Maternal origin of honeybee (*Apis mellifera*) colonies from across Europe

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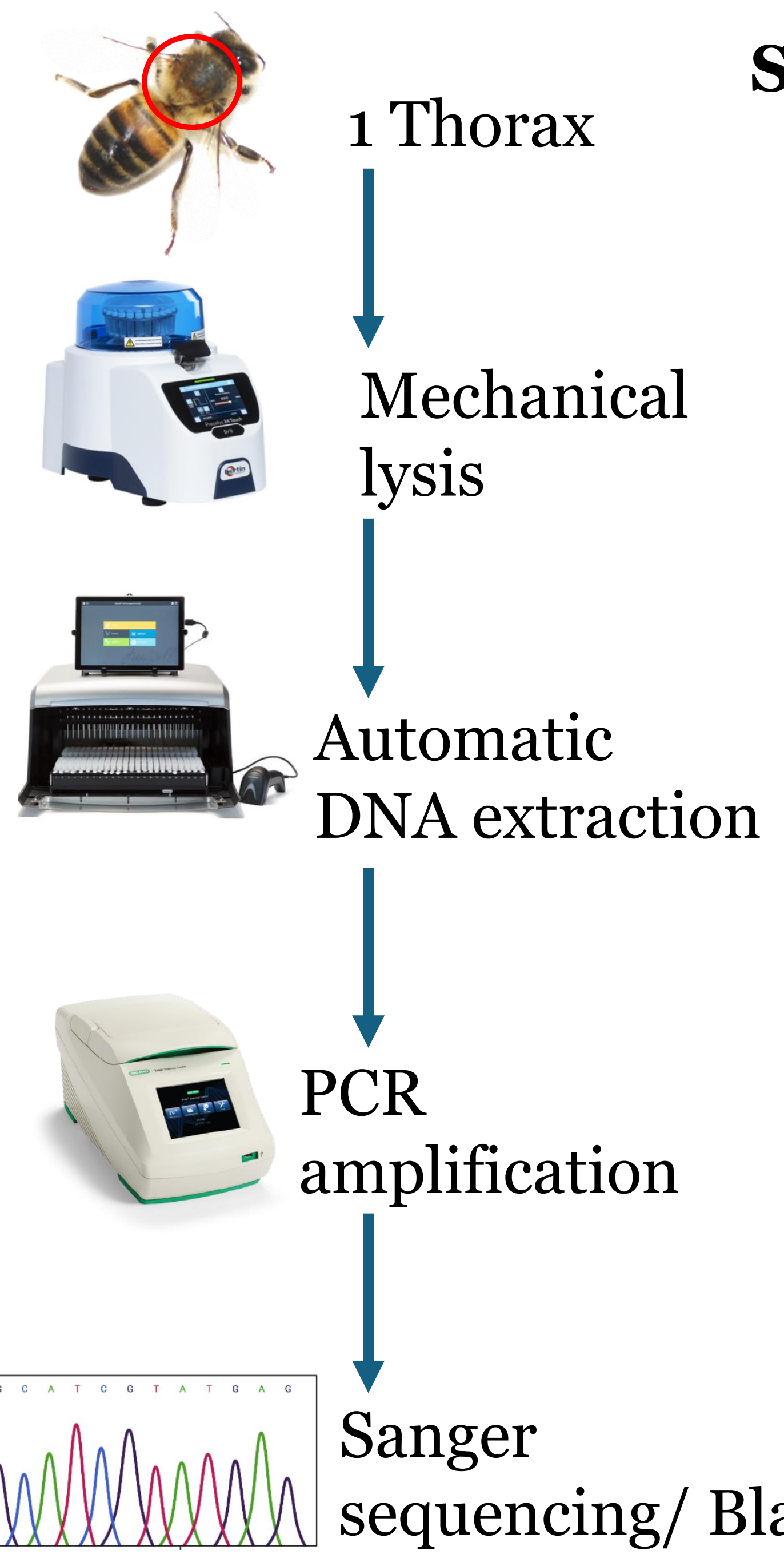
Introduction

Worldwide commercial beekeeping threatens the native origin of the honeybee (*Apis mellifera*), with beekeepers favouring subspecies of Eastern European C-lineage ancestry due to their docile behaviour and high honey production traits. In many parts of Western and Northern Europe, queens of Western European M-lineage ancestry have been massively replaced by queens of C-lineage ancestry, and this has led to the development of conservation programs aiming at recovering native lines. The maternally-inherited mitochondrial DNA (mtDNA), particularly the intergenic region tRNA^{leu}-cox2, has been the marker of choice for assessing honeybee variation at large geographical scales.

<u>GOAL:</u> assess the mtDNA variation across 28 European countries

Materials & Methods



1 Thorax

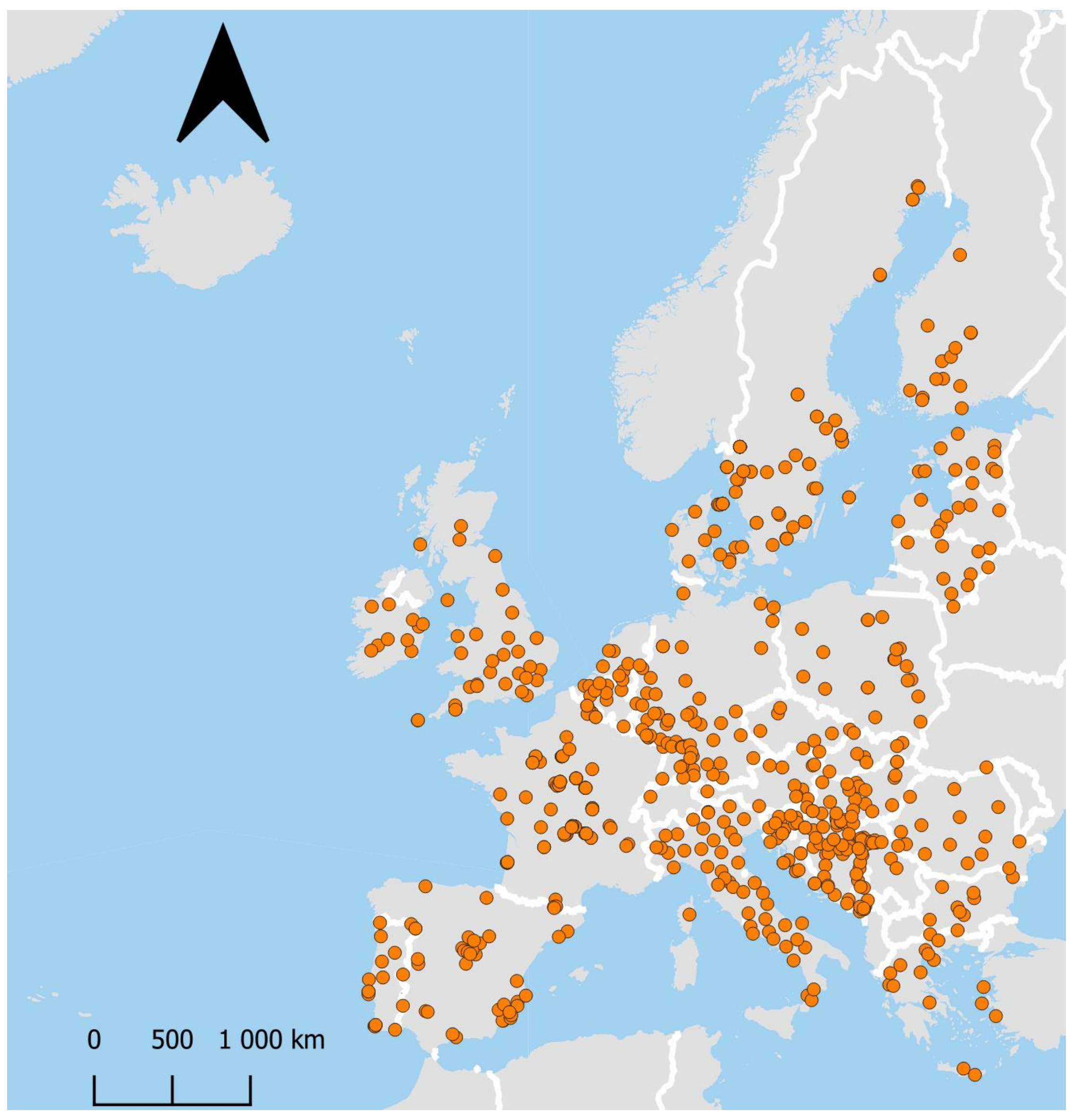
Mechanical lysis

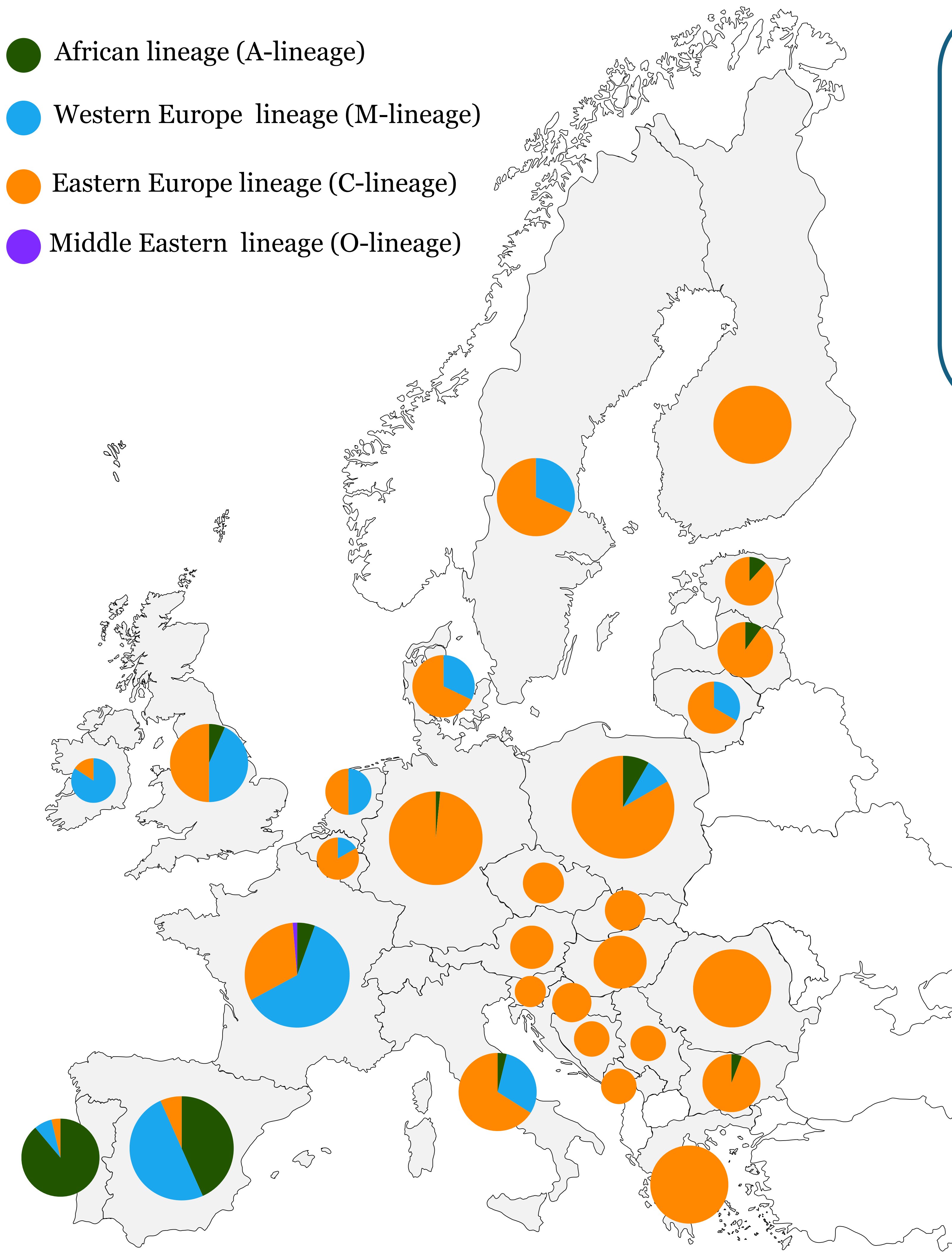
Automatic DNA extraction

PCR amplification

Sanger sequencing/ Blast N/ Mega alignment

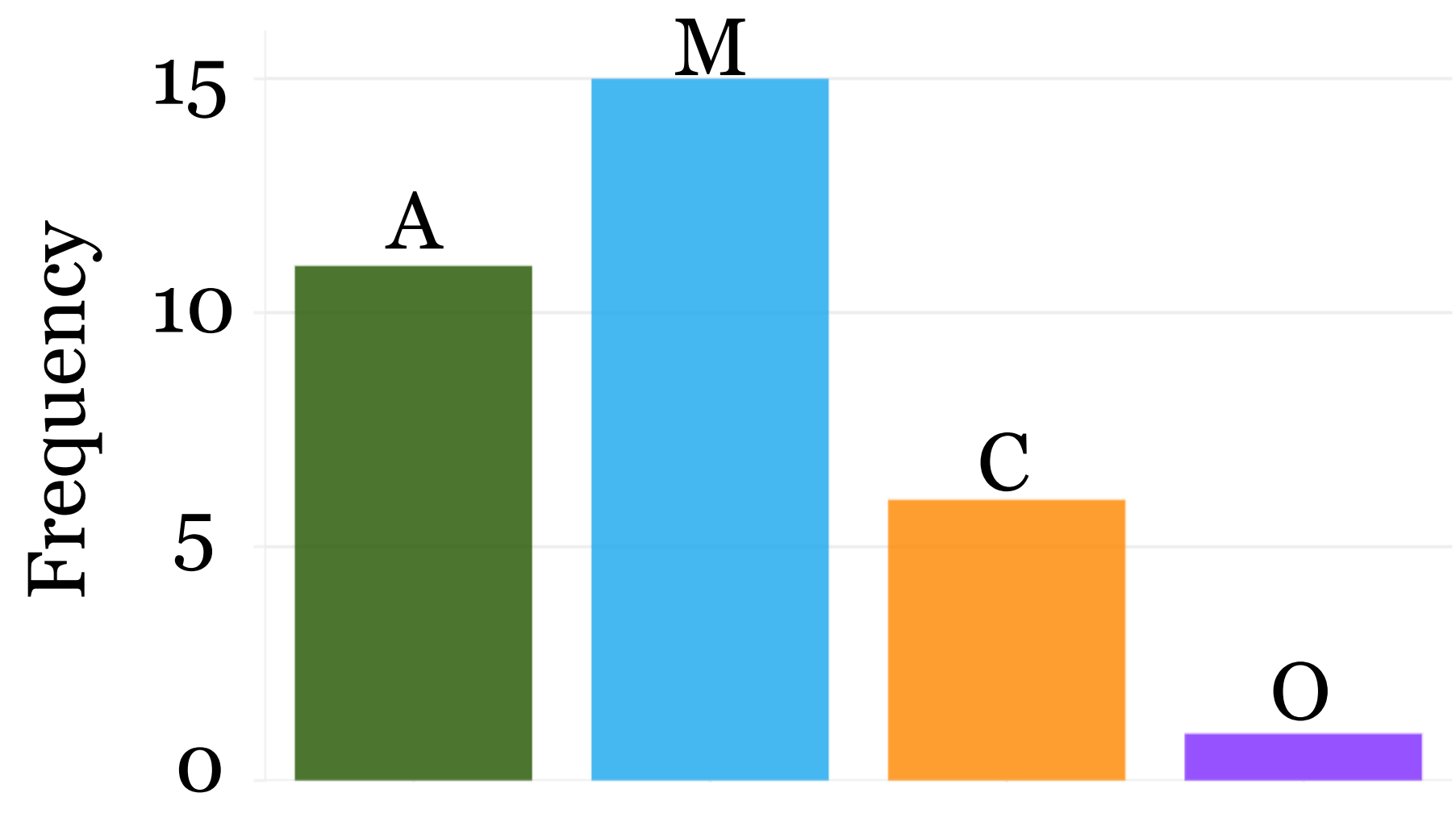
Sampling: 853 samples, 28 European countries





- **765 samples** demonstrated good sequencing quality (missing data = 10%)
- Portugal and Spain with a higher number of colonies exhibiting A and M lineage. However, C-lineage colonies were also detected in Portugal (1) and Spain (2).
- Conservation centres in France and Denmark (Læsø) exhibiting M-lineage colonies.
- Remaining countries are dominated by colonies of C-lineage maternal ancestry.

Number of haplotypes by lineage



<u>Haplotypes:</u>

Most frequent **A:**
- **A1** (mainly found in Portugal)

Most frequent **M:**
- **M4** (France, Denmark, Spain, Ireland, Italy)

Most frequent **C:**
- **C2** (Germany, Greece, Italy, and most of eastern countries)
- Only the **Czech Republic** showed exclusive **C1 colonies**.

This unprecedented mtDNA analysis across Europe **underscores the worrying dominance of C-lineage** genetic variation, highlighting the **urgent need for strategic conservation efforts to preserve the native genetic diversity of *Apis mellifera*.**

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