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Study of guano from New Caledonia

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LIFOU ISLAND :

✂ The HAMA site **HAMA** is a cave located on the south part of Lifou Island – 1196 km² (Loyalty Islands).

Climate : two main seasons, a cool and dry season, from May to September and a wet and warm season from November to April.

Vegetation : rain forest on calcareous soil, savanna and bushes.

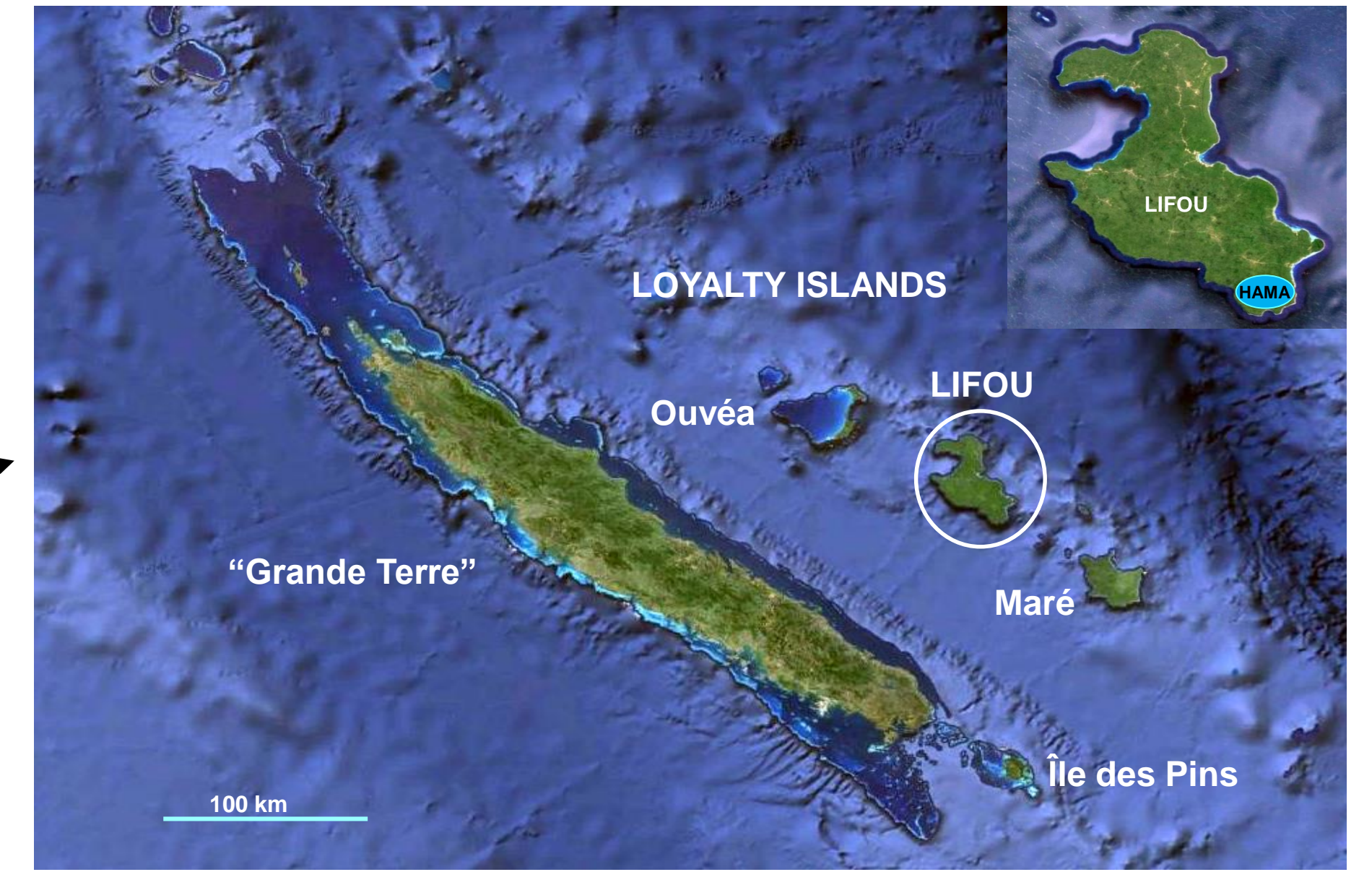
Anthropization : some cultivated places.

✂ The swiftlets, diurnal birds, are insectivorous and eat insects visiting chosen flowers.

Therefore, the guano dumped in the cave contains some insect rests and pollen.

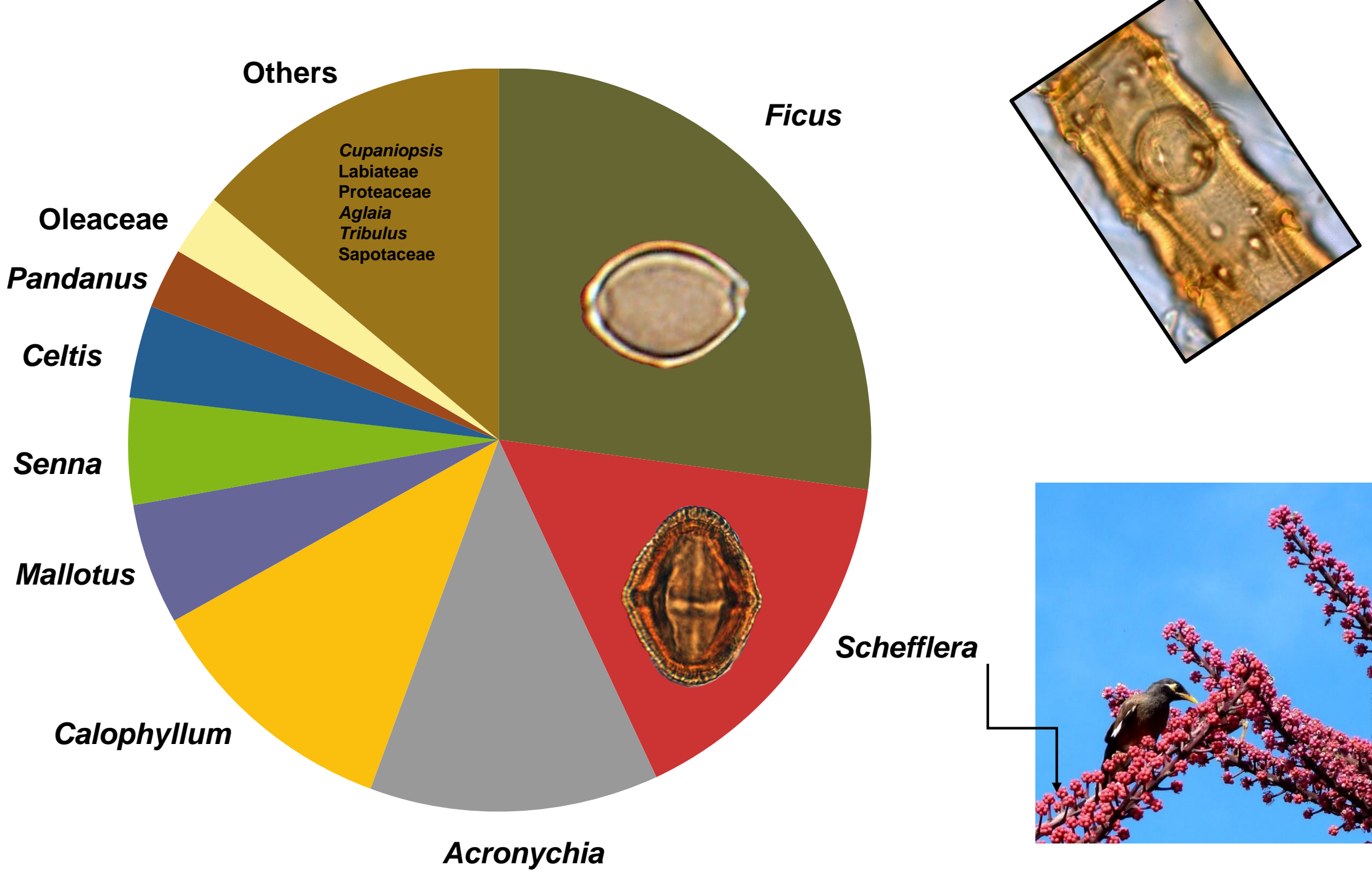
The association, in the guano, between the pollen content from plants *flowering at the same time* and insects indicates the climatic conditions at the time of the deposit.

✂ An analysis of guano from surface samples for different periods during a year, linked with meteorological data will allowed us to realize a precise calibration. With this calibration, it will be possible to get high resolution data for palaeoclimatic and palaeoenvironmental studies concerning the long records of guano in the caves.

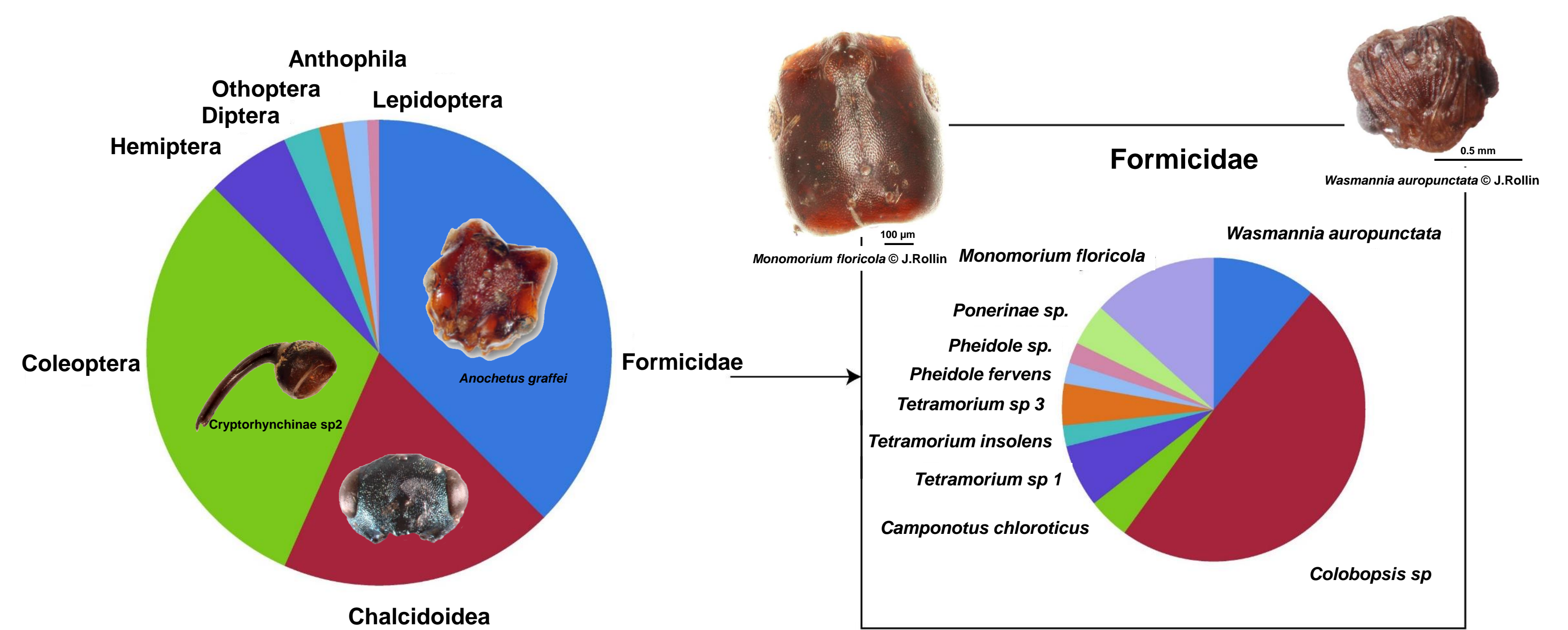


HAMA - HA3 (surface sampling of HAK1) - 11/11/2012

Pollen



Entomology



Palynological data

During the wet season, November 2012, we can observe the important presence of *Ficus*, *Schefflera*, *Acronychia* and *Calophyllum* among many others less represented species. This association will be used for calibrations.

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

Entomological study

A great diversity of insects are consumed by swiftlets, but the most present taxa are represented by winged ants, Chalcidoidea and Coleoptera (many weevils).

The flying of xylophagous beetles and the ant genus *Monomorium* and *Colobopsis* testify to a wet season.

The association of ant swarms will be used for calibration. Thanks to the insects consumed, especially the Chalcidoidea, it is possible to know the periods of flowering and seasonality. Pteromalidae and Agaonidae explain the abundance of pollen *Ficus* in guano.

✂ The guano's pollen and insects content gives us precise palaeoenvironmental parameters and with calibration, allows us to reconstruct, with a high resolution, the palaeoenvironmental changes during the past.

✂ HA3: used for calibration, underlines the relationships between plants and insects e.g. *Ficus* and Chalcidoidea.

✂ HAK1 42-43: dry period linked with El Niño events.

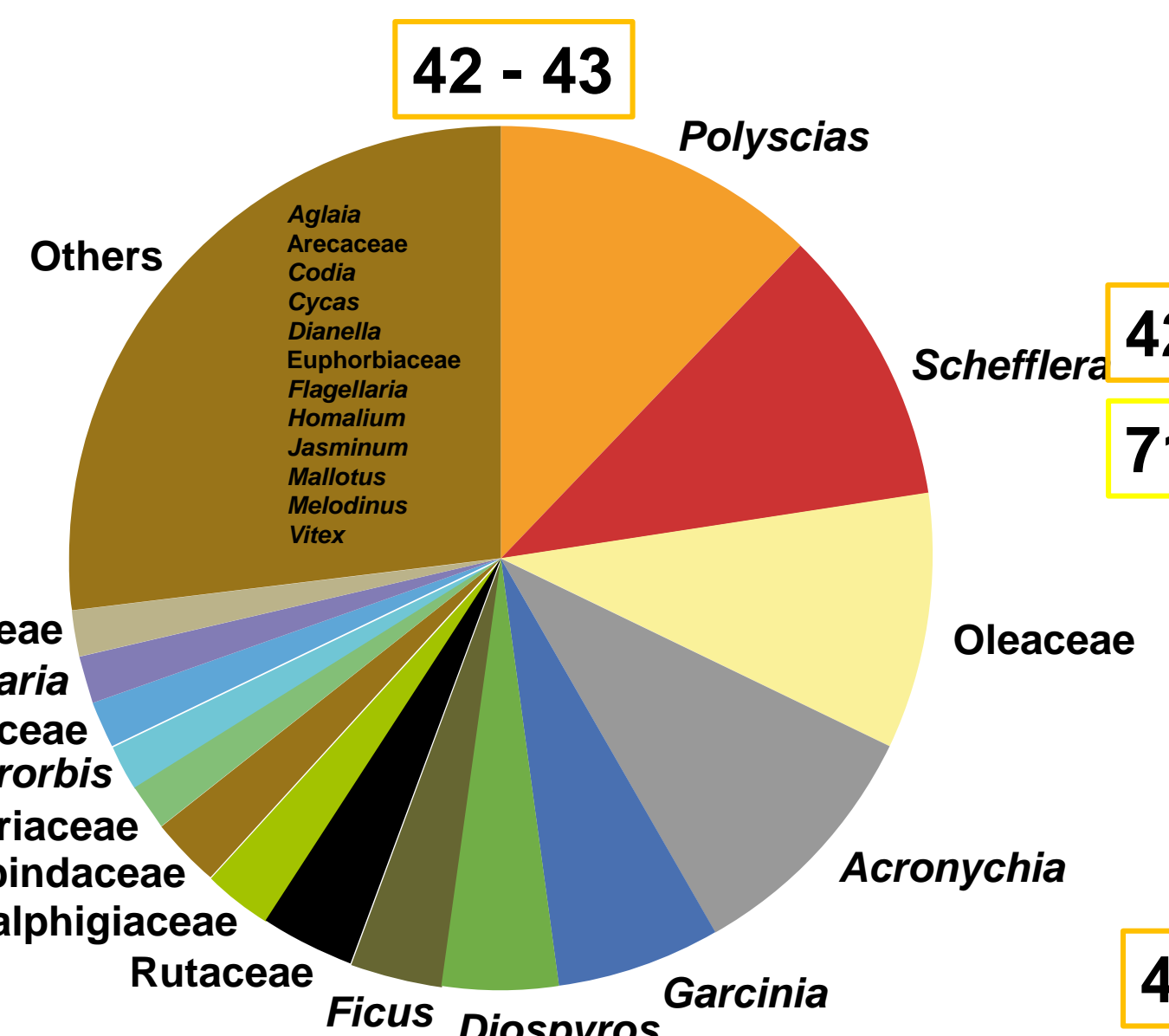
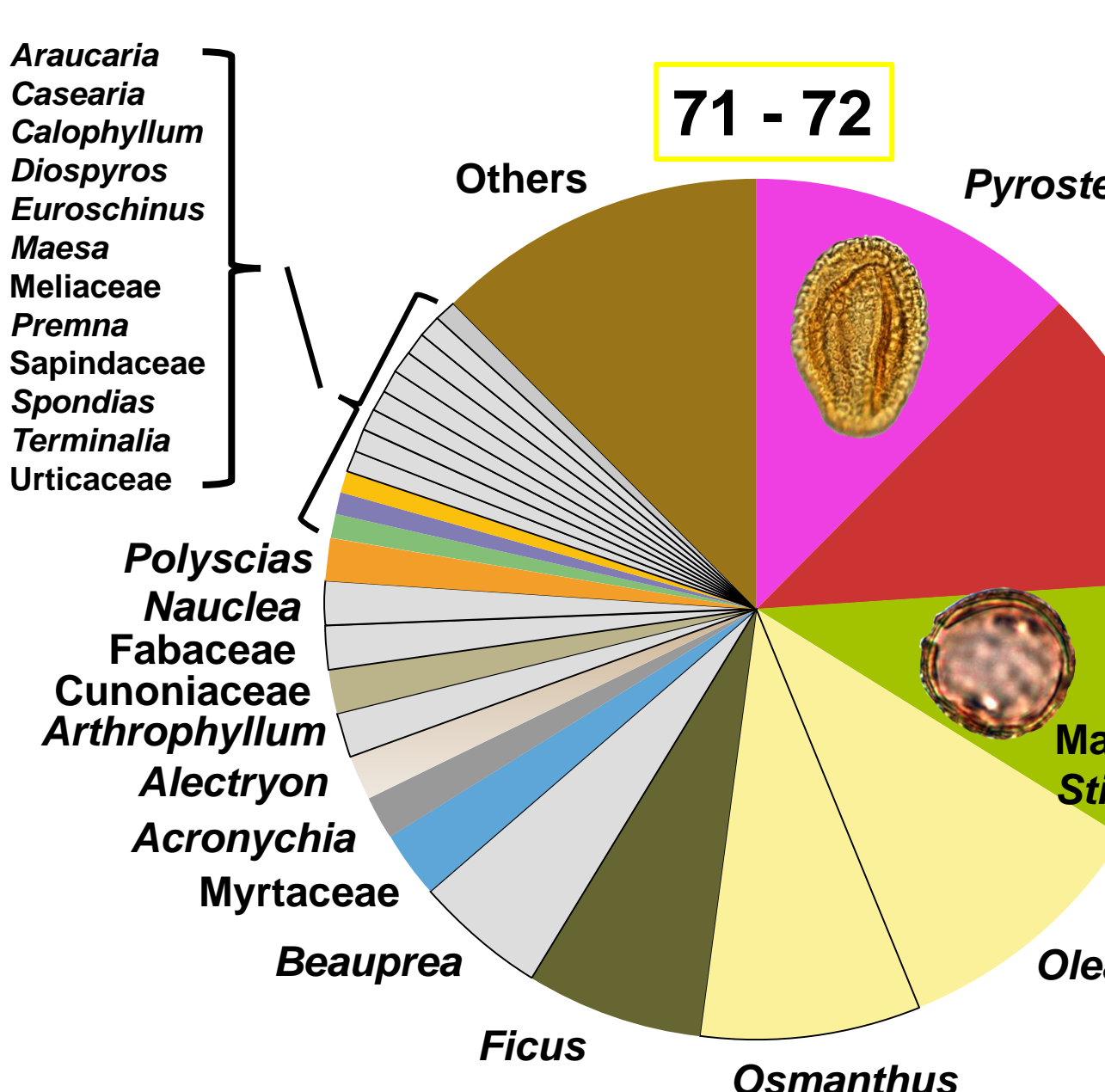
✂ HAK1 71-72: high diversity linked with very warm and wet conditions associated with La Niña events.

HAMA – HAK1 - 92 cm long record

Palynological data – 42-43 cm sample

We can observe a more important richness than for the surface sample with many same species in different proportion. The importance of *Polyscias* and the high diversity can correspond to a more flowering period, in December for instance.

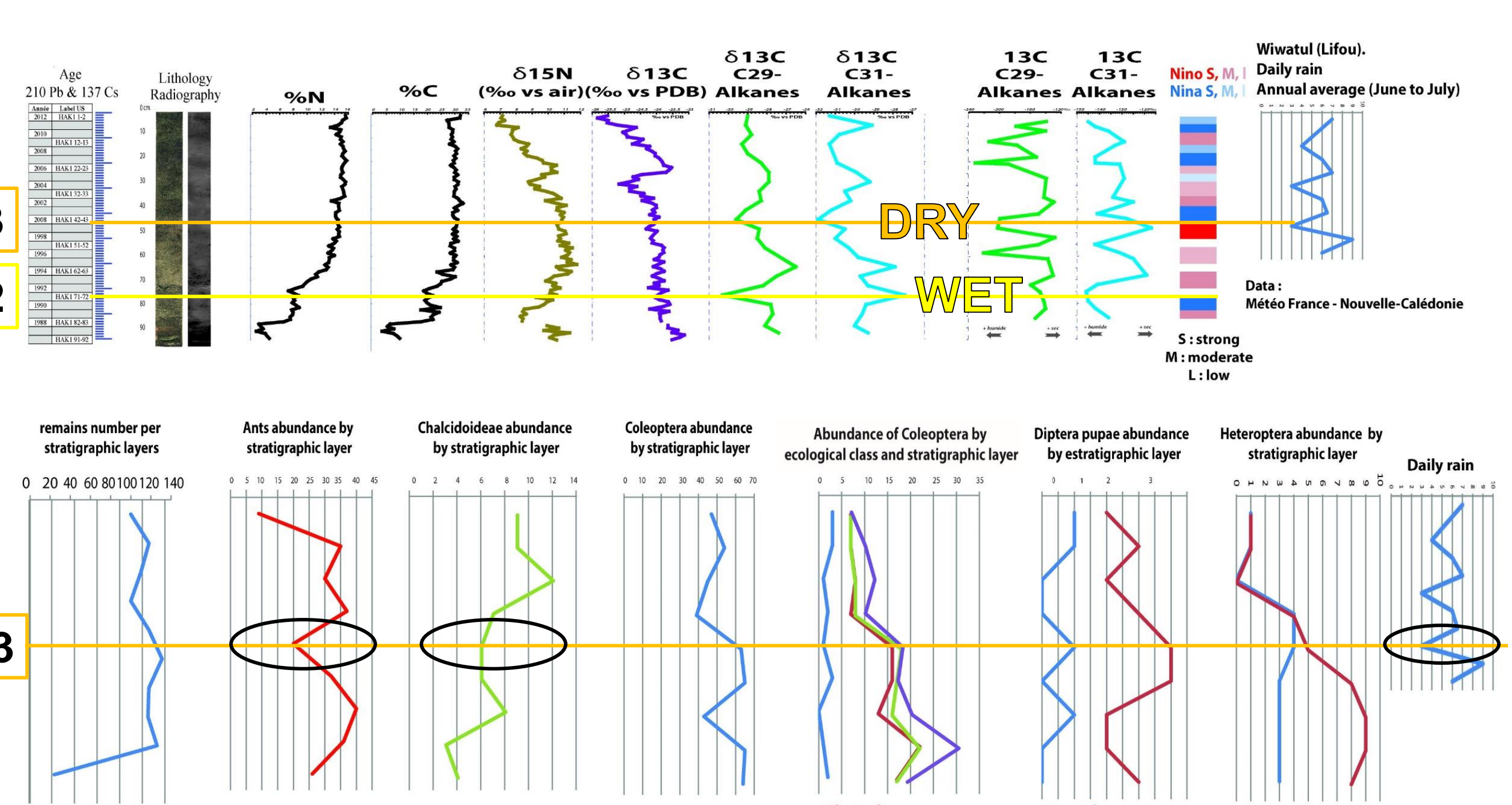
The importance of *Polyscias*, *Acacia spirorbis*, the Rutaceae and Myrtaceae, suggests drier conditions just following an El Niño period.



Palynological data - 71-72cm sample

This level shows a very high diversity which can be linked with humid conditions during the warm season reinforced by repetitive La Niña events.

Schefflera is always well represented. The importance of *Pyrostegia*, *Stigmaphyllon* and *Olea* underlines the presence of specific vectors like *Pseudaonidia trilobitiformis*, (Chalcidoidea), wasps and bees, affecting many plants in New Caledonia.



Entomological study

The entomological corpuses for each stratigraphic layers are distributed according to El Niño climatic events and their intensities and flowers. This distribution shows that El Niño is the main cause of the structuring of the data set. The results show that winged ants have a high sensitivity to climatic fluctuations, especially during El Niño periods. Thanks to the nuptial flight periods of the different species of ants, it is possible to obtain a resolution at the season.