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A Multi-disciplinary Approach to Sheep/Goat Coprolite Analysis at Early Bronze Age. Les Mongets, Sévrier (France)

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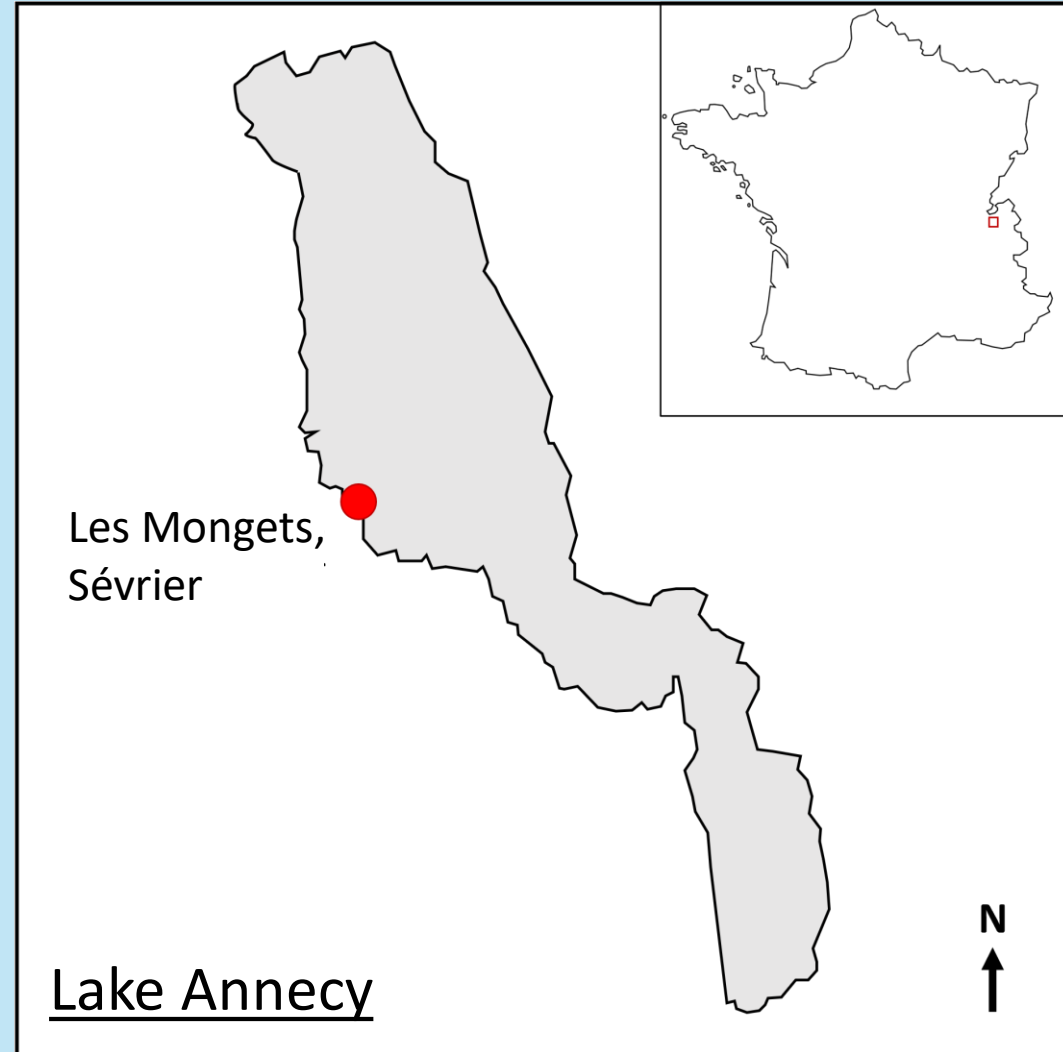
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Introduction

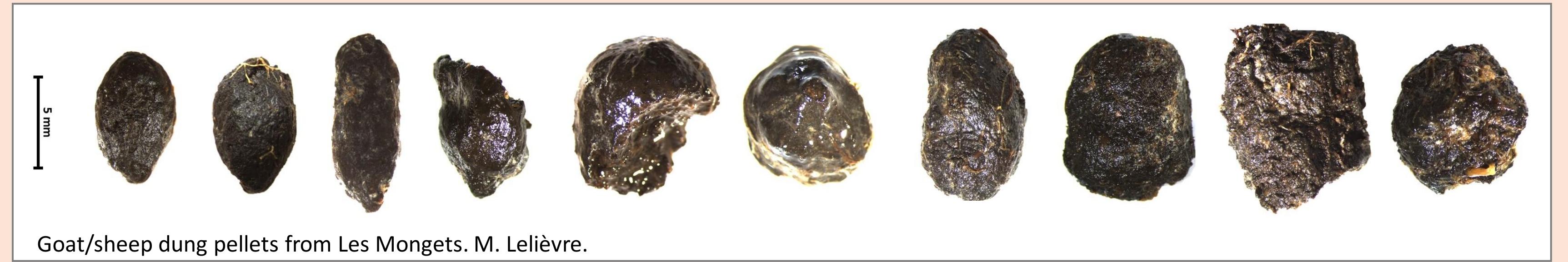
Les Mongets, a "pile-dwelling" site on the western shore of Lake Annecy, has been radiocarbon dated to the Early Bronze Age (2140-1632 cal. BC, Billaud 1992). The anaerobic conditions typical of wetland environments have led to exceptional preservation of organic materials at this site, including goat/sheep dung pellets.

A multidisciplinary study combining ancient DNA analysis, pollen analysis and macroremains identification was conducted on these pellets to gain insights in the environment of Les Mongets and the pastoral activities that were conducted there.



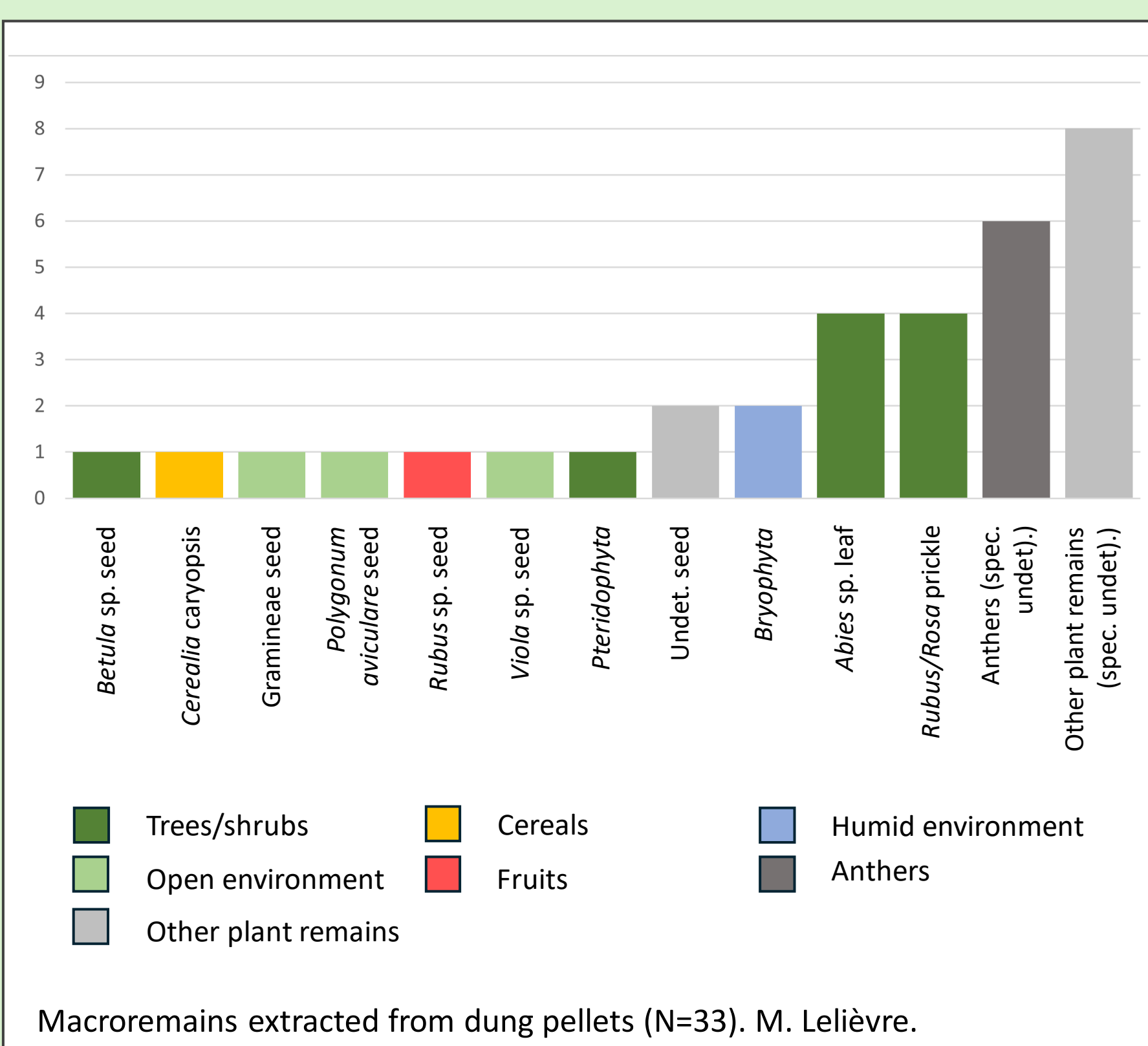
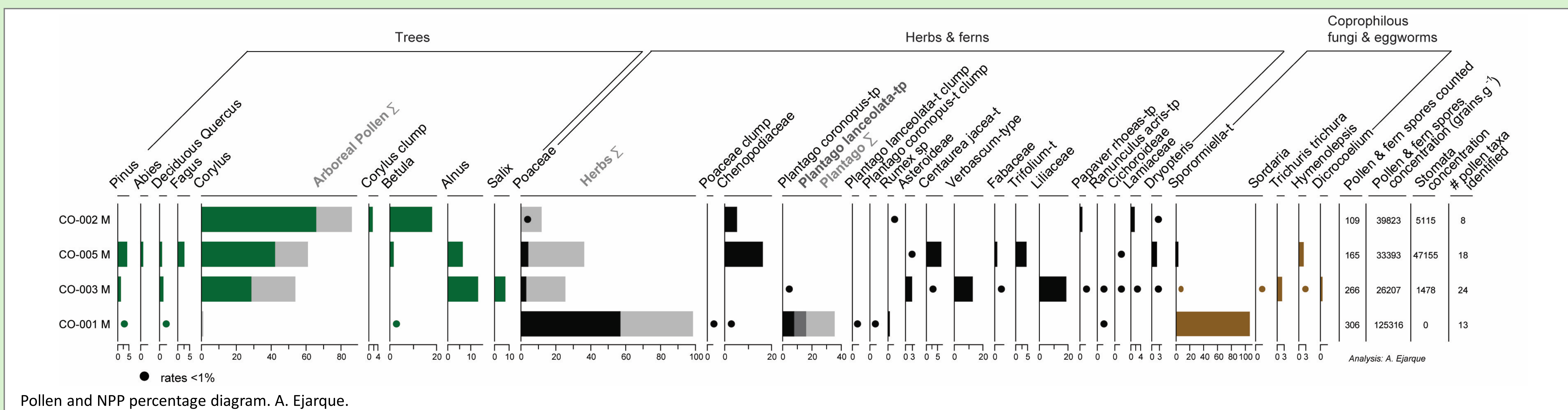
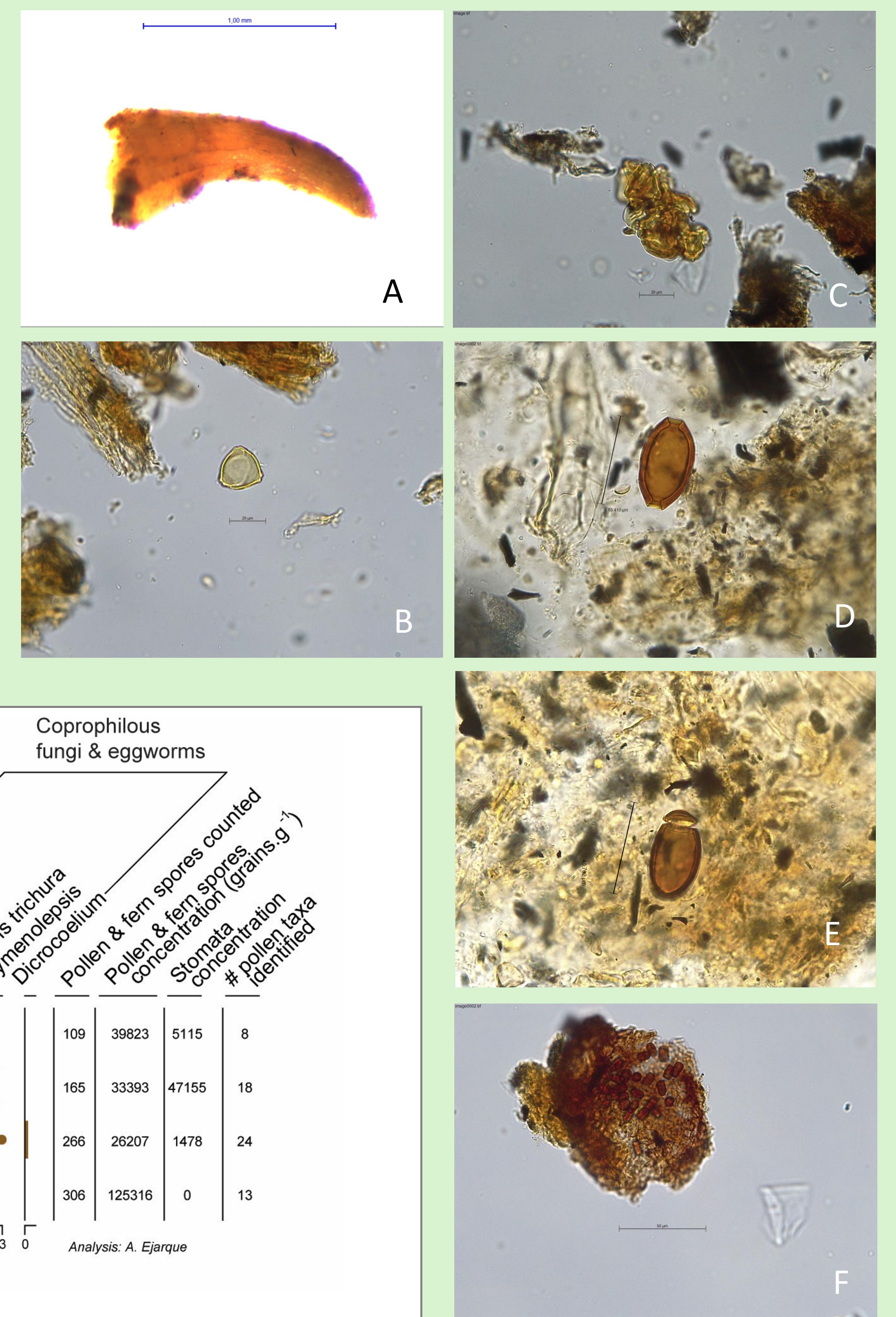
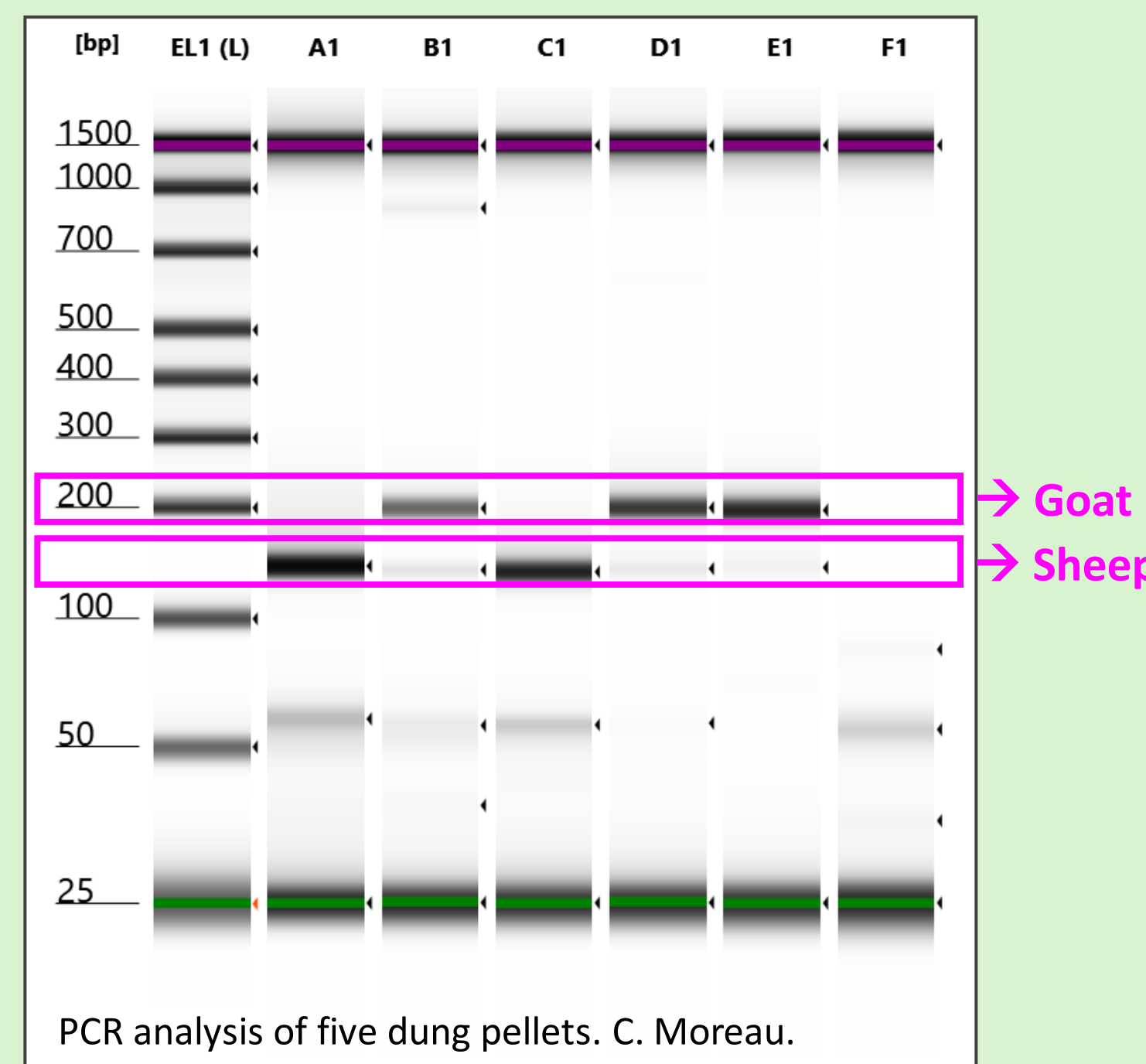
Materials and methods

- 10 coprolites were studied, split evenly between pollen and ancient DNA analysis. Individual pellets were initially deemed too small to be divided for both analyses.
- The methodology for treatment of the dung pellets was derived from Kühn *et al.* (2013), including cleaning of the surfaces to remove contaminants and dissection in demineralized water.
- Macroremains and aDNA extraction were done in the confined laboratory at Paleolab (Clermont-Ferrand). The aDNA extraction method was derived from Murchie *et al.* (2020); A Polymerase Chain Reaction (PCR) using the cytochrome b (cyt b) gene was used to determine the animal species, following Santaclara *et al.* (2007). Pollen and NPP analysis followed standard procedures (Faegri & Iversen 1989).



Results

- **aDNA:** Two coprolites came from sheep, three from goats.
- **Macroremains:** Prickles from brambles (*Rubus*, A) were identified, as well as fragments of fir (*Abies*) leaves and anthers of unidentified species.
- **Pollen and NPP:** Three pellets were dominated by deciduous tree taxa, mainly hazel (*Corylus*, B). Alder (*Alnus*), birch (*Betula*), and willow (*Salix*) were also abundant, together with a variety of herbs. One pellet was dominated by Poaceae and *Plantago* sp., including clumps (C). One individual was heavily parasitised by a variety of helminths such as *Trichuris* (D) and *Dicrocoelium* (E). High abundance coprophilus fungal spores were observed in one pellet (*Sporormiella-t*, F).



Discussion and conclusion

- Winter and early spring blooming taxa were ingested, particularly hazel which produces highly nourishing catkins. Hazel and fir branches may have been collected to serve as fodder or litter. Brambles such as *Rubus* sp. have perennial leaves, that can be attractive to goats.
- Pollen clumps suggest that hazel buds and/or flowers as well as gramineae and plantago flowers were eaten.
- Herbs blooming in spring and summer as well as leaves from deciduous species, could have been grazed directly by the animals, or could have been gleaned to be dried and used as hay during the winter. Early-spring collection of deciduous leaves would be consistent with the remaining presence of flowers of winter-pollinated trees such as hazel.
- Further multidisciplinary analyses could allow to :
 - Identify possible deciduous leaf fragments using stomata.
 - Reveal a wider panel of ingested plants using results from the aDNA sequencing, which will list all taxons whose aDNA was detected within the dung remains.
 - Combine all approaches, with new analyses on the same individual pellets, and explore the differences in food supply between goats and sheep.

References :

Billaud 1992: Billaud Y. (1992) – Prospections subaquatiques sur le site des Mongets (Sévrier, lac d'Annecy, Haute-Savoie) et sur les sites des Charretières, de Rupy et du Bout du Lac (Lac d'Annecy): rapport 1991; Faegri & Iversen 1989: Faegri K., Iversen J. (1989) – Textbook of Pollen Analysis, 4th ed. Wiley, Chichester; Kühn *et al.* 2013: Kühn M., Maier U., Herbig C., Ismail-meyer K., Le Bailly M., Wick L. (2013) – Methods for the examination of cattle, sheep and goat dung in prehistoric wetland settlements with examples of the sites Alleshäusen-Taschenwiesen and Alleshäusen-Grundwiesen (around cal 2900 BC) at Lake Federsee, south-west Germany, *Journal of Environmental Archaeology* vol. 18, no 1, p. 43-57; Murchie *et al.* 2020: Murchie, T. J., Kuch, M., Duggan, A. T., Ledger, M. L., Roche, K., Klunk, J., Karpinski, E., Hackenberger, D., Sadoway, T., MacPhee, R., et al. (2020) – Optimizing Extraction and Targeted Capture of Ancient Environmental DNA for Reconstructing Past Environments Using the PalaeoChip Arctic-1.0 Bait-Set. *Quat. Res.*, 99, 1–24; Santaclara *et al.* 2007: Santaclara, F. J., Espiñeira, M., Cabado, A. G., & Vieites, J. M. (2007) – Detection of Land Animal Remains in Fish Meals by the Polymerase Chain Reaction-Restriction Fragment Length Polymorphism Technique. *J. Agric. Food Chem.*, 55(2), 305–310.

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