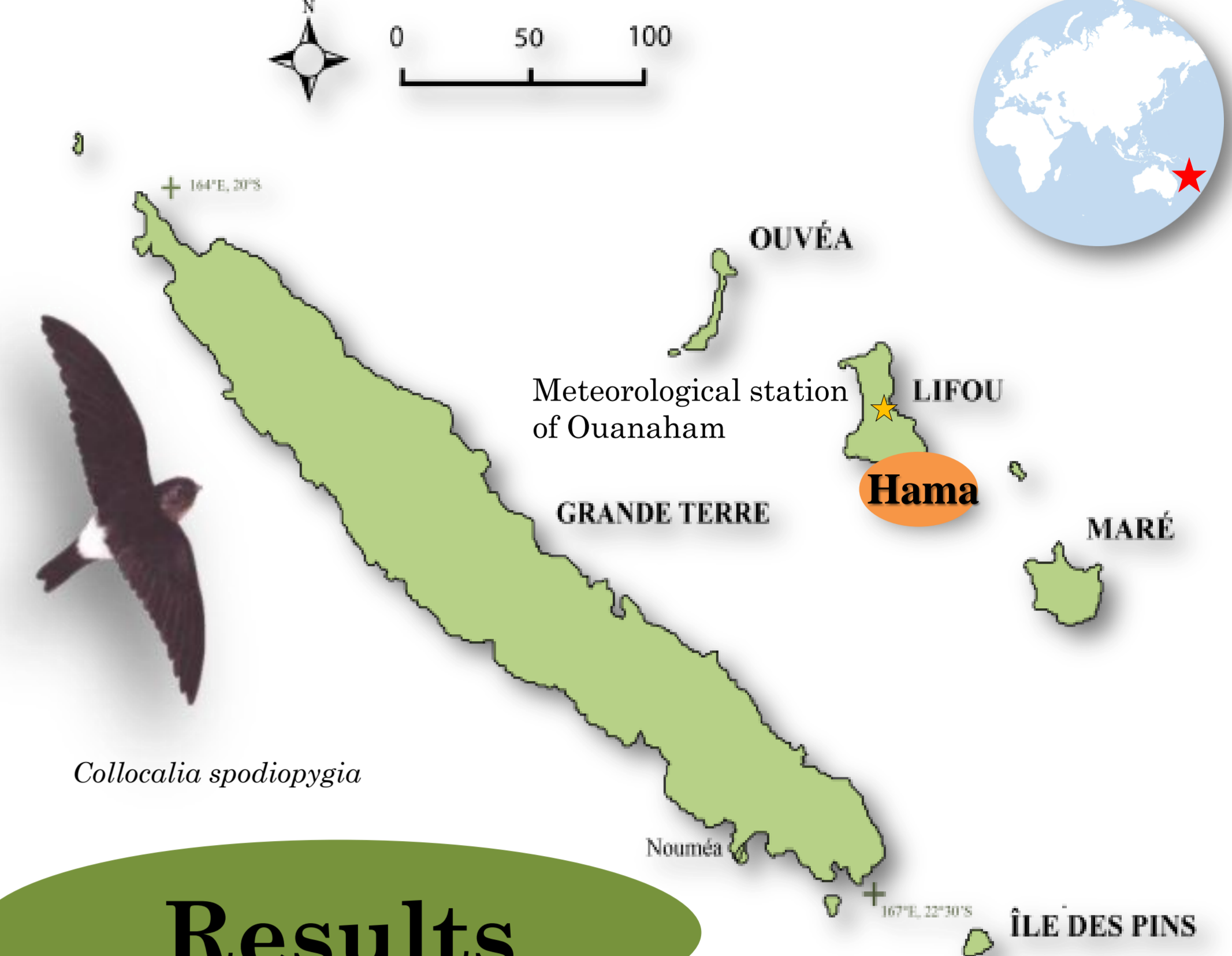
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- Location sample:** Guano core HAK1 (95cm long) was retrieved in HAMA CAVE, which lies on the southernmost part of the coralline Lifou Island (New Caledonia, Loyalty Islands).
- Climate:** Two main seasons: cool and dry from May to September ; wet and warm from November to April. The El Niño Southern Oscillation (ENSO mode) controls the main interannual climate variability, with lower rainfall than average during El Niño years and higher during La Niña years.
- Vegetation:** Tropical rain forest and/or savanna on clayey soils (Terra rossa) produced by the weathering of limestone.
- Why this study ?** Insects which feed on chosen flowers are eaten by *Collocalia spodiopygia*, diurnal and insectivorous swiftlets. Therefore, the insect remains and pollen content preserved in their guano give useful information about the current environmental conditions. By refining the calibration with climatic parameters, it will be hence possible to use the guano piles as palaeoenvironmental and paleoclimatic archives.
- Entomological bias:** Insects are used as bioindicators but the study faces several difficulties: the significant fragmentation of the entomological remains and the New caledonian species not listed or poorly documented.

PROJECTS : <http://www.observatoire-gops.org/en/caid>  
 GUACAMOLÉ : GUAno, Carbonate karstiques, Alcane analyses MOLéculaires) INSU - EC2CO - BIOEFFECT CAID - GOPS 2013 : Chiroptères, Analyse Isotopique de leur Diète



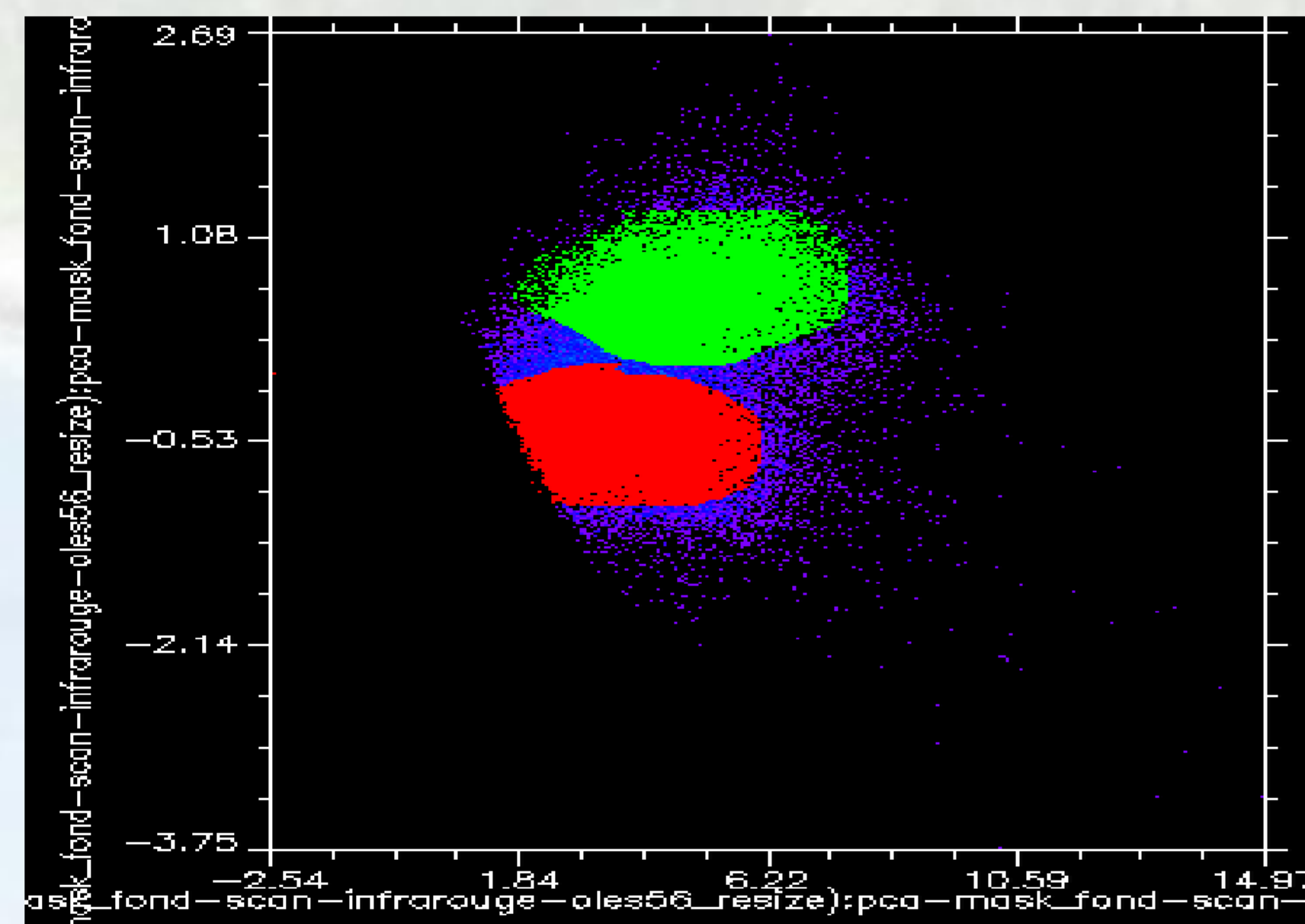
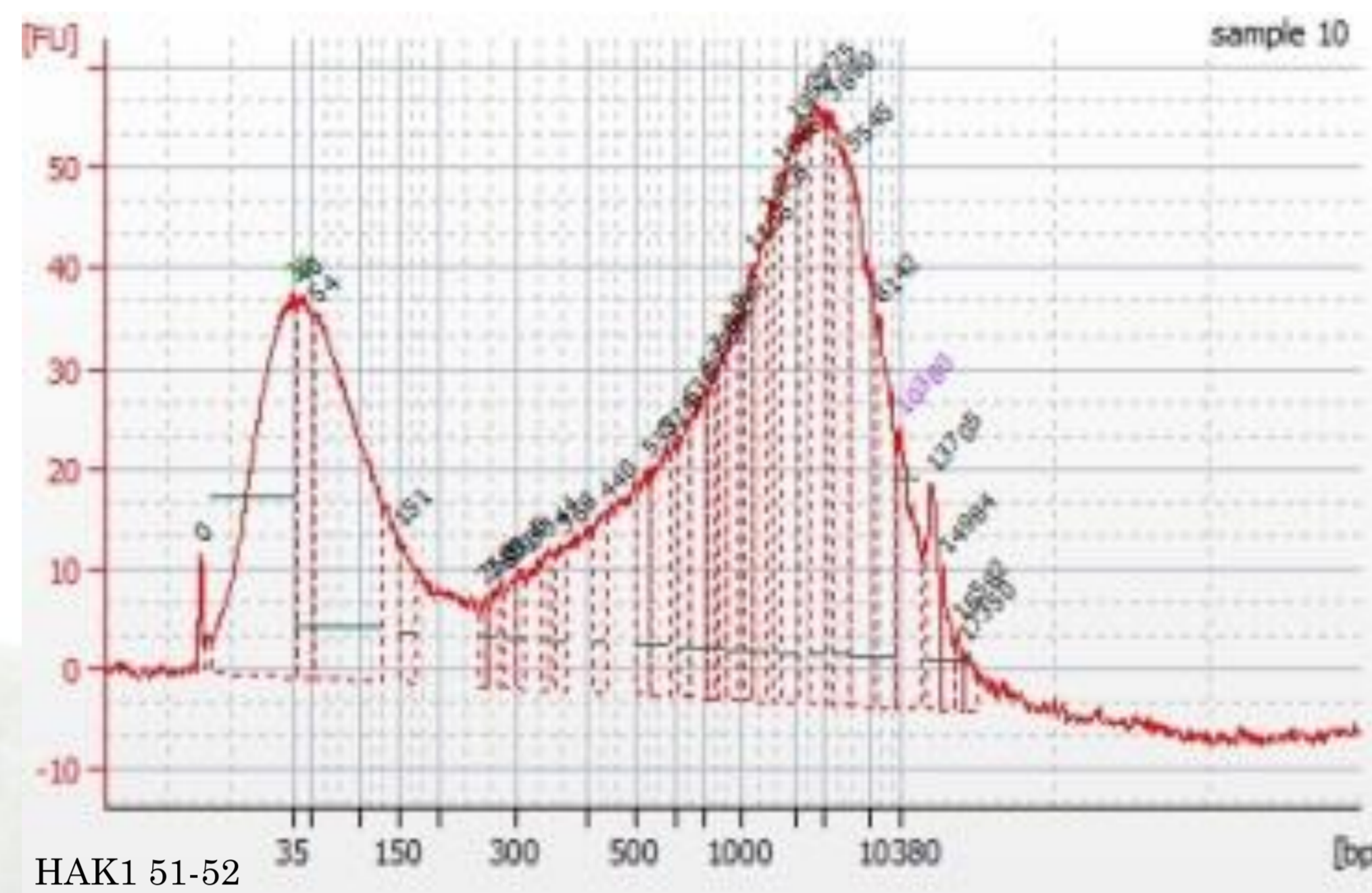
*Collocalia spodiopygia*

## Methods

### Metabarcoding

### Short-Wave InfraRed spectroscopy

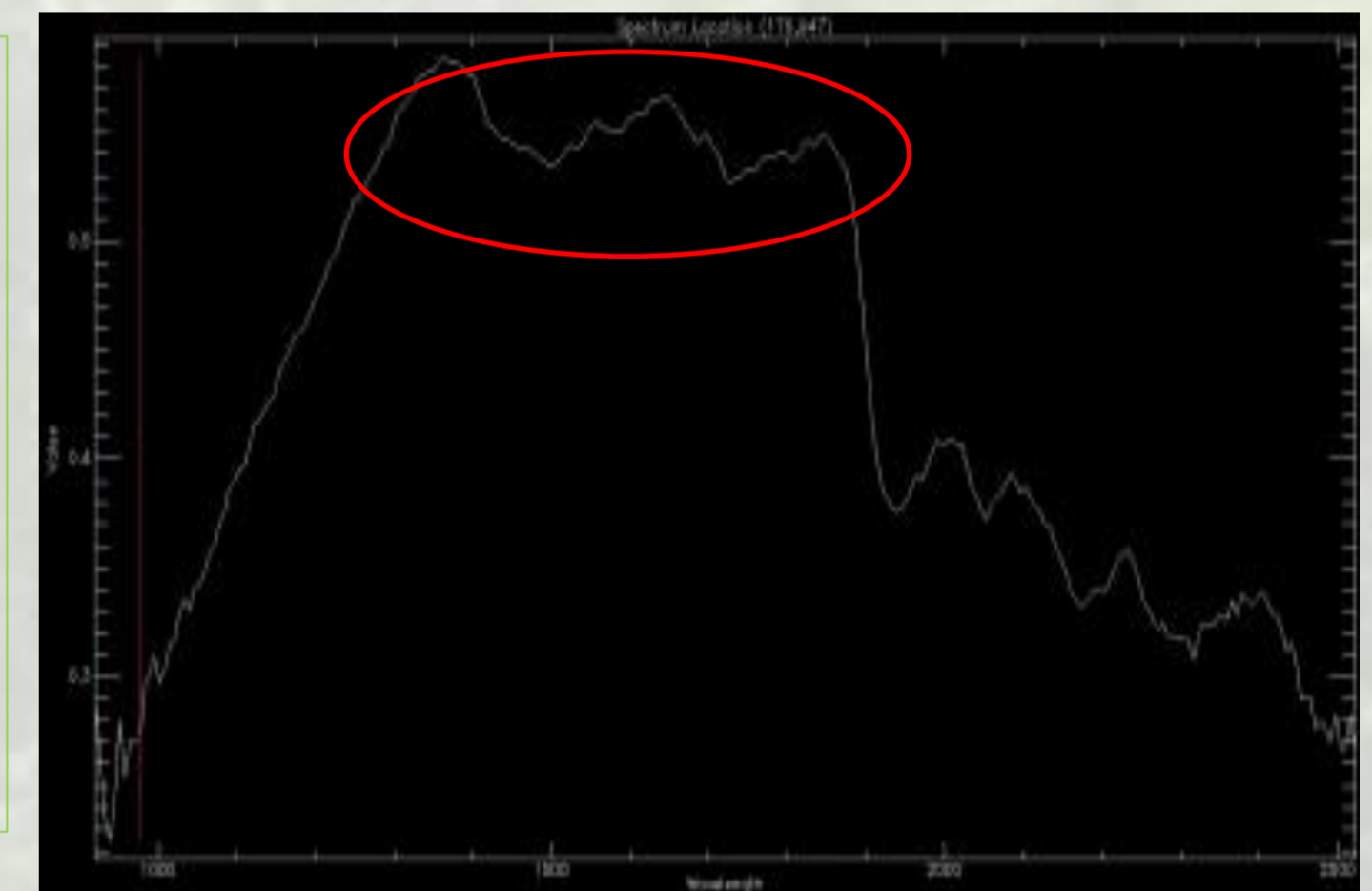
### Taxonomic identification



There are chemical differences between the layers of the guano pile (two main differences in the PCA). Unfortunately, at this stage they remain difficult to determine precisely. However, this type of analysis is valuable to attest to the presence of chitin in a fossil sediment.

## Results

Molecular analyzes allow to reveal DNA presence up to 70 cm deep in the swiftlet's guano pile. DNA sequencing is currently in progress, but it has already allowed the identification of several arthropods such as Salticidae, Pteromalidae (*Toxeomorpha nigra*...),...

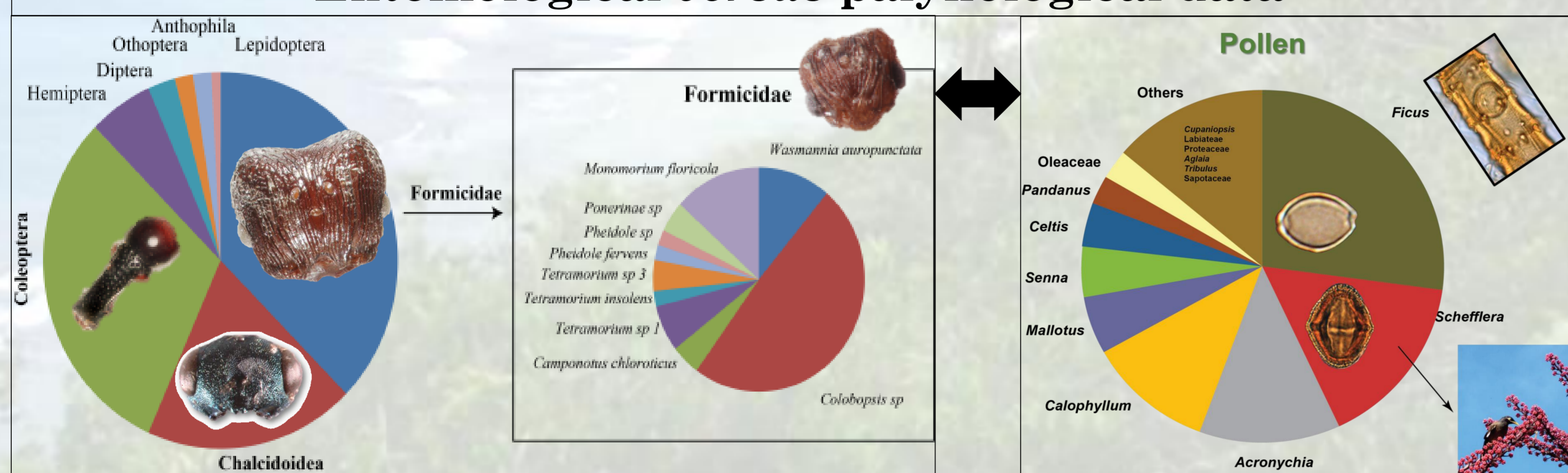


Typical signature of insect chitin in the infrared spectrum ( Hak1 62-63)

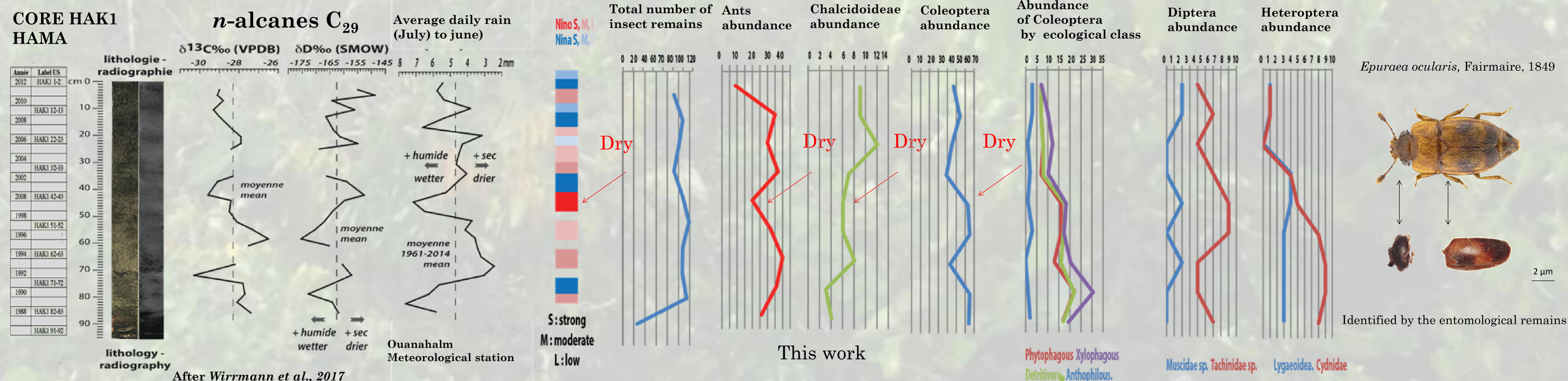
Taxonomic identification of insect remains provides a quantitative and qualitative approach to entomofauna at a given time. Despite the great diversity of insects eaten by the swiftlets (1038 insect remains, 54 taxa identified) the most represented preys are winged ants, Chalcidoidea and Coleoptera (above all weevils). These data are correlated with palynological data to tentatively precise the timing of the flowering periods as their seasonality.

The pollinisation of *Ficus*, in particular, underlines the link between flowers and insects, especially Pteromalidae and Agaonidae.

## Hama surface sampling (HA3) – 11/11/2012 Entomological versus palynological data



- ❖ The results highlight ecological preferences, vulnerability and resilience time of some insects taxa in relationship with ENSO mode.
- ❖ Hymenoptera are more sensitive to the dryness (El Niño periods), while some Coleoptera are better represented during wetter episodes (La Niña periods).



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