National SCIENCE Challenges

SUSTAINABLE SEAS

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Quantifying marine biodiversity using environmental DNA (eDNA)

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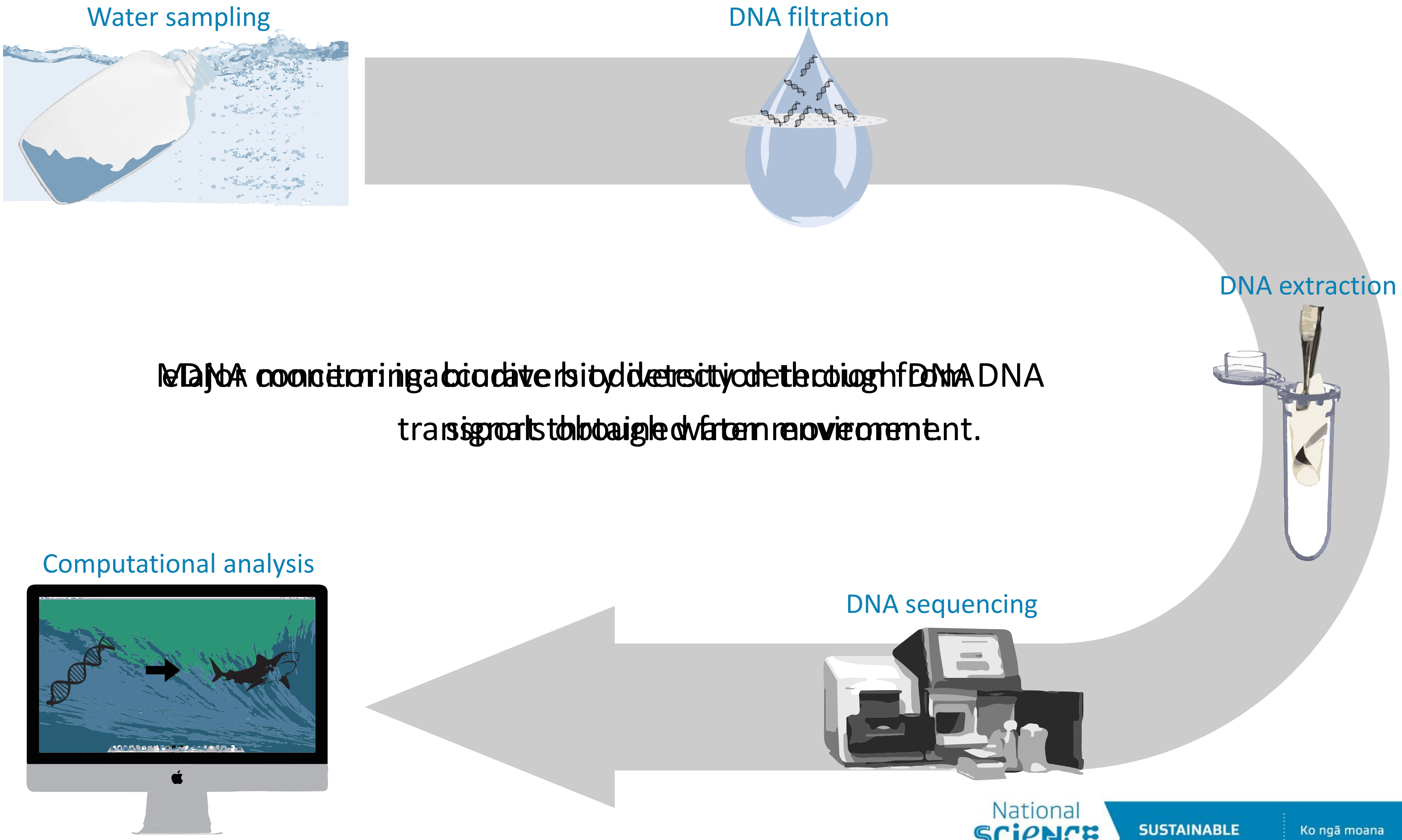
eDNA monitoring: methodology



eDNA monitoring: biodiversity detection through DNA signals obtained from environment.

Major concern: accurate biodiversity detection of DNA transport through water movement.

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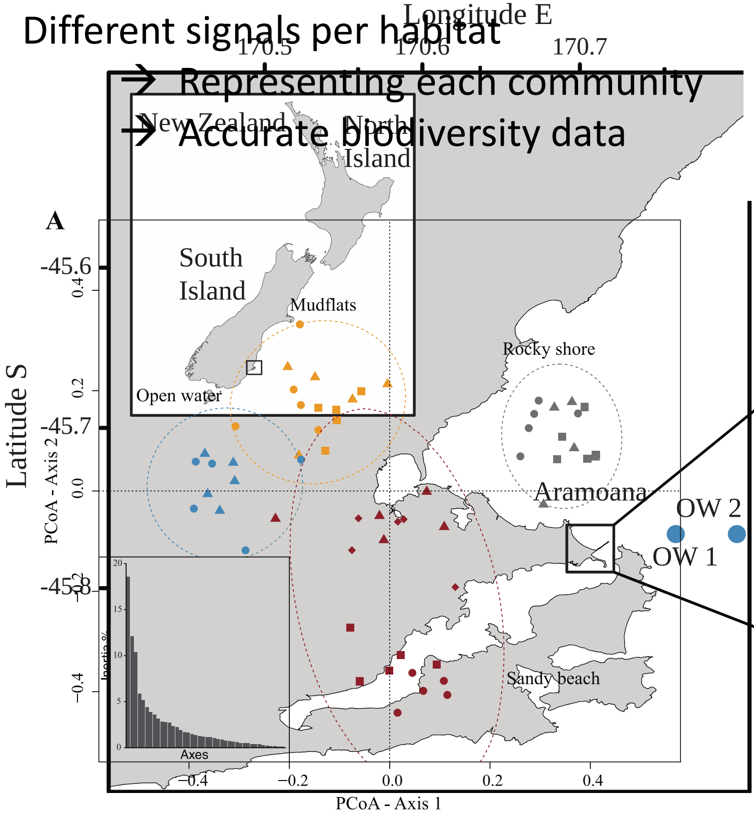
Accuracy of the eDNA monitoring method

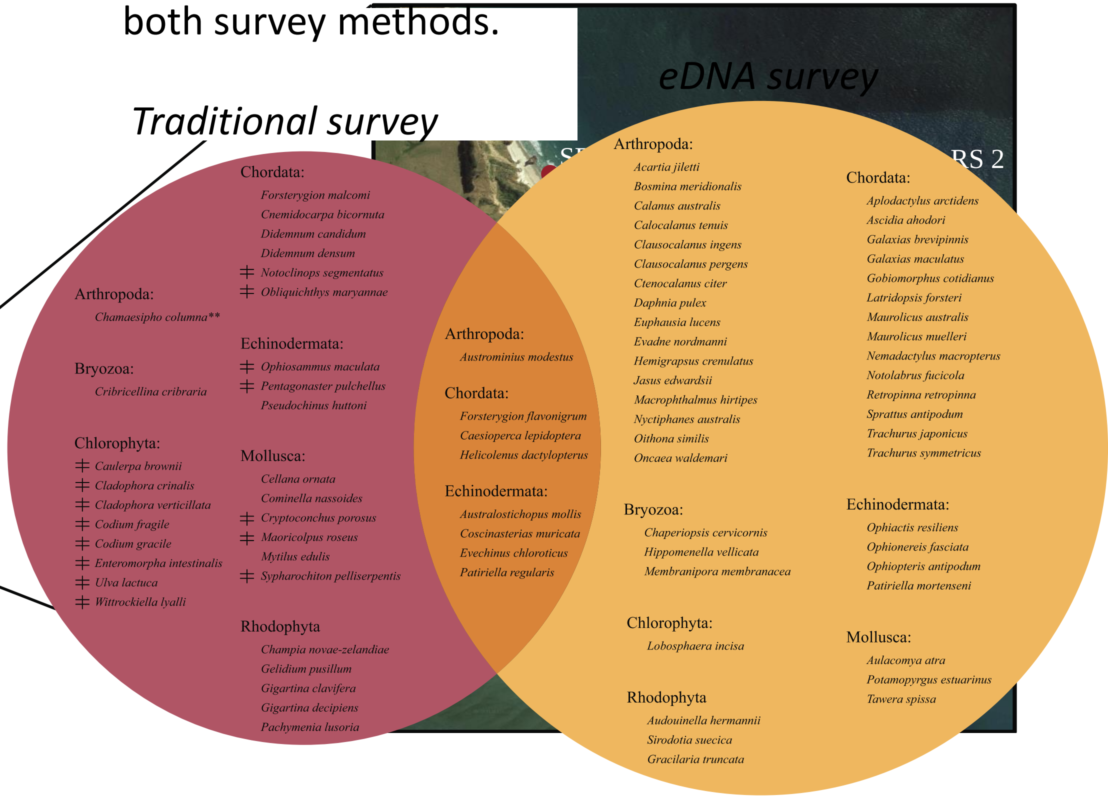
Different signals per habitat

→ Representing each community

→ Accurate biodiversity data



Small overlap in species detection shows limitations in both survey methods.



Traditional survey

eDNA survey

Chordata:
- *Forsterygion malcomi*
- *Cnemidocarpa bicornuta*
- *Didemnum candidum*
- *Didemnum densum*
- ‡ *Notoclinops segmentatus*
- ‡ *Obliquichthys maryannae*

Arthropoda:
- *Chamaesipho columna***

Echinodermata:
- ‡ *Ophiosammus maculata*
- ‡ *Pentagonaster pulchellus*
- *Pseudochinus huttoni*

Bryozoa:
- *Cribricellina cribraria*

Chlorophyta:
- ‡ *Caulerpa brownii*
- ‡ *Cladophora crinalis*
- ‡ *Cladophora verticillata*
- ‡ *Codium fragile*
- ‡ *Codium gracile*
- ‡ *Enteromorpha intestinalis*
- ‡ *Ulva lactuca*
- ‡ *Wittrockiella lyalli*

Mollusca:
- *Cellana ornata*
- *Cominella nassoides*
- ‡ *Cryptoconchus porosus*
- ‡ *Maoricolpus roseus*
- *Mytilus edulis*
- ‡ *Sypharochiton pelliserpentis*

Rhodophyta
- *Champia novae-zelandiae*
- *Gelidium pusillum*
- *Gigartina clavifera*
- *Gigartina decipiens*
- *Pachymenia lusoria*

Arthropoda:
- *Austrominius modestus*

Chordata:
- *Forsterygion flavonigrum*
- *Caesioperca lepidoptera*
- *Helicolenus dactylopterus*

Echinodermata:
- *Australostichopus mollis*
- *Coscinasterias muricata*
- *Evechinus chloroticus*
- *Patiriella regularis*

Arthropoda:
- *Acartia jiletti*
- *Bosmina meridionalis*
- *Calanus australis*
- *Calocalanus tenuis*
- *Clausocalanus ingens*
- *Clausocalanus pergens*
- *Ctenocalanus citer*
- *Daphnia pulex*
- *Euphausia lucens*
- *Evadne nordmanni*
- *Hemigrapsus crenulatus*
- *Jasus edwardsii*
- *Macrophthalmus hirtipes*
- *Nyctiphanes australis*
- *Oithona similis*
- *Oncaea waldemari*

Bryozoa:
- *Chaperiopsis cervicornis*
- *Hippomenella vellicata*
- *Membranipora membranacea*

Chlorophyta:
- *Lobosphaera incisa*

Rhodophyta
- *Audouinella hermannii*
- *Sirodotia suecica*
- *Gracilaria truncata*

Chordata:
- *Aplodactylus arctidens*
- *Ascidia ahodori*
- *Galaxias brevipinnis*
- *Galaxias maculatus*
- *Gobiomorphus cotidianus*
- *Latridopsis forsteri*
- *Maurolicus australis*
- *Maurolicus muelleri*
- *Nemadactylus macropterus*
- *Notolabrus fucicola*
- *Retropinna retropinna*
- *Sprattus antipodum*
- *Trachurus japonicus*
- *Trachurus symmetricus*

Echinodermata:
- *Ophiactis resiliens*
- *Ophionereis fasciata*
- *Ophiopteris antipodum*
- *Patiriella mortenseni*

Mollusca:
- *Aulacomya atra*
- *Potamopyrgus estuarinus*
- *Tawera spissa*

Open water

Sandy beach

Rocky shore

Mudflats

Conclusions

eDNA can become a powerful tool to aid conservation management strategies.

➔ Used by ecologists in conjunction with established methods

1. Easy-to-follow guidelines for field and lab work.

2. Semi-automated computational pipeline for data-analysis.

Minimal training is needed: providing the necessary information

Workshops

eBook

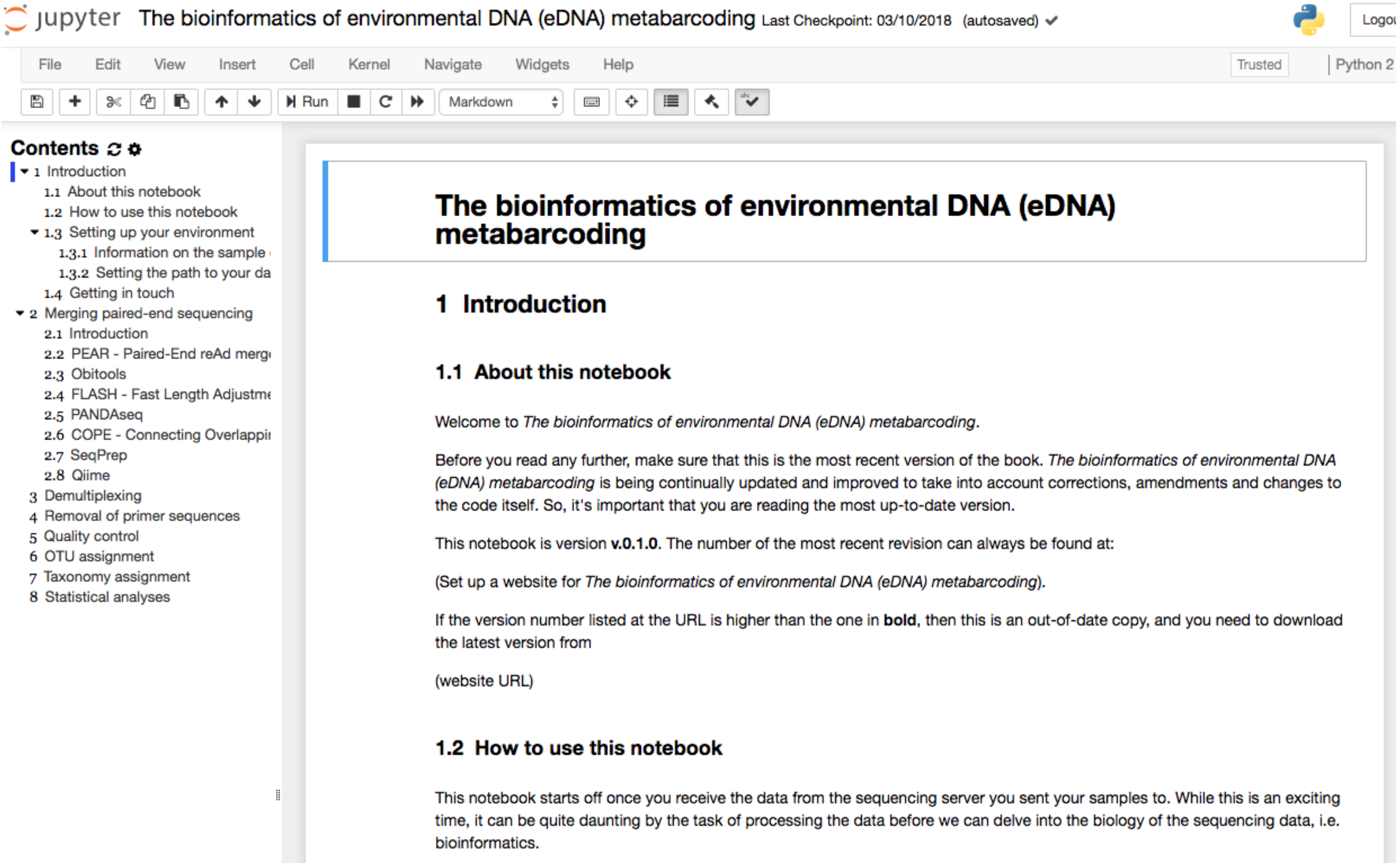
Collaboration

Sampling procedures

Laboratory procedures

Computational analysis

Workshops **eBook** Collaboration



The bioinformatics of environmental DNA (eDNA) metabarcoding Last Checkpoint: 03/10/2018 (autosaved)

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The bioinformatics of environmental DNA (eDNA) metabarcoding

1 Introduction

1.1 About this notebook

Welcome to *The bioinformatics of environmental DNA (eDNA) metabarcoding*.

Before you read any further, make sure that this is the most recent version of the book. *The bioinformatics of environmental DNA (eDNA) metabarcoding* is being continually updated and improved to take into account corrections, amendments and changes to the code itself. So, it's important that you are reading the most up-to-date version.

This notebook is version **v.0.1.0**. The number of the most recent revision can always be found at:

(Set up a website for *The bioinformatics of environmental DNA (eDNA) metabarcoding*).

If the version number listed at the URL is higher than the one in **bold**, then this is an out-of-date copy, and you need to download the latest version from

(website URL)

1.2 How to use this notebook

This notebook starts off once you receive the data from the sequencing server you sent your samples to. While this is an exciting time, it can be quite daunting by the task of processing the data before we can delve into the biology of the sequencing data, i.e. bioinformatics.

Oscar Ortega

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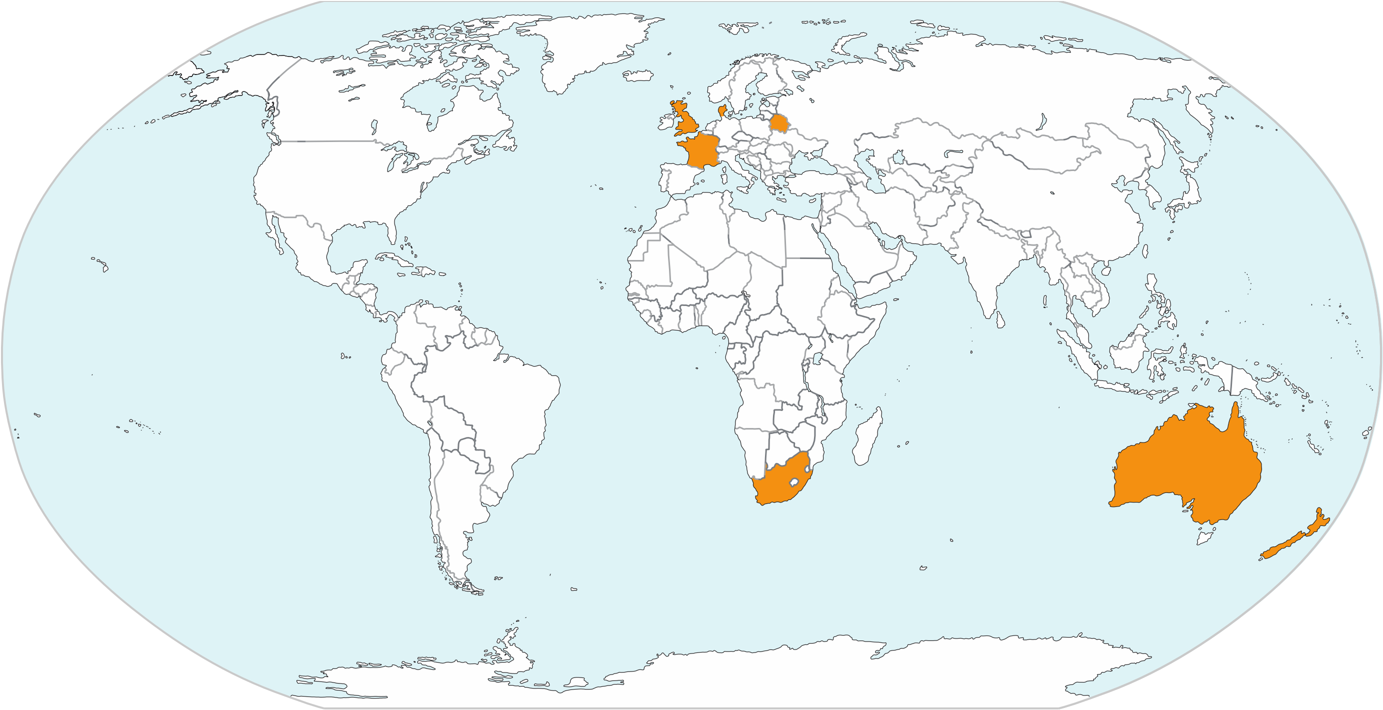
Workshops eBook **Collaboration**

Collaborative projects: setting up, advancing, or promoting eDNA research



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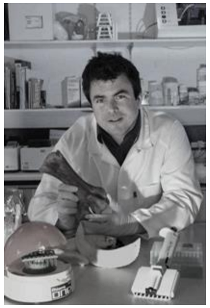

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