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# PALYNOLOGY: A REMOTE SENSOR OF POLLEN TRANSPORT MECHANISMS – IMPLICATIONS FOR UNDERSTANDING ENTOMOPHILY AND ANEMOPHILY IN TROPICAL PLANTS

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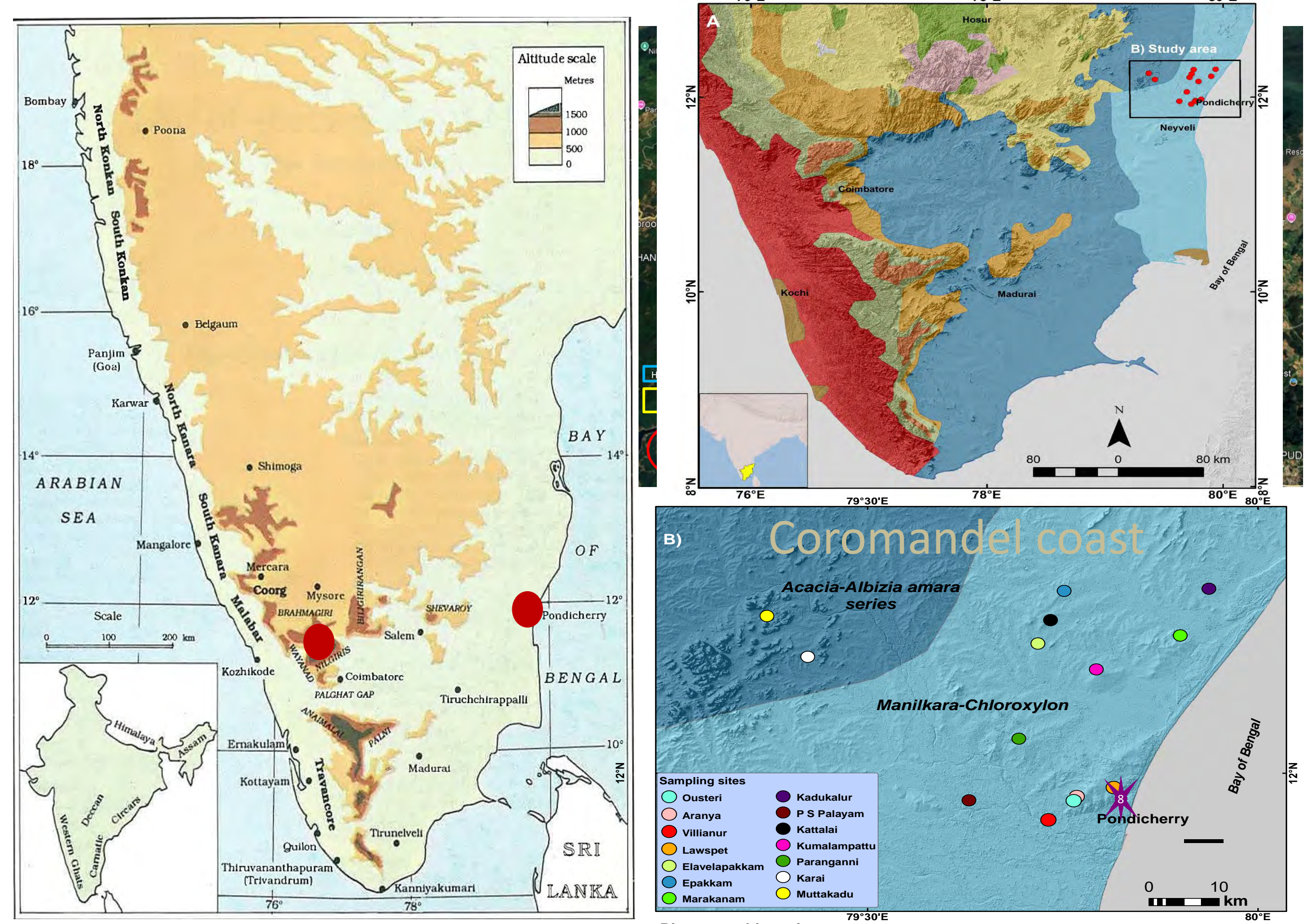
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Palynology: powerful tool to interpret modern & past vegetation using pollen in soils & in honey bee loads  
 Soil pollen: yields regional, wind-dispersed taxa; bee pollen: captures insect-pollinated plants  
 Together - provide fine-scale biological signal of vegetation dynamics in bio diverse Southern India



The contrasting landscapes in south India adapted from Tissot et al. (1994)

Map adapted from Navya et al. (2025)

## OBJECTIVES

- Evaluate how surface soil & bee pollen samples complement each other in vegetation reconstruction
- Demonstrate palynology as a geospatial ecological sensor
- Provide baseline data on tropical pollen transport mechanisms

## MATERIALS & METHODS

Two contrasting landscapes, 34 samples

- **Upper montane (8 sites):** Nilgiris  
 7 surface soils, 1 moss sample at 7 sites  
 Bee pollen (from *Apis cerana*) at 3 sites
- **Coromandel Coast (16 sites):** Pondicherry region  
 15 surface soil samples at 14 sites (Navya et al., 2025)  
 Corbicular loads of *A. cerana* (Jan–Apr 2021–22, Lazar (2024) PhD thesis)  
 1 *Apis florea* comb, 1 soil sample, IFP garden

## VEGETATION SURVEY & SOIL COLLECTION

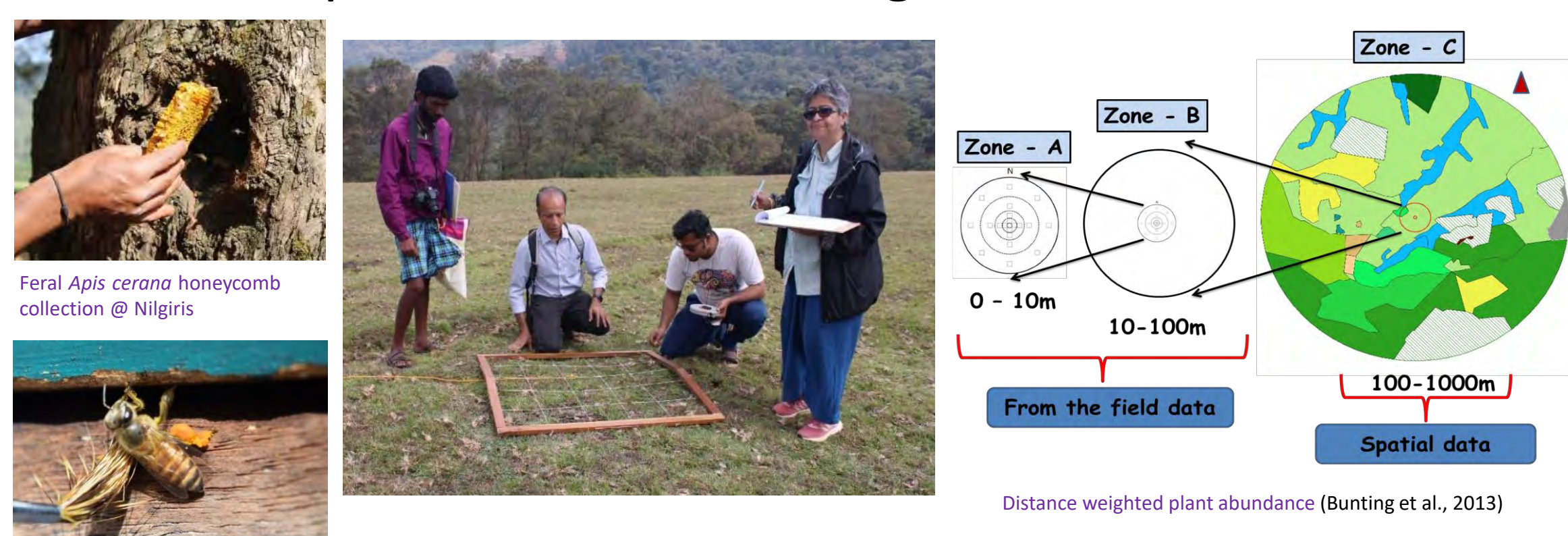
- Quantitative vegetation surveys conducted around each soil sampling point.
- Soil collected from top 2 cm within 1 m<sup>2</sup> quadrat after removing litter

## LABORATORY PROTOCOL, MICROSCOPY & ANALYSES

- Standard acid digestion including acetolysis
- Light Microscopy @ 40x, ≥1,000 grains enumerated
- Statistical analyses: PCA, CA & Pollen diagrams with CONISS cluster

## RESULTS & DISCUSSION

- 151 taxa recorded (soil: 135; bee pollen: 63)
- Common taxa : *Acacia*-t, Asteraceae (Echinate), Poaceae, Sapotaceae, *Syzygium*-t.
- 84 Exclusive taxa: Soil (Coast: 43; Nilgiris: 26); Bee pollen (Coast: 11; Nilgiris: 4)
- Spores and algal cysts: only in soil samples.
- Nilgiris and Coastal bee pollen: distinct clusters in CA.
- Surface soil samples from both landscapes separate but less distinct in CA.
- Major taxa defining the CA and PCA axes: Poaceae, Asteraceae (Echinate), *Cocos*-t.
- Core subset (4 paired soil–bee samples) produced similar clustering, confirming pattern robustness



Corbicular loads from *Apis cerana* @ IFP, Pondicherry

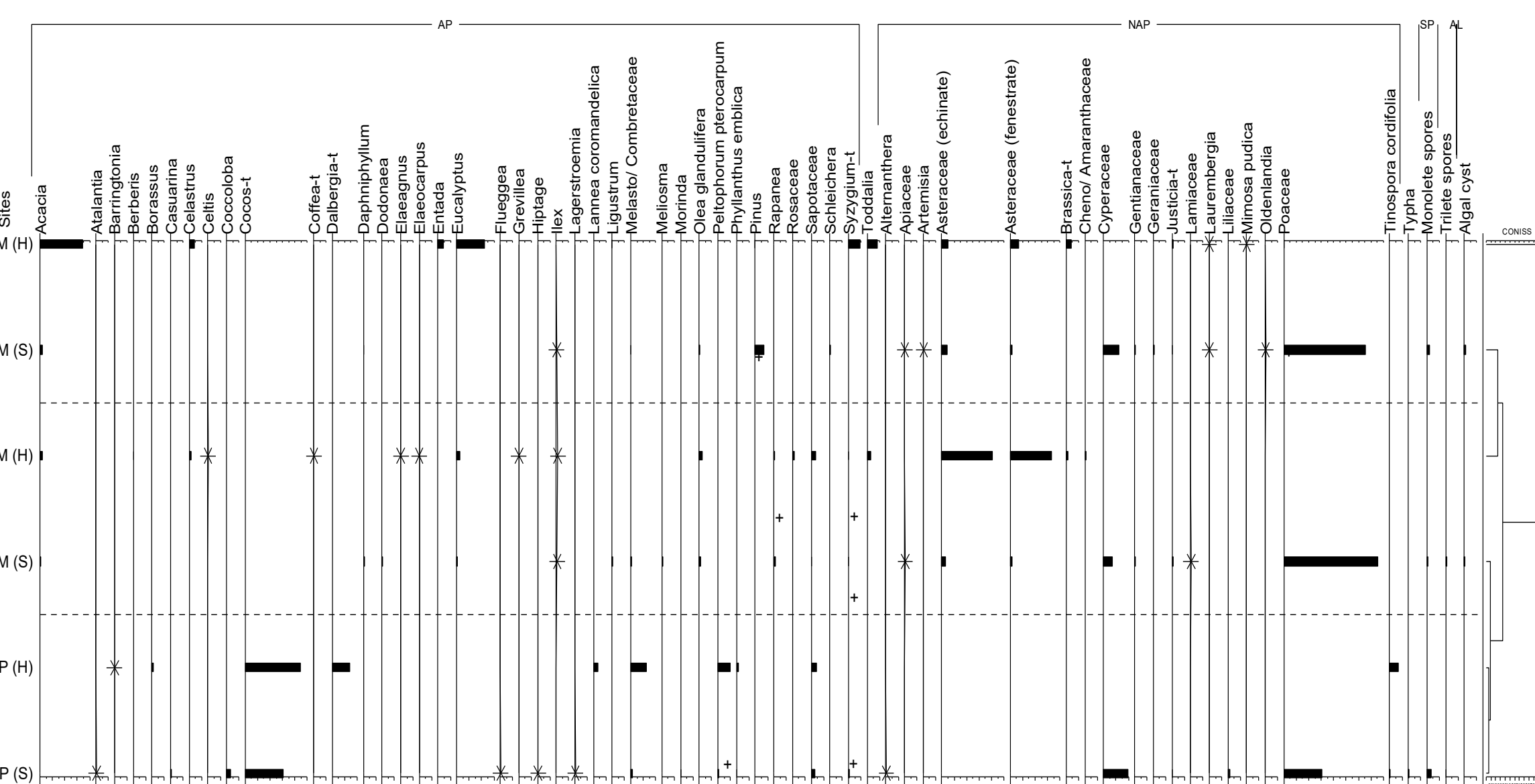
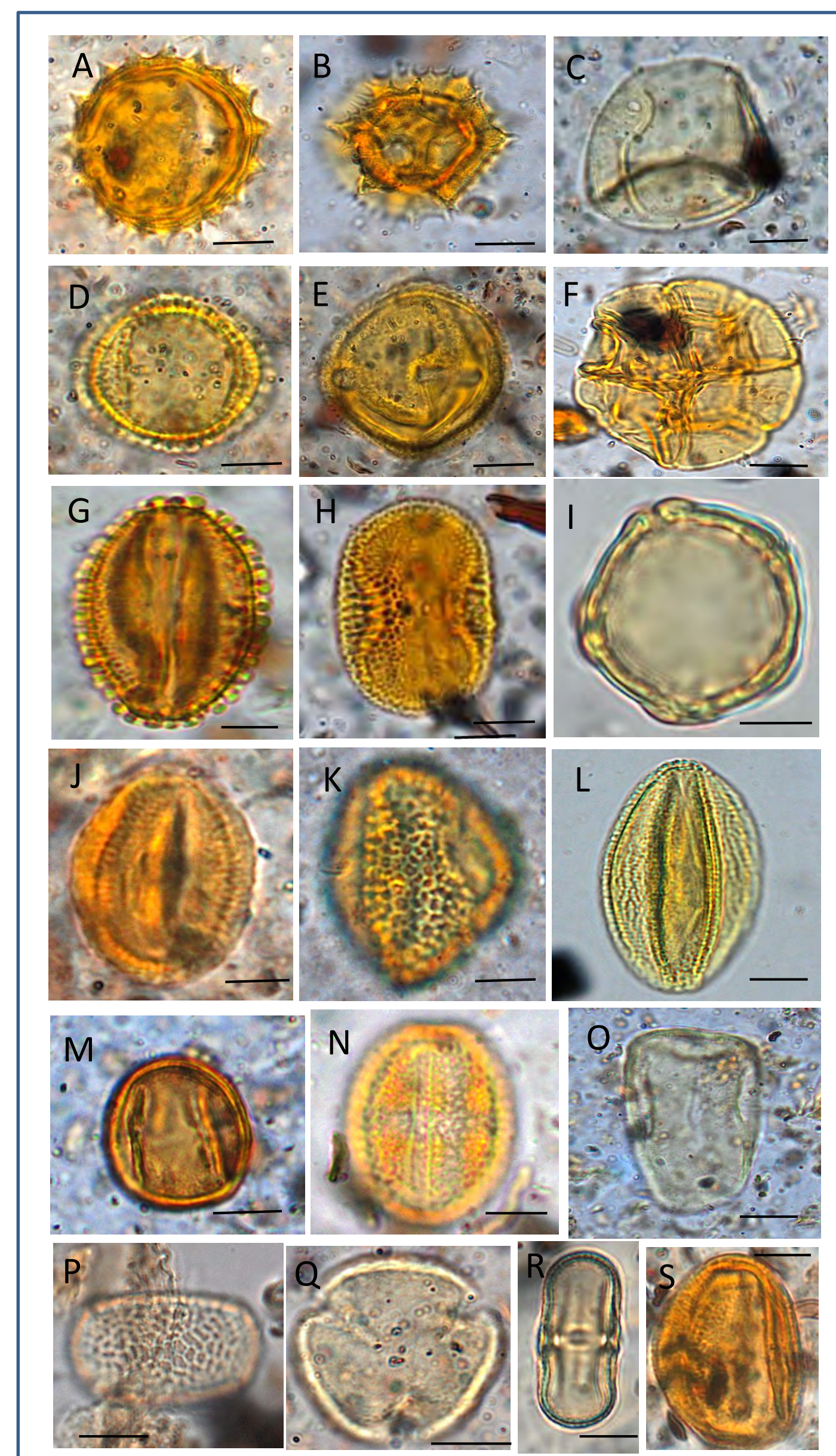
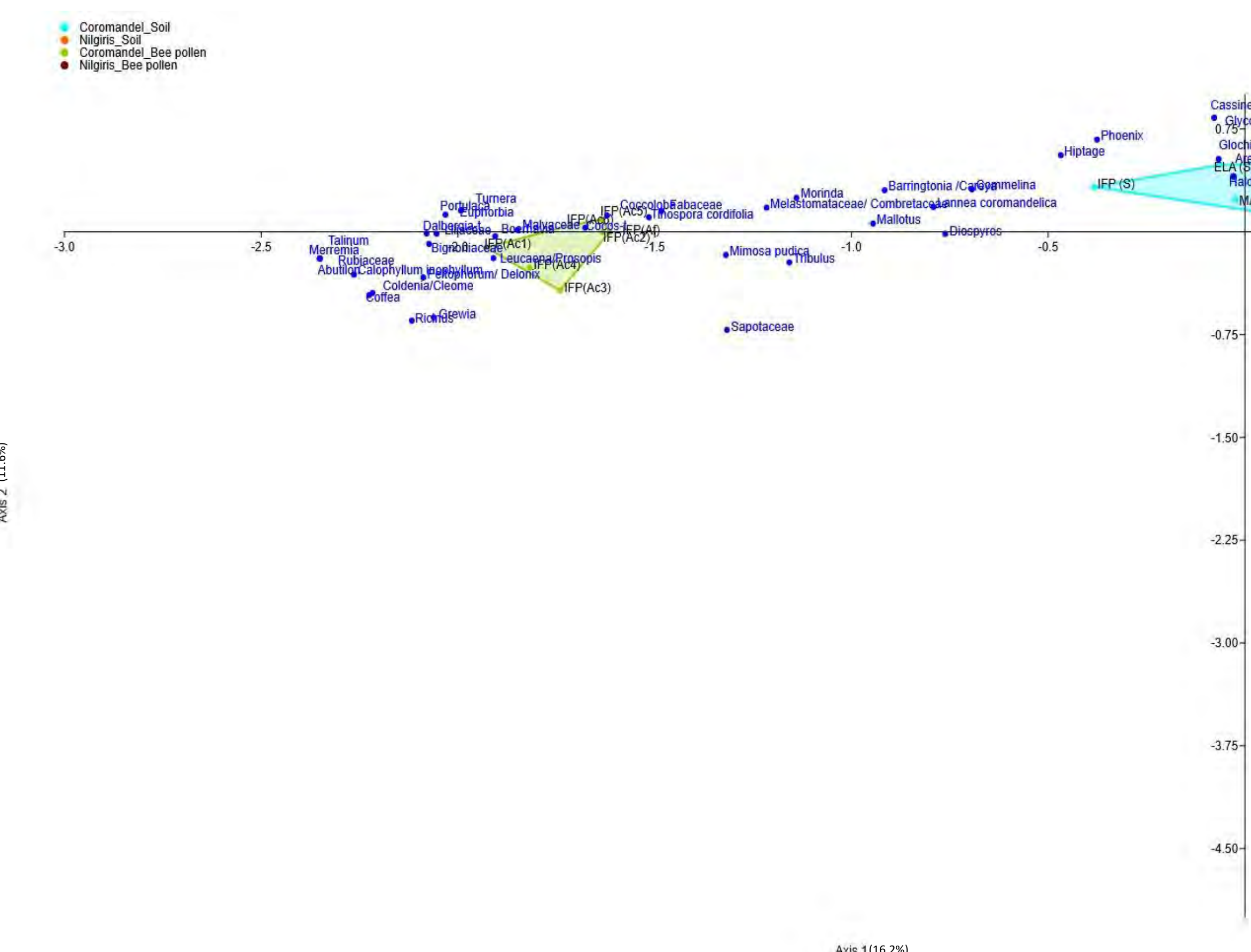


Diagram showing surface pollen & bee pollen percentages in three sites where both kinds of modern pollen samples were collected at the same location close to each other on the same day. The fourth pair is not depicted here.



LM images of some pollen taxa from the Nilgiris. A. Asteraceae (echinate); B. Asteraceae (fenestrate); C. Poaceae; D. *Olea glandulifera*; E. *Dodonaea viscosa*; F. *Acacia*; G. *Ilex*; H. *Justicia*; I. *Laurembergia*; J. *Artemisia*; K. *Ligustrum*; L. *Gentiana*; M. *Rapanea*; N. *Meliosma*; O. *Cyperaceae*; P. *Impatiens*; Q. *Daphniphyllum*; R. *Apiaceae*; S. *Turpinia nepalensis*. Scale bar: 10 µm



CA of the core data of 34 surface soil & bee pollen samples from the two landscapes

## CONCLUSION & PERSPECTIVES

- Palynology: a geospatial biological sensor, integrating local and regional pollen inputs
- Combined soil–bee datasets enhance understanding of pollination modes (anemophily + entomophily)
- Integrating palynology with GIS and remote-sensing strengthens landscape-level ecological interpretation
- Extend pollen sampling to the Eastern Ghats

- Incorporate knowledge from Chenchu honey-gatherers as an additional ecological index.
- Integrate pollen–vegetation relationships with archaeological & palaeoecological datasets.

## ACKNOWLEDGEMENTS

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