

Sedimentary DNA insights into Holocene Adélie penguin populations and ecology in the Ross Sea, Antarctica

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Key collaborators



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Guojie Zhang

Funding and logistical support



Antarctica
New Zealand

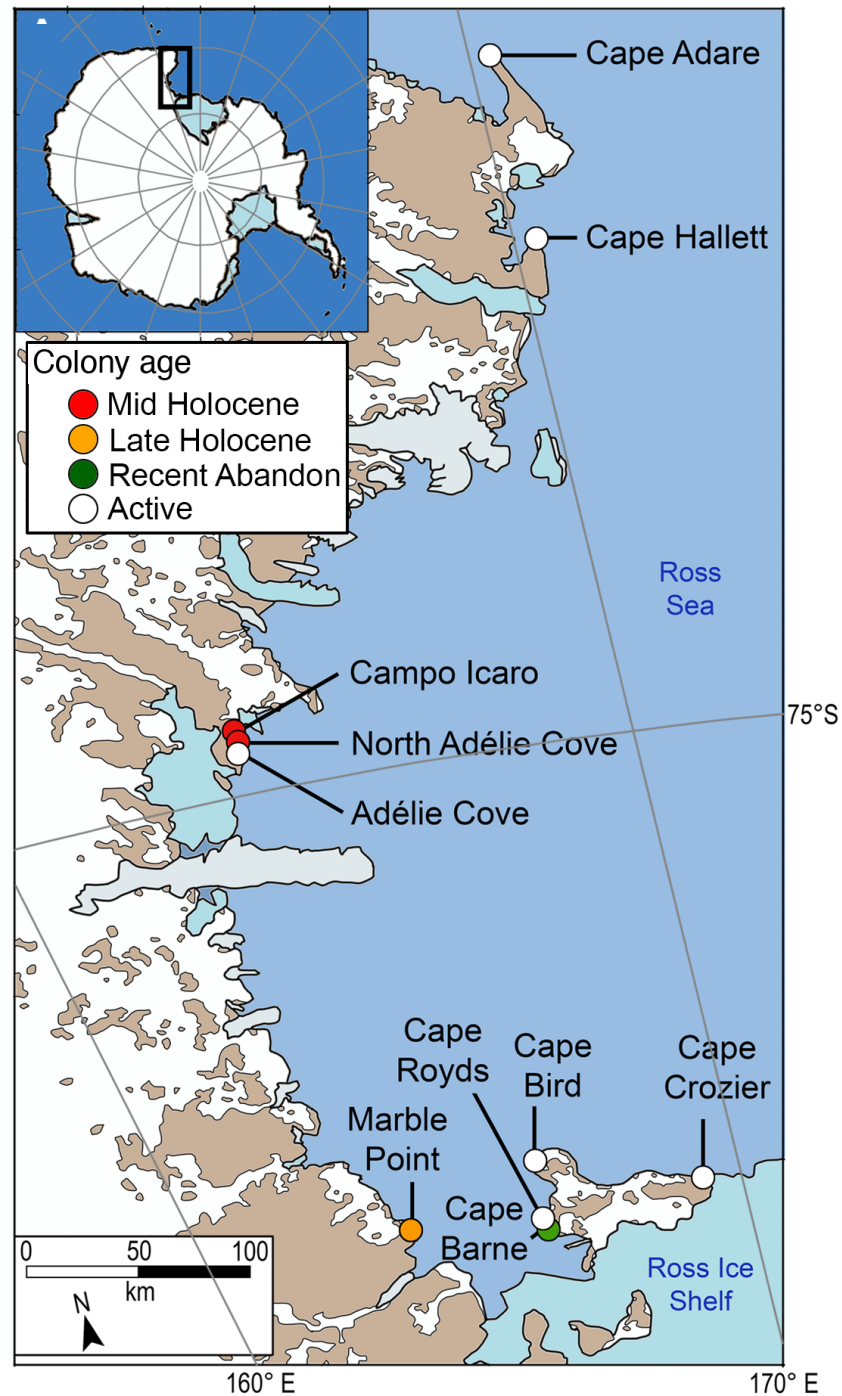


Zhejiang University
Centre For Evolutionary & Organismal Biology



MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Active colonies



Abandoned colonies



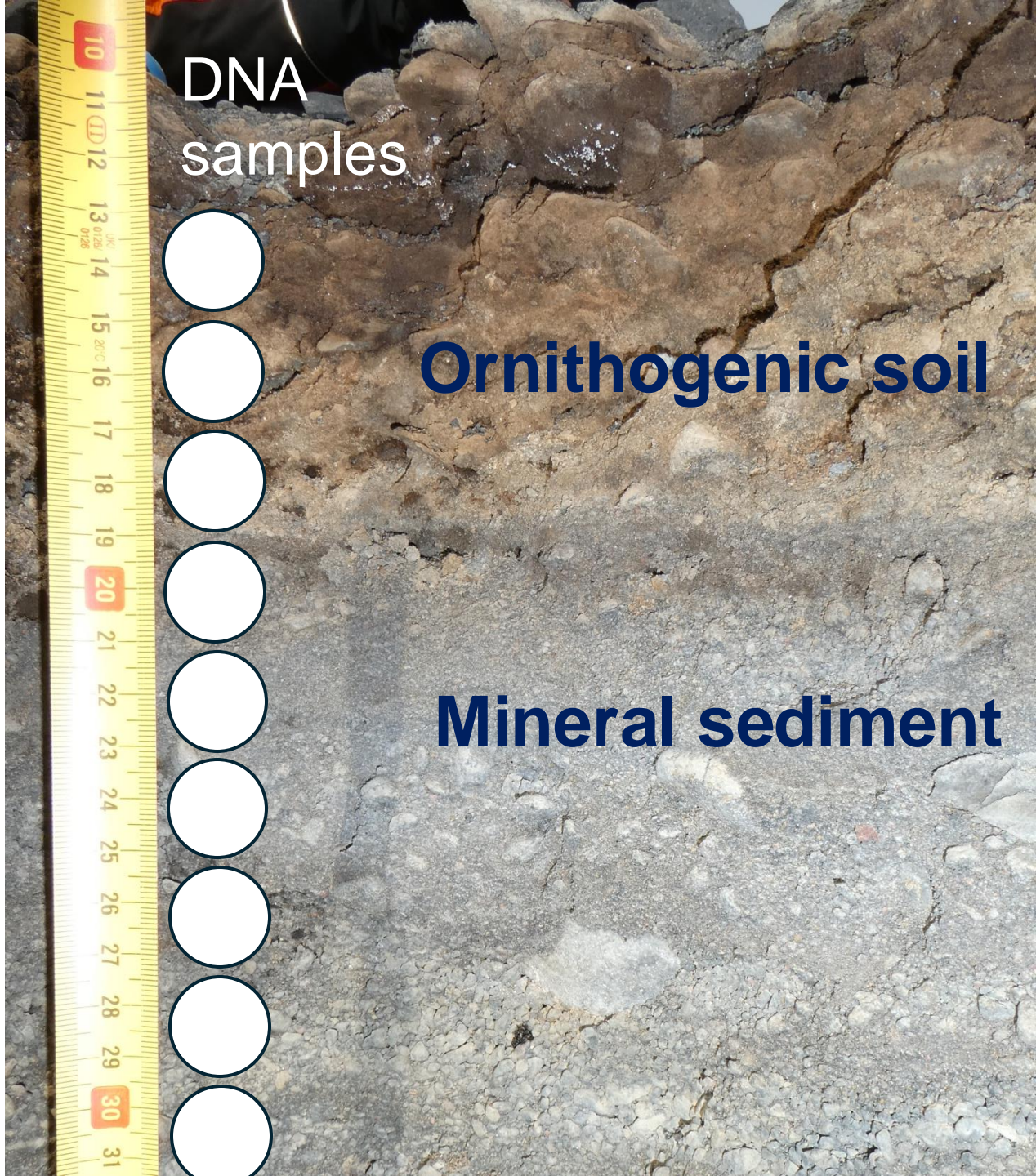


DNA
samples



Ornithogenic soil

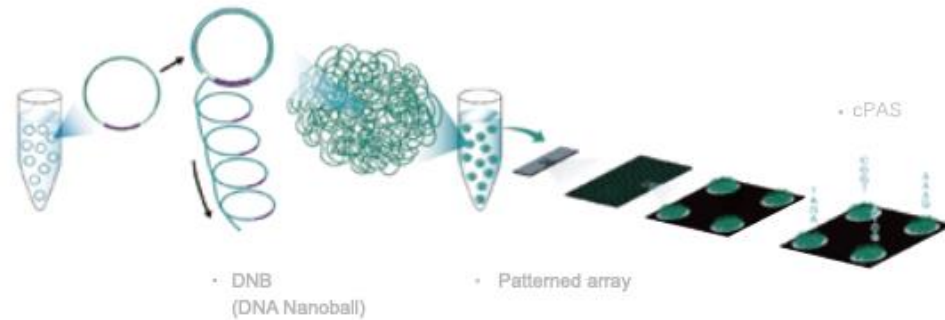
Mineral sediment



Laboratory processing

- Ancient DNA laboratory for extraction and library preparation steps
- DNA extracted with Qiagen PowerMax Soil Kit
- 172 shotgun libraries with 18 controls (Blunt-End Single-Tube Protocol)
- DNBSEQ-T1 platform (14,209,972,895 PE reads)

MGI'S PROPRIETARY
DNBSEQ™
TECHNOLOGY



INCREASED
ACCURACY

DECREASED
DUPLICATES

REDUCED
INDEX HOPPING

Animals and plants



Pygoscelis



Stercorarius



Oceanites



Hydrurga



Mirounga



Leptonychotes



Collembola

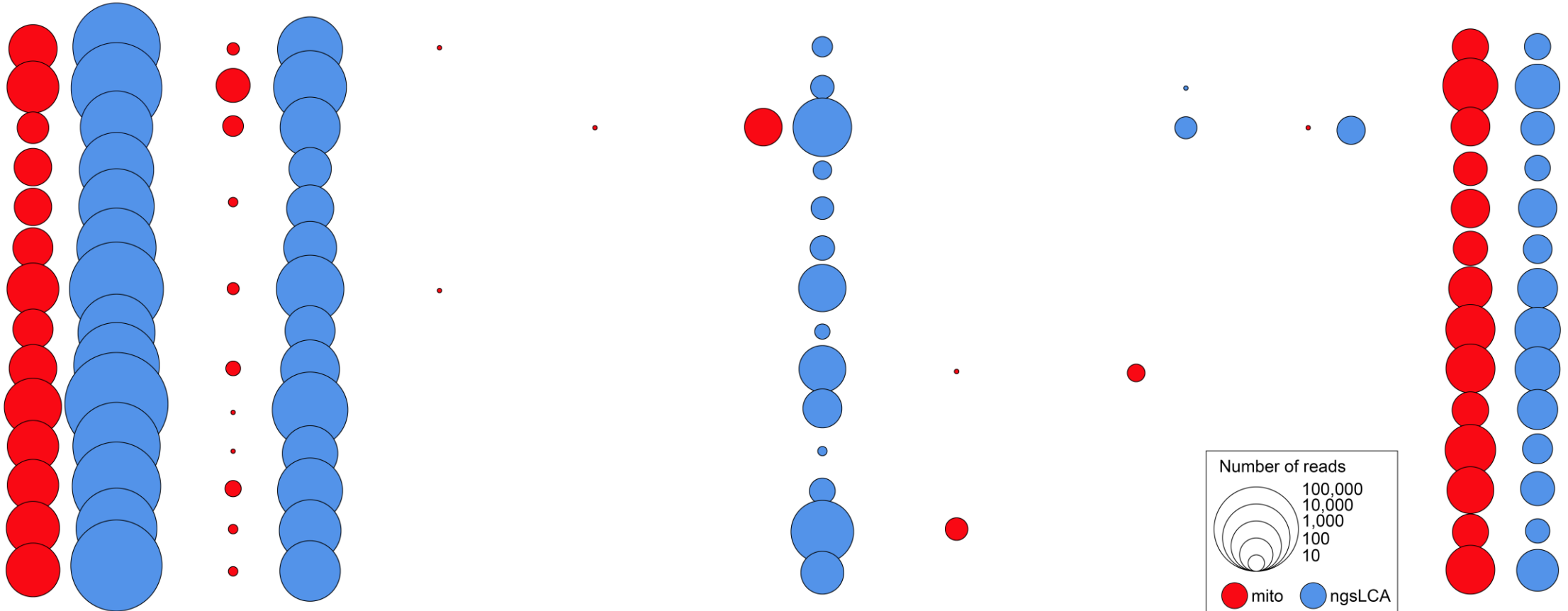


Eutardigrada

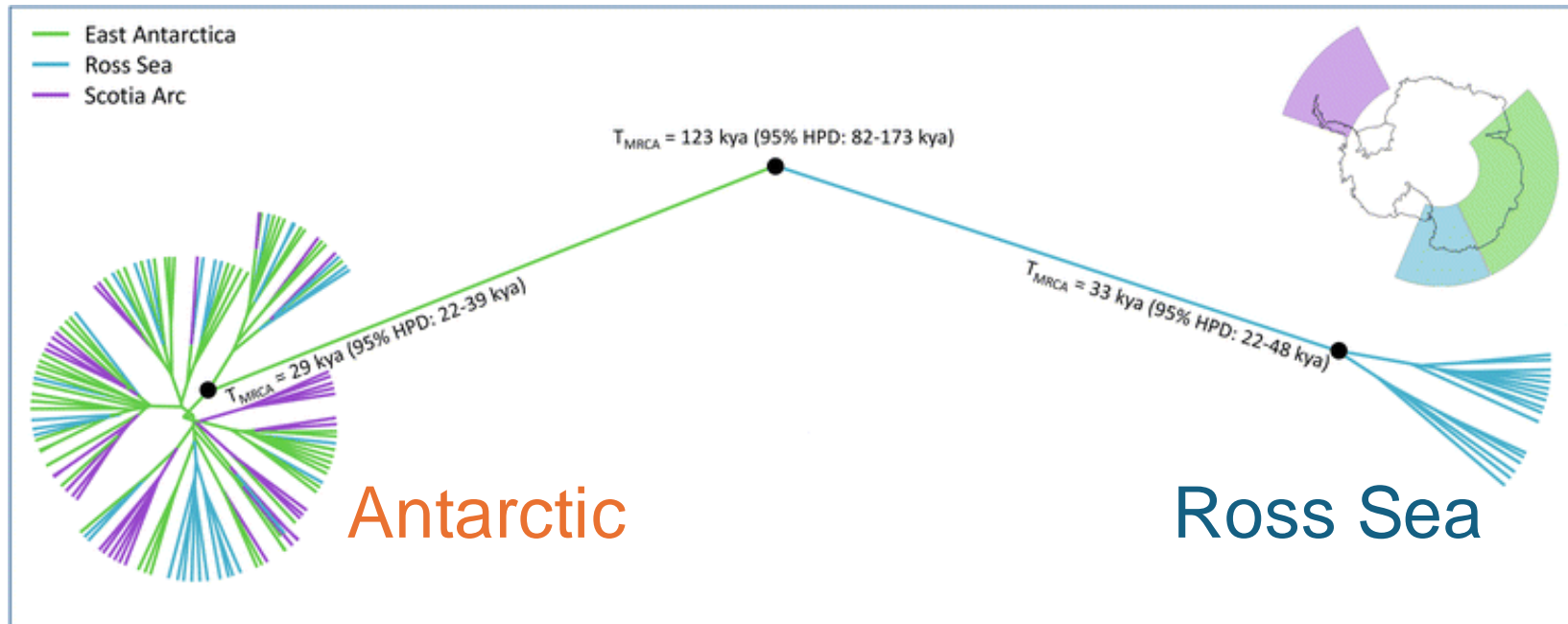


Bryopsida

- Cape Adare 2
- Cape Adare 1
- Cape Hallett
- Campo Icaro
- N. Adelie Cove
- Adelie Cove
- Cape Bird
- Marble Point 2
- Marble Point 1
- Cape Crozier
- Cape Royds 1
- Cape Royds 2
- Cape Barne 1
- Cape Barne 2

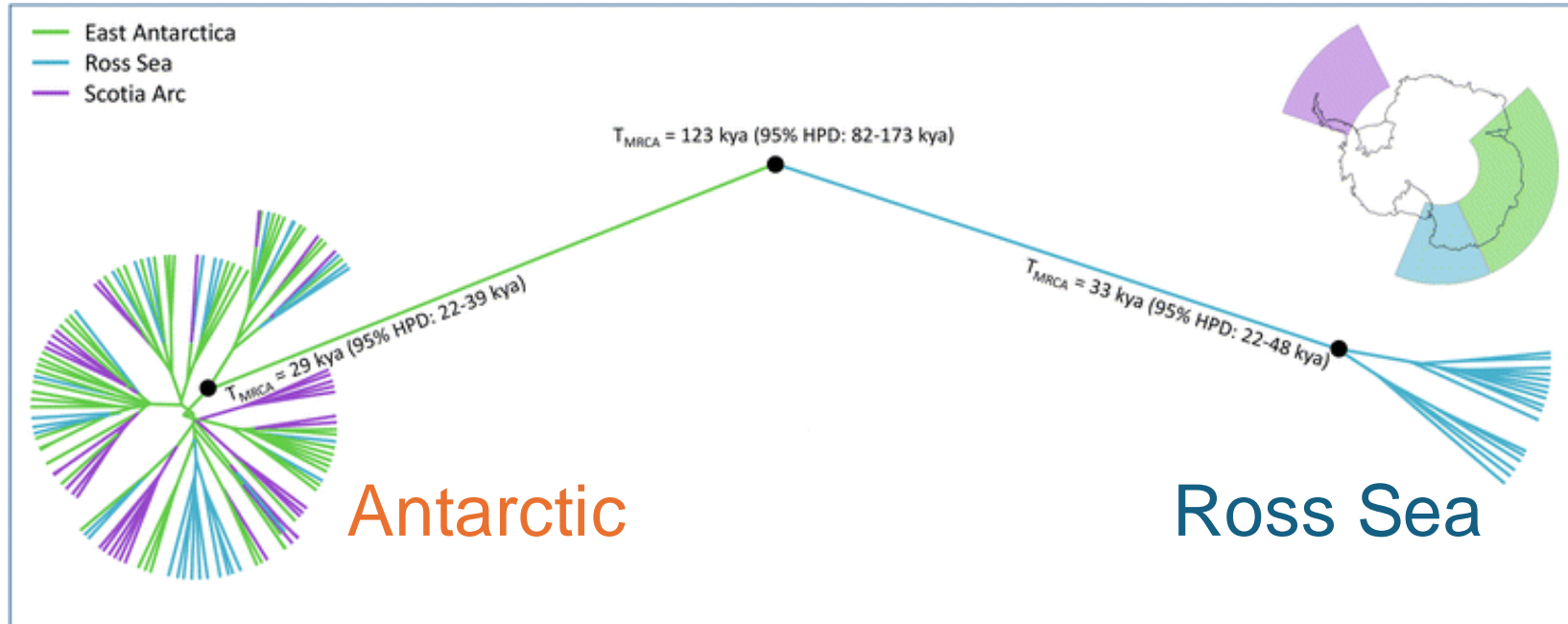


Adélie penguin mitochondrial lineages

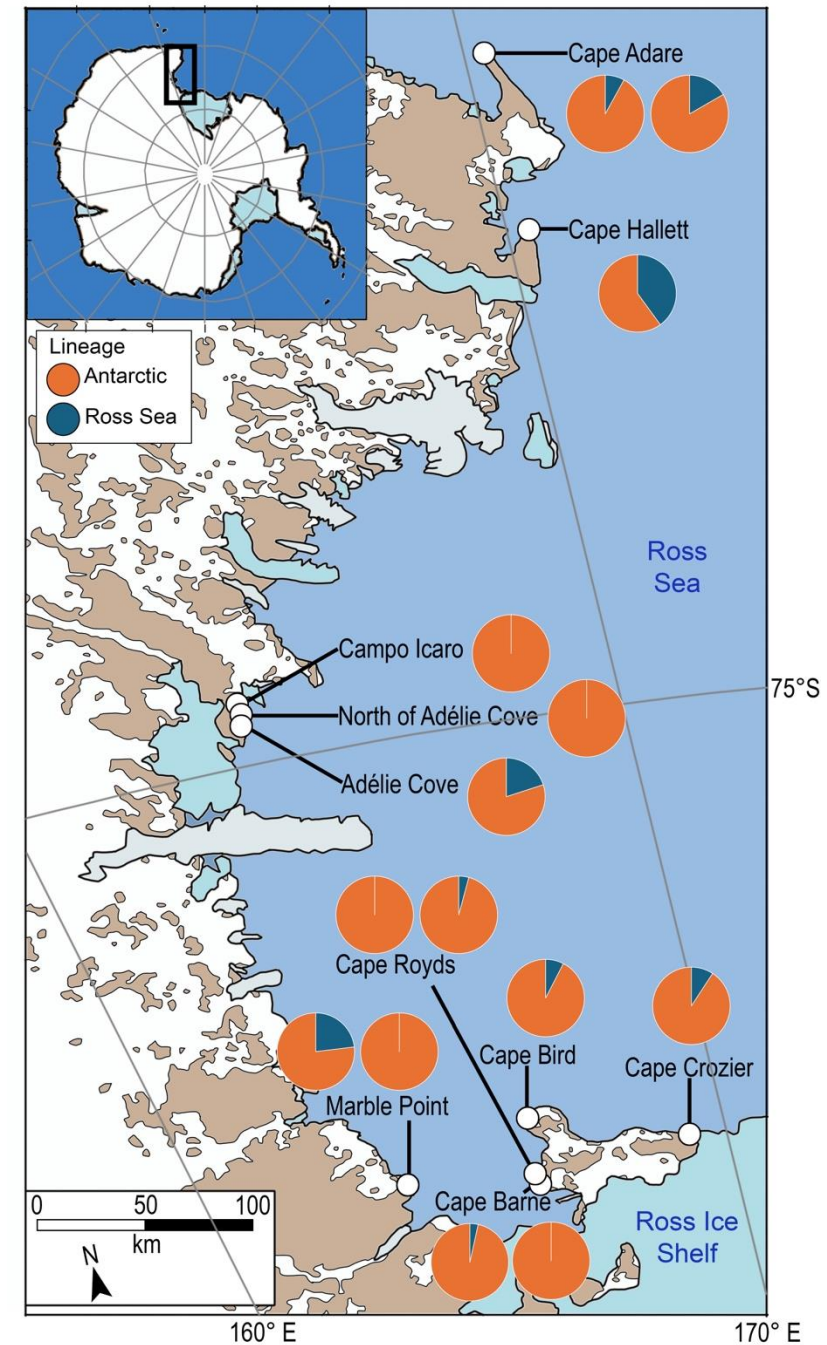


Younger *et al.* (2015) *BMC Evol. Biol.* 15: 236.

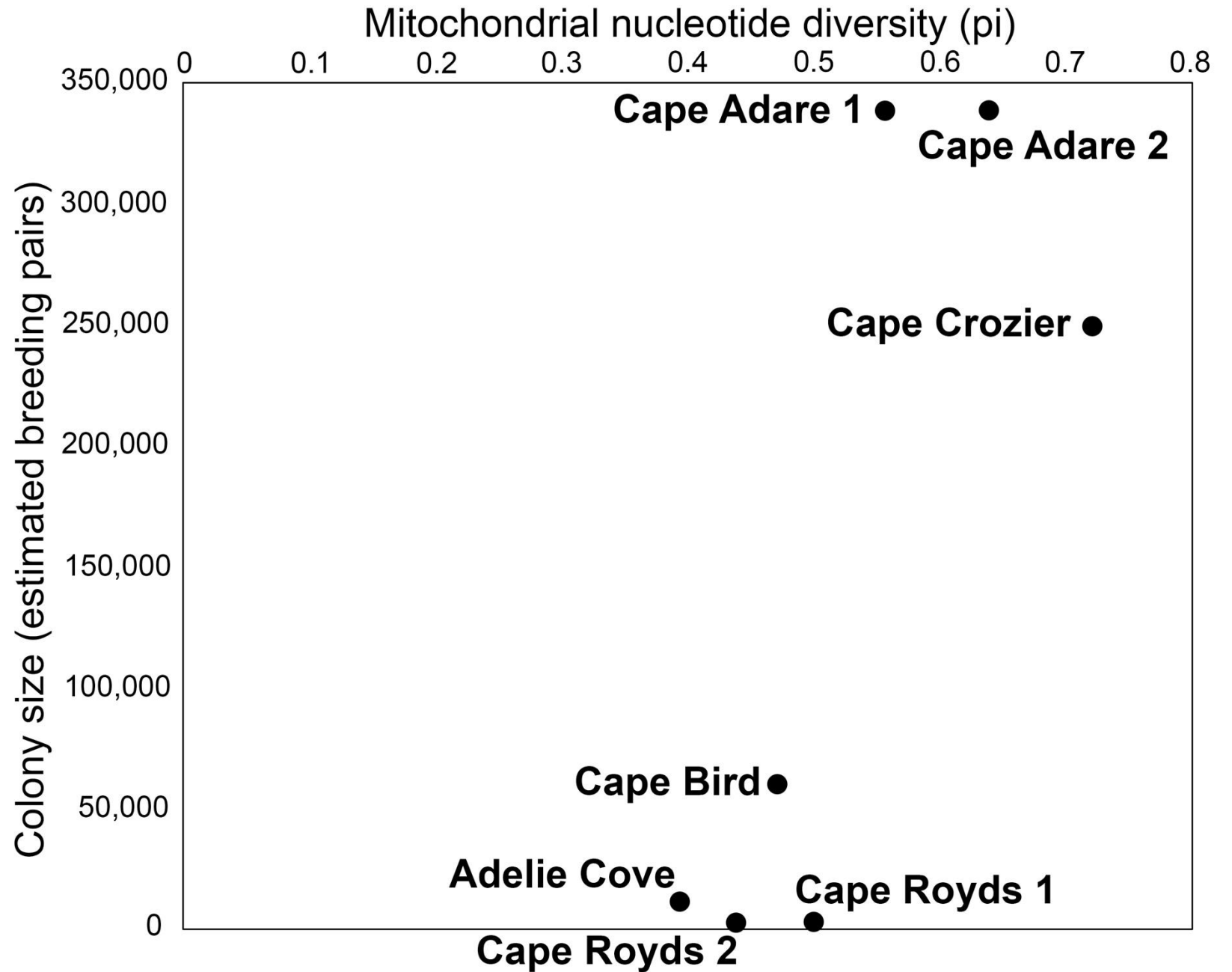
Adélie penguin mitochondrial lineages



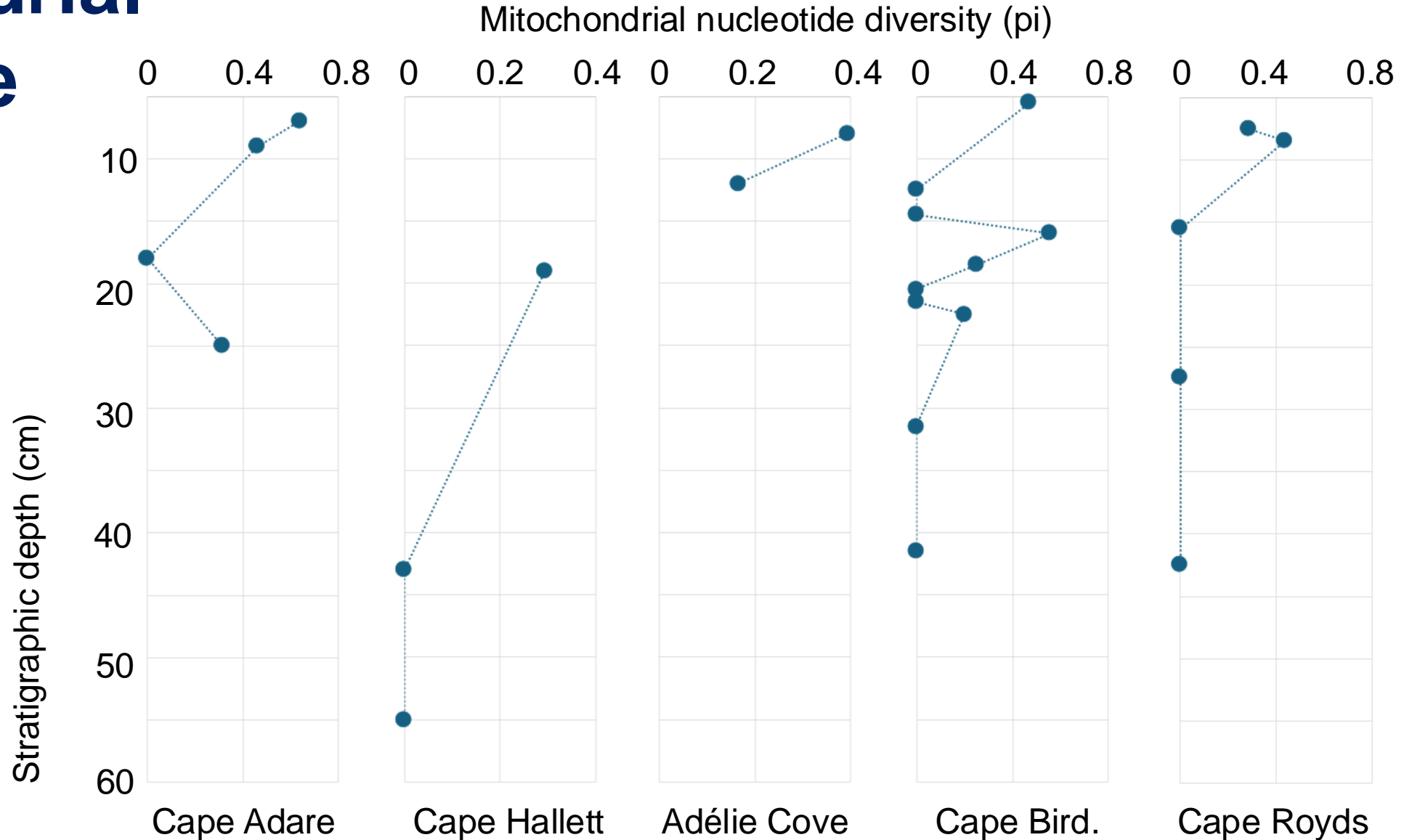
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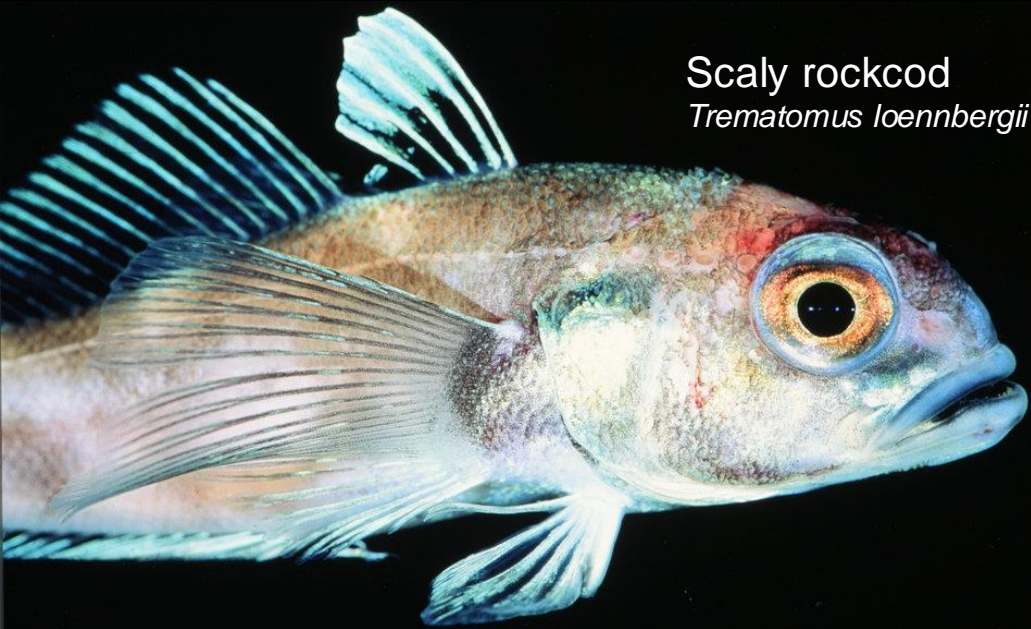


Adélie penguin mitochondrial nucleotide diversity



Adélie penguin mitochondrial nucleotide diversity





Scaly rockcod
Trematomus loennbergii



Bald notothen
Pagothenia borchgrevinki



Antarctic krill
Euphausia superba

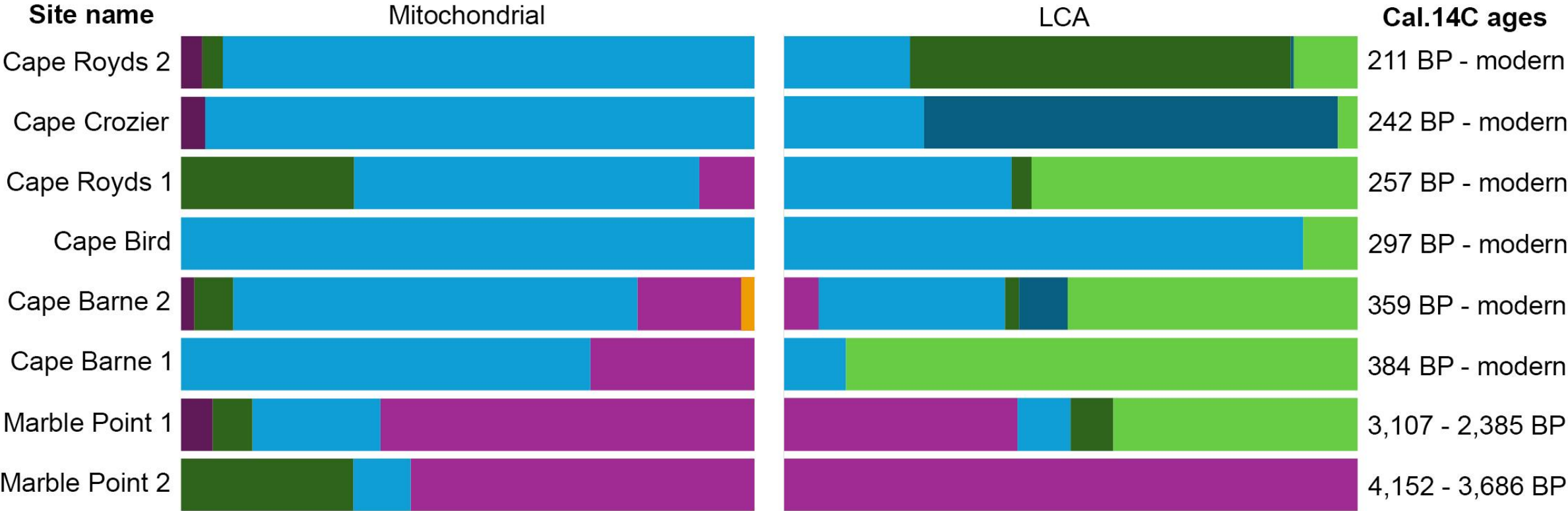


Antarctic silverfish
Pleuragramma antarctica



Emerald rockcod
Trematomus bernacchii

Adélie penguin diet (fish)



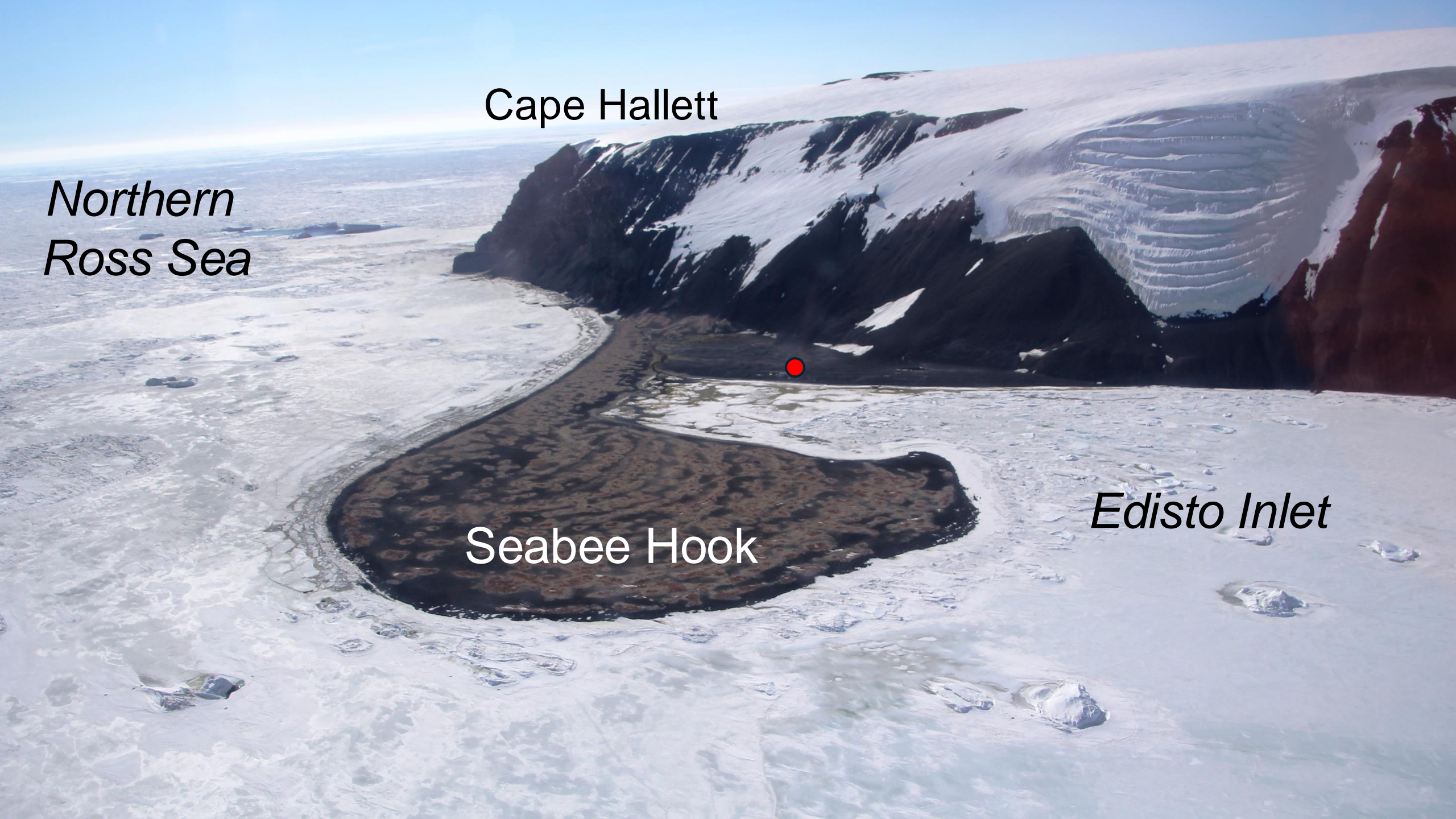
Cape Hallett

*Northern
Ross Sea*

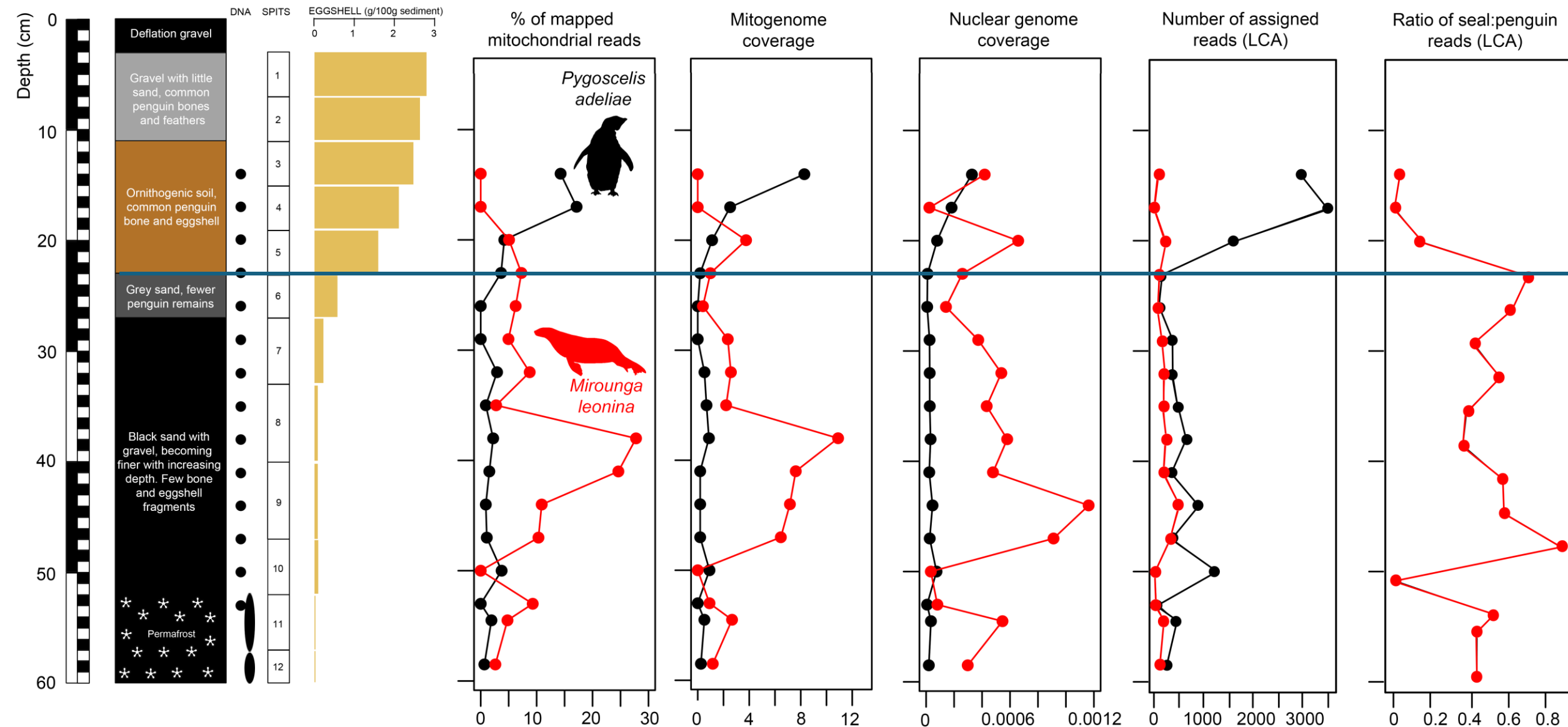


Seabee Hook

Edisto Inlet



Megafaunal turnover at Cape Hallett

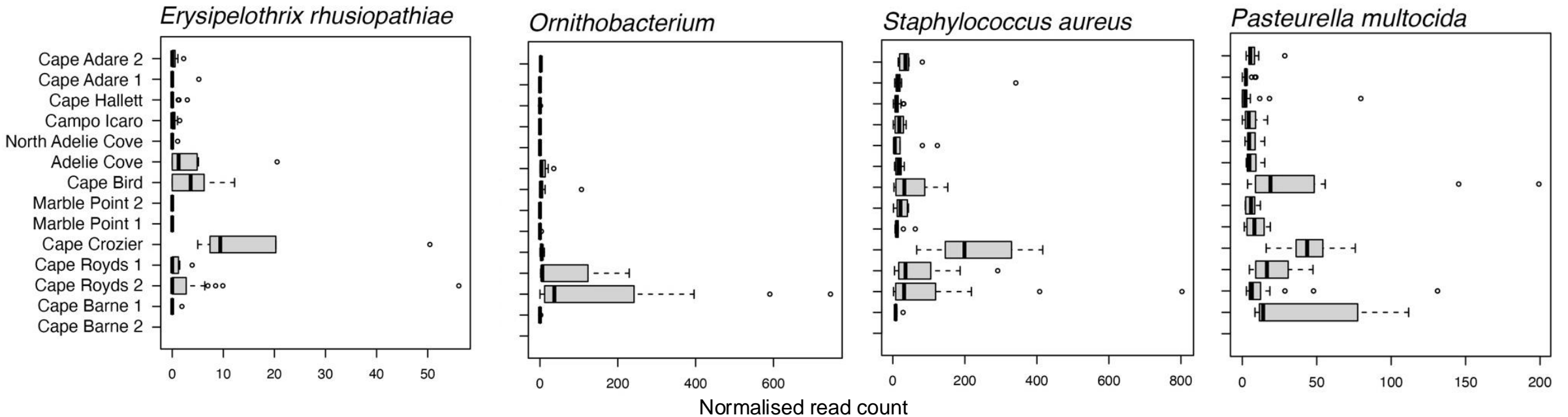


Penguin pathogens & disease

- **Avian cholera** (*Pasteurella multocida*)
- **Penguin diphtheria** (*Plesiomonas shigelloides*)
- **MAC lung disease** (*Mycobacterium avium*)
- **Erysipelas** (*Erysipelothrix rhusiopathiae*)
- **Avian chlamydiosis** (*Chlamydiophila psittaci*)
- **Avian adenovirus** (*Aviadenovirus*)
- **Avian respiratory disease** (*Ornithobacterium*)
- **Staph infection** (*Staphylococcus aureus*)

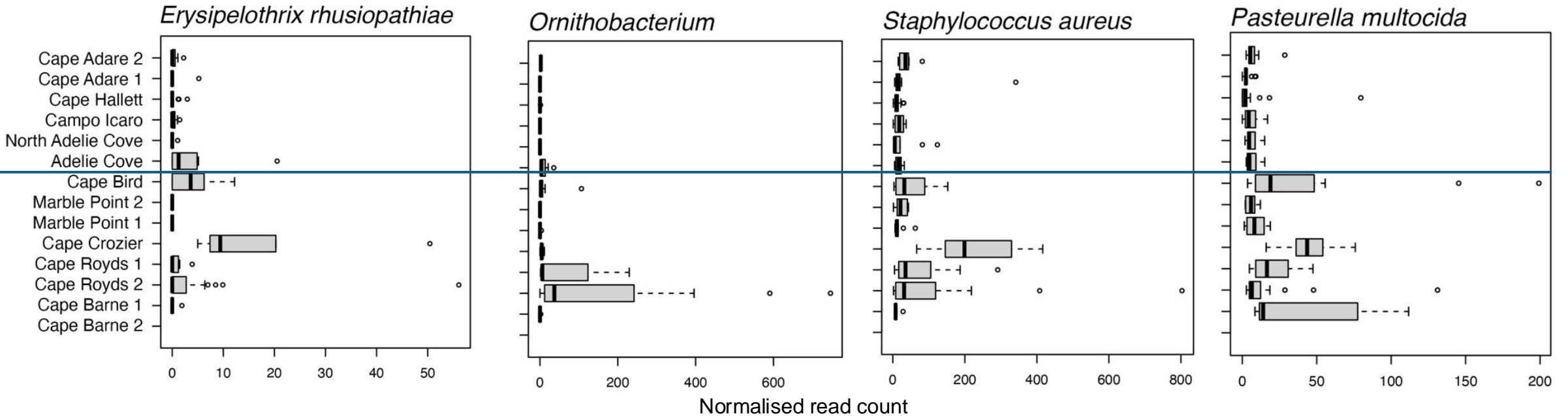
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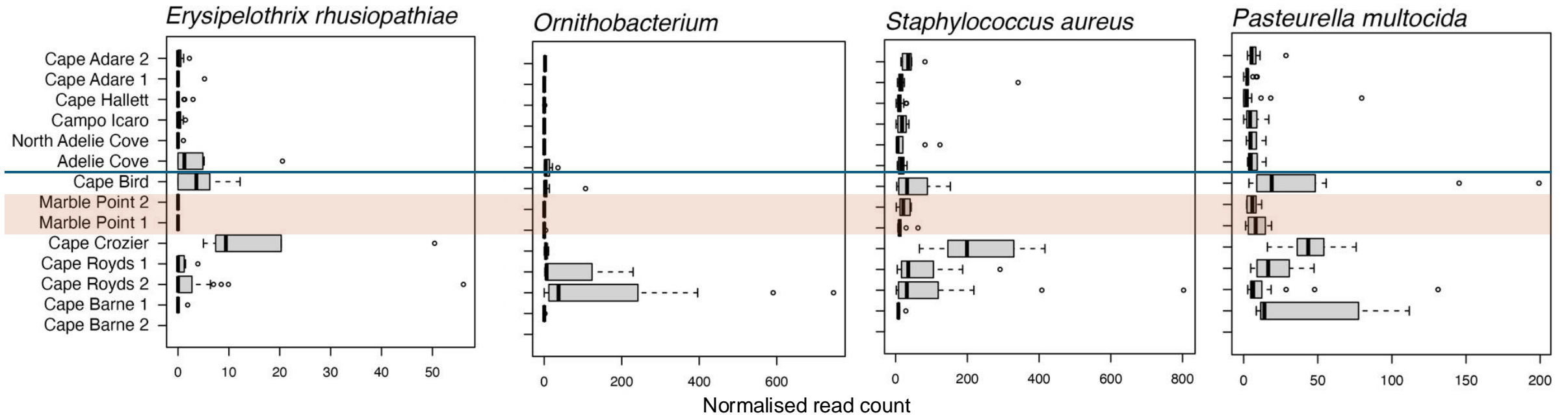
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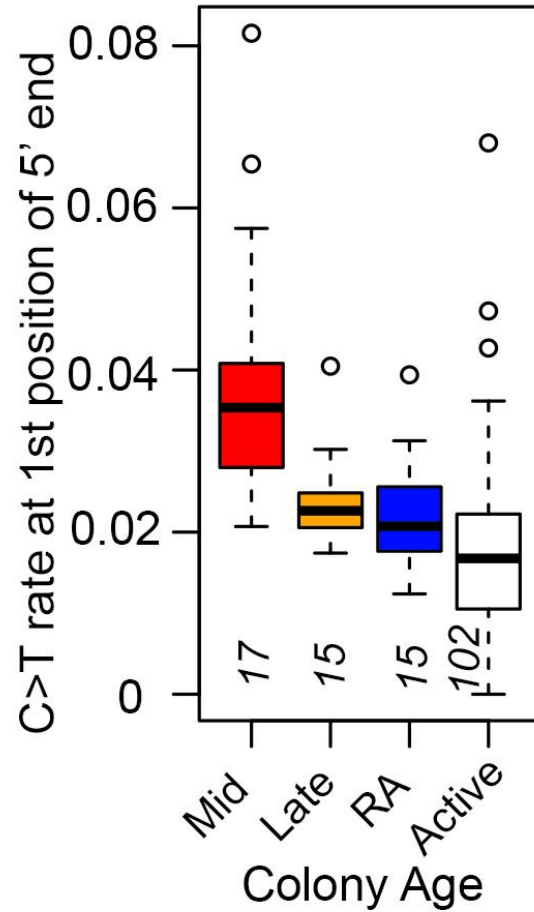
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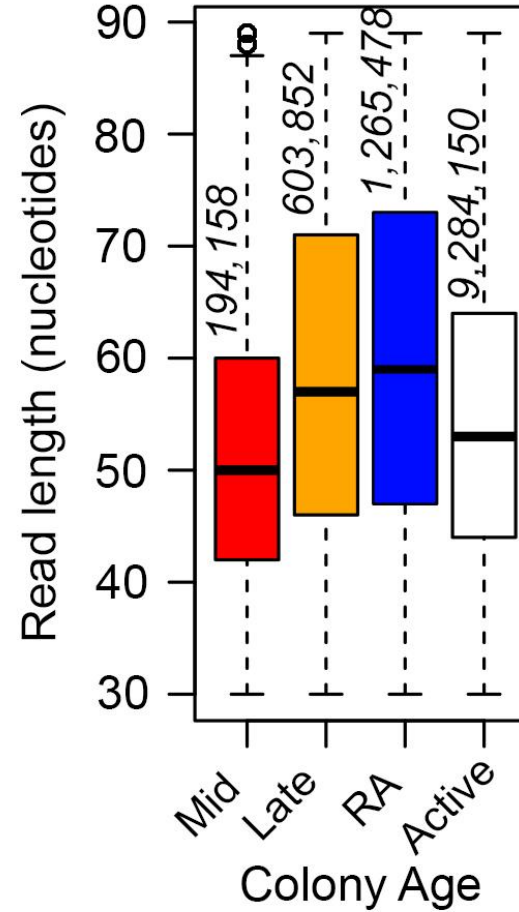
DNA preservation (Adélie penguin)

Cytosine deamination



Older < Younger

Fragment length



Older < Younger

Key points

- Terrestrial sediment DNA can track Antarctic faunal diversity over time
- eDNA may provide a tool for tracking population size through time
- Sediment DNA can provide insights into past diet composition
- High potential for very old DNA in Antarctic terrestrial sediments

