

# Ancient DNA extraction from museum collections

## What do Lepidoptera species tell us?

Elsa CALL

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LUNDS  
UNIVERSITET

**BIG4**  
Biosystematics, Informatics, Genomics



**BIG4 Midterm Review  
meeting**

**Tovetorp 14/10/2016**



- Natural history museum collections are abundant
  - Use for morphological studies
- DNA from these specimens
  - Too degraded to be used



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  - Use for morphological studies
- DNA from these specimens
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  - Next-Generation Sequencing
    - New possibilities
    - Short fragments
  - Successfully from “fossilized” taxa
    - Neanderthals, mammoths and cave bears



- Complete first draft version of the Neanderthal genome
  - Studies of the recent evolutionary story of modern human
  - Understanding our own genome
    - Finding the “language gene”
    - Diseases (type 2 diabetes, Crohn's disease )





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  - Investigate the level of DNA preservation
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  - Investigate the level of DNA preservation
  - Develop protocols to sequence genomic DNA
  - Target rare and difficult to collect lineages
- New advances in the field of “museomics”
- Phylogenetic relationships of major lineages in Lepidoptera



- Investigating the level of DNA preservation in museum specimens of various ages
  - Are there any general trends in the preservation of DNA over time?

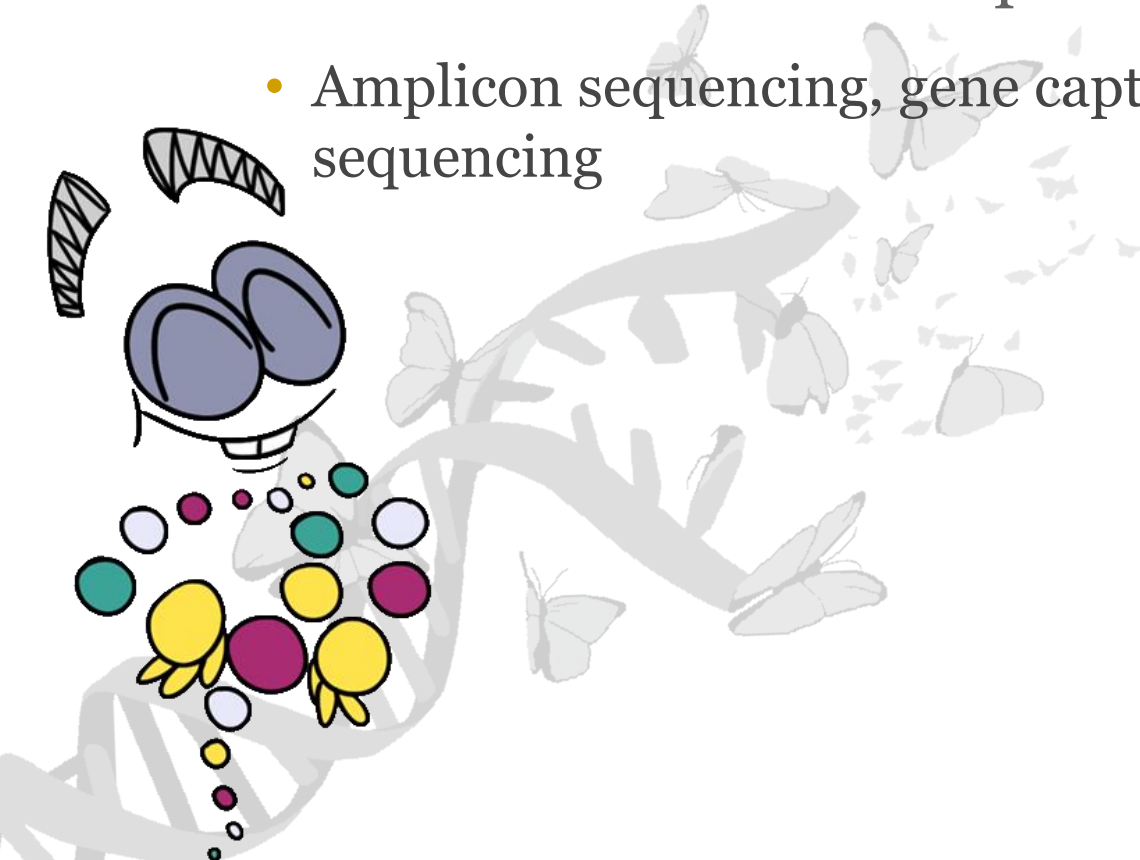


- Investigating the level of DNA preservation in museum specimens of various ages
  - Are there any general trends in the preservation of DNA over time?
  - Assessment of the state of DNA preservation
  - Investigate the suitability of such samples for Next-Generation Sequencing

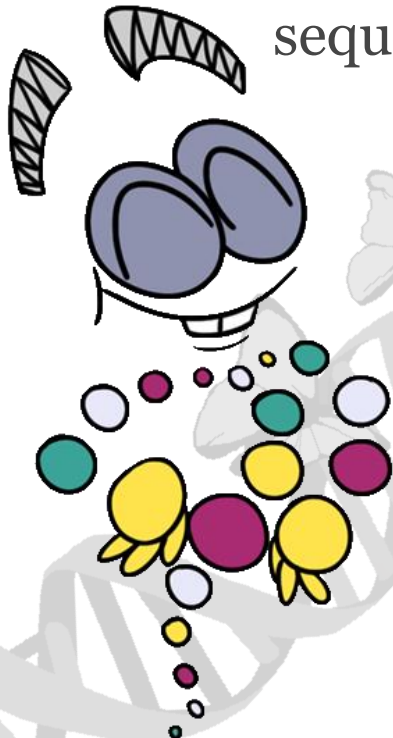




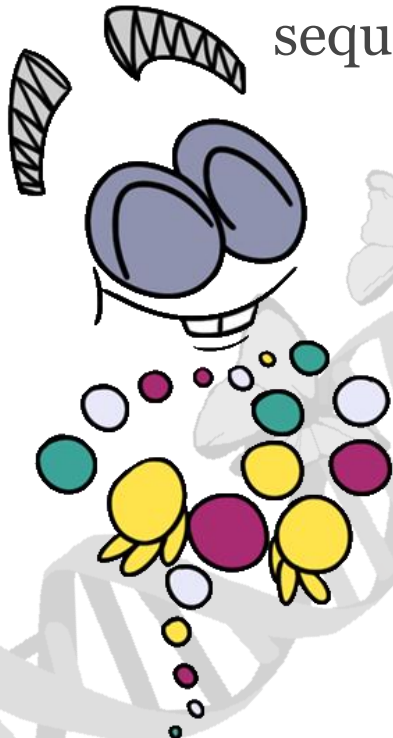
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    - Which one is the best?
      - To sequence homologous regions of the genome in different taxa
    - ➔ In our case: Gene capture seems more appropriate



- Two projects will concentrate on clades of Lepidoptera to resolve phylogenetic relationships
  - Geometroidea and Noctuoidea
    - ~35,000 known species each
    - Worldwide repartition
    - Extensive collections in Copenhagen and Stockholm

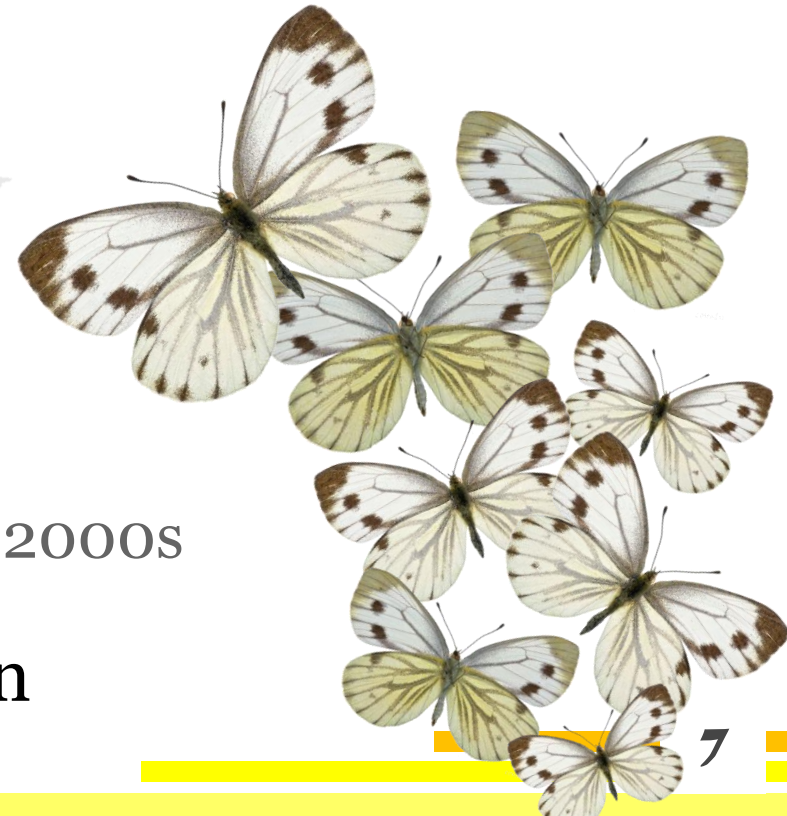


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- *Pieris napi* (Pieridae)
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- 25 selected specimens
- From 1878 to 2008
- 5 different periods
  - 1880s, 1920s, 1940s, 1960s and 2000s
- DNA extraction from abdomen

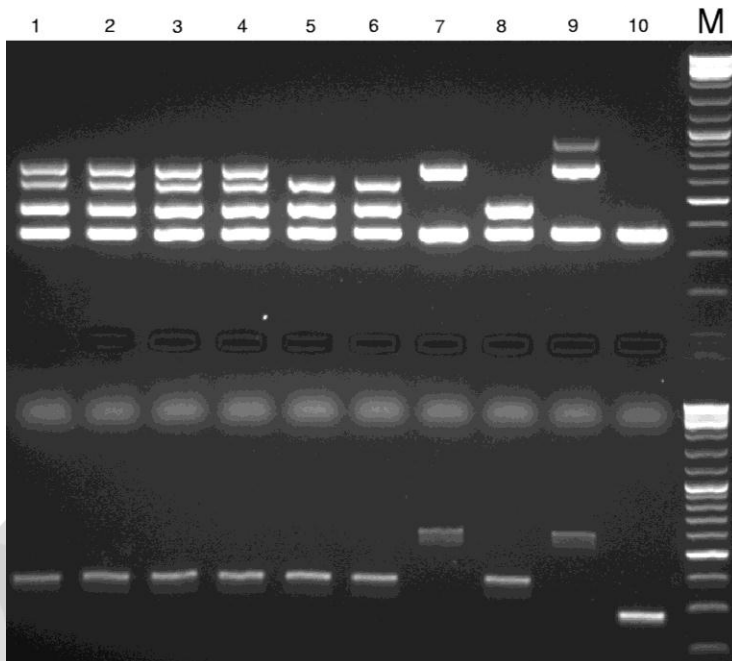


- How the DNA looks like
  - DNA is more degraded in older specimens than in fresh ones



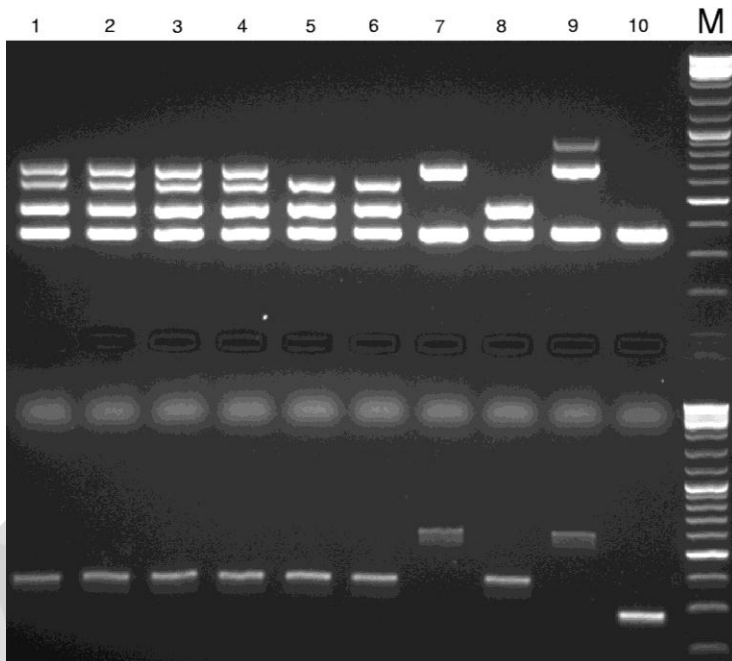
- First results

- Attempted method
  - Saturated NaCl
- Expectation



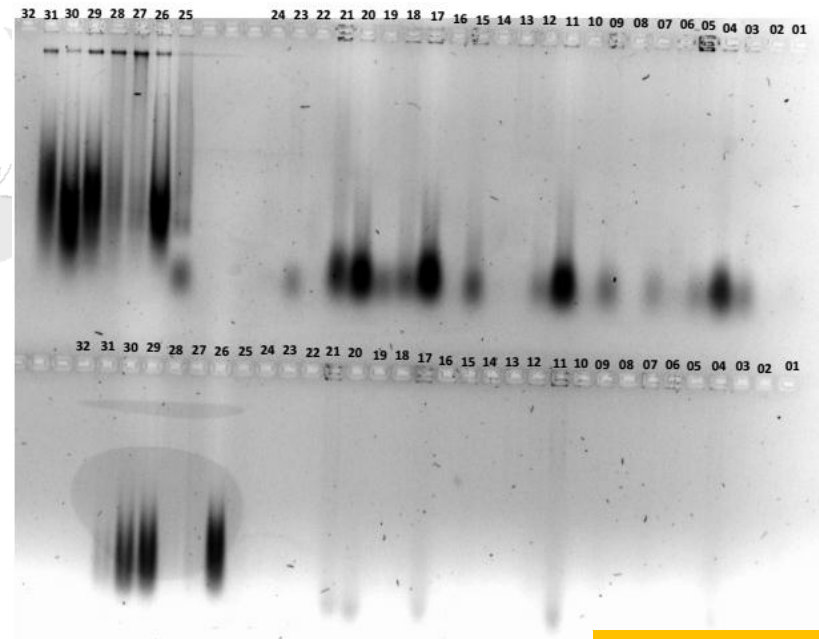
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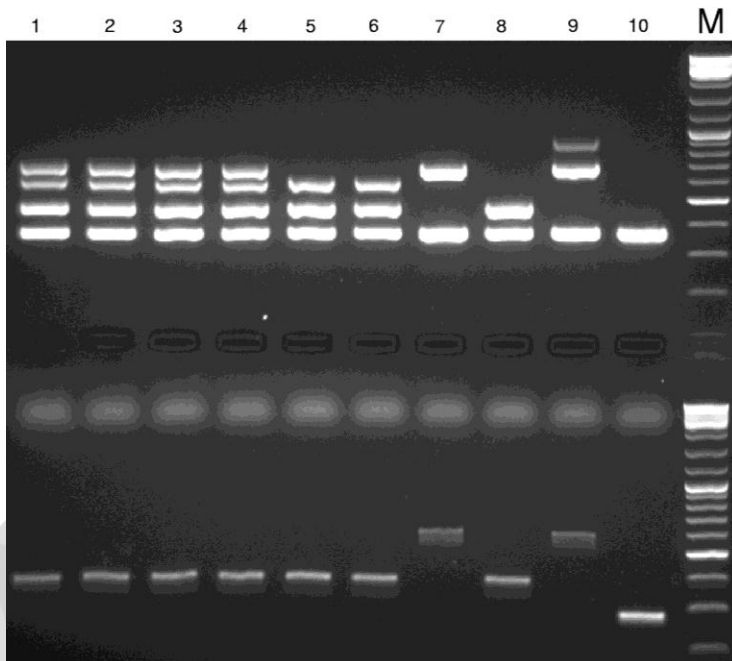
vs

Reality



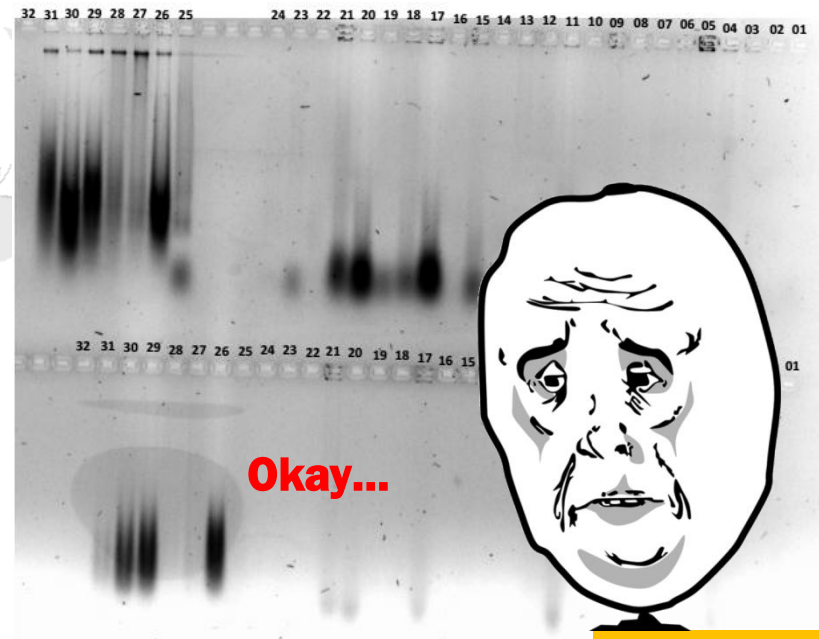
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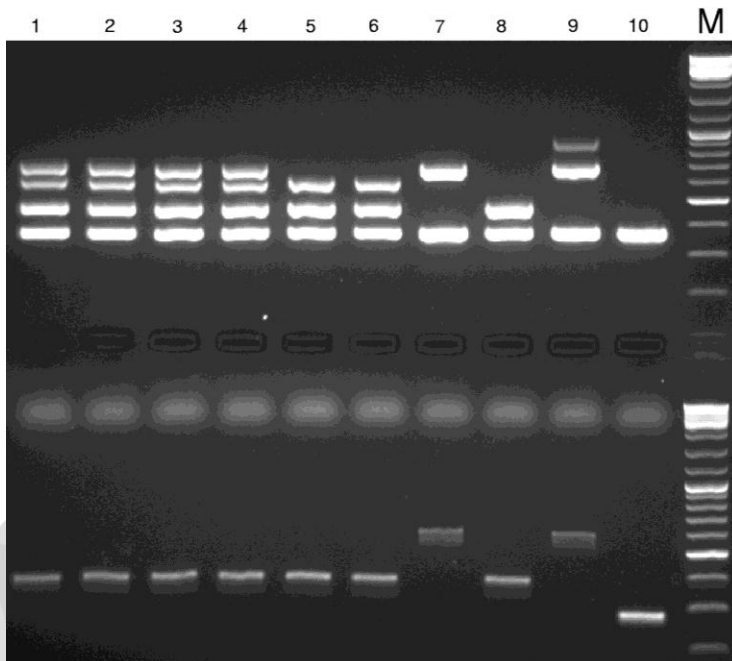
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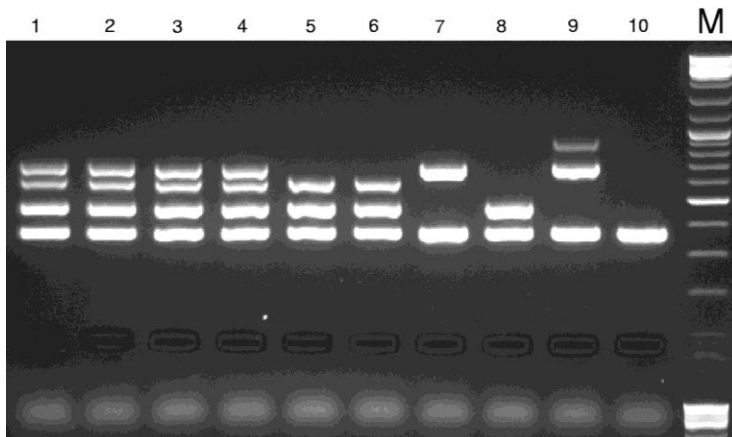
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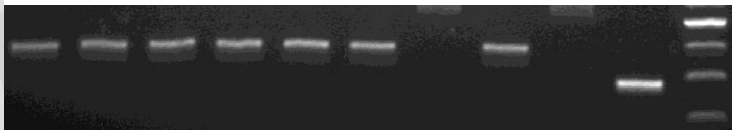


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➡ Try another method



vs

Reality



- Many applications
- But ancient DNA is difficult to sequence
- Several methods to test
- Genomic data can be used to resolve phylogenetic relationships of two clades of Lepidoptera
  - Geometroidea and Noctuoidea



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