



Applied Genomics

Improving Observation Capabilities
of Biodiversity in UK Waters



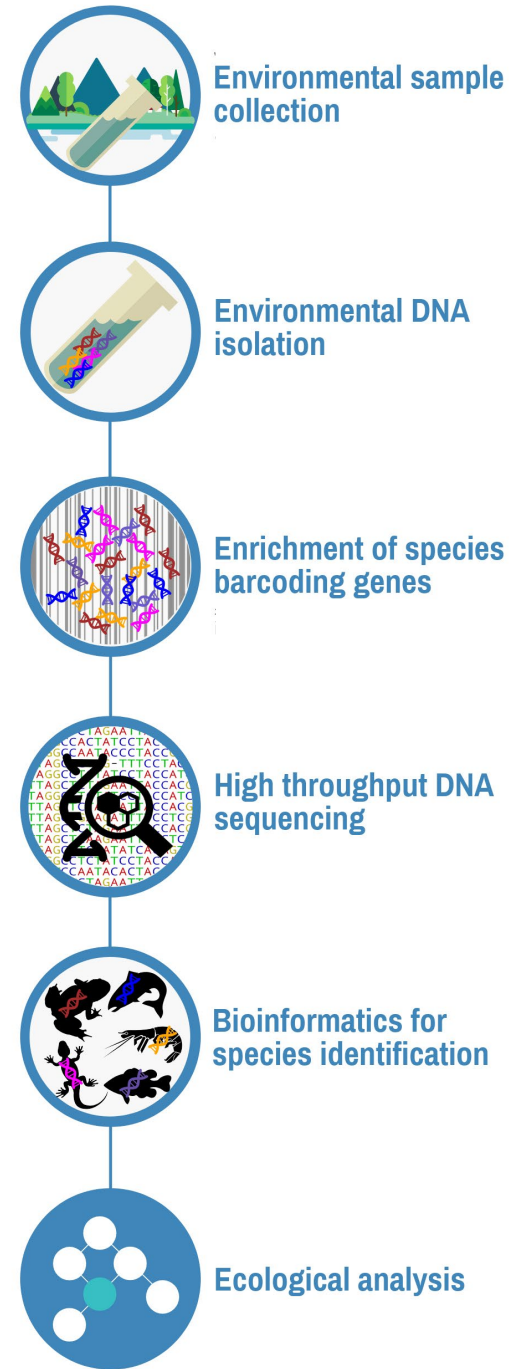
MST SECTOR COUNCIL

Technology Overview: DNA-Based Species Detection

Environmental DNA (eDNA) is genetic material that is released by organisms living in their environment.

Sources of genetic material may include, faeces, urine, skin cells, mucous, gametes, etc.

The DNA from these sources will degrade over time but persist in the environment for long enough that the presence of organisms in the environment may be detected without their being seen or captured.

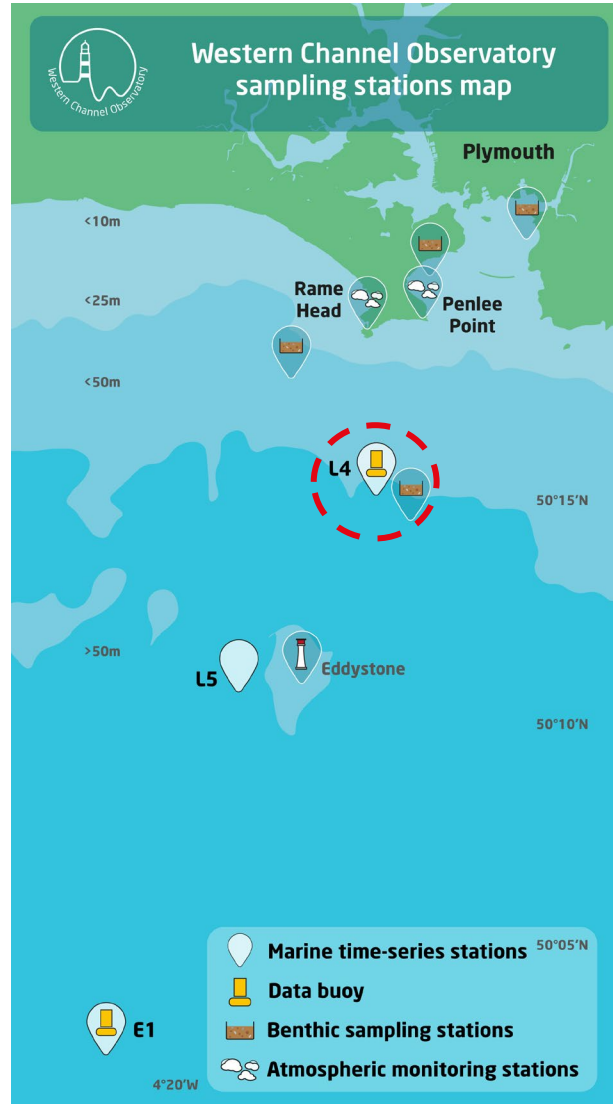
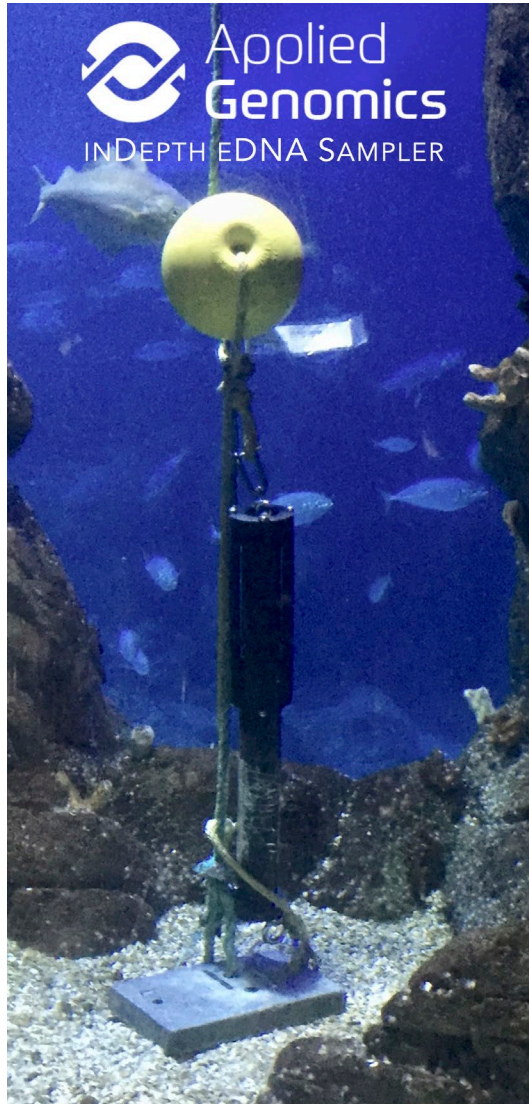


Insights

- eDNA vs. traditional surveys
- eDNA for fish phenology and diversity
- eDNA in community and genetic trend analysis

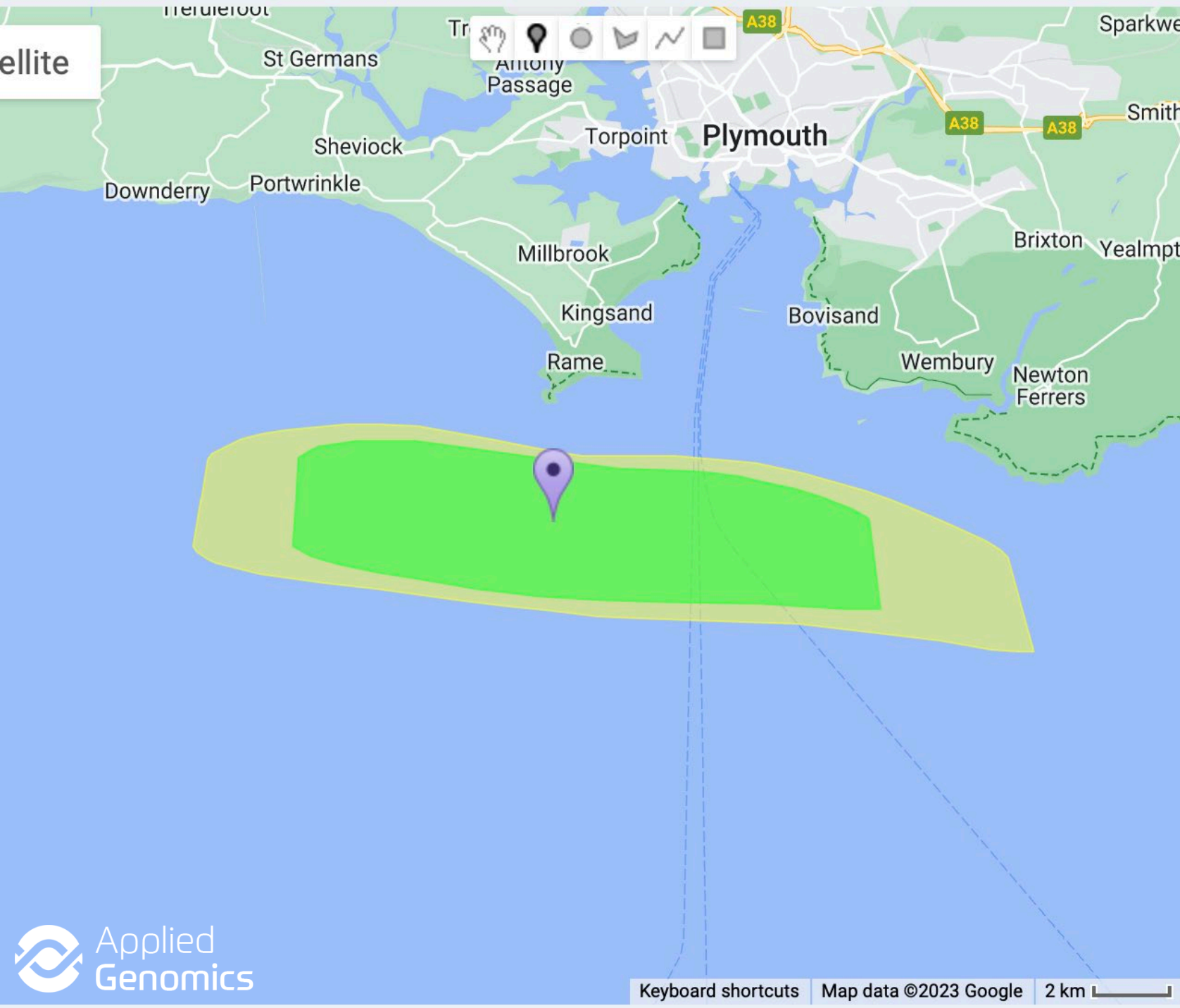
Outcomes

- ✓ eDNA reliably monitors marine fish over time.
- ✓ In-situ eDNA sampling is highly accurate for biodiversity.
- ✓ eDNA outperforms traditional methods in quality, and speed.
- ✓ eDNA provides significant return on investment.



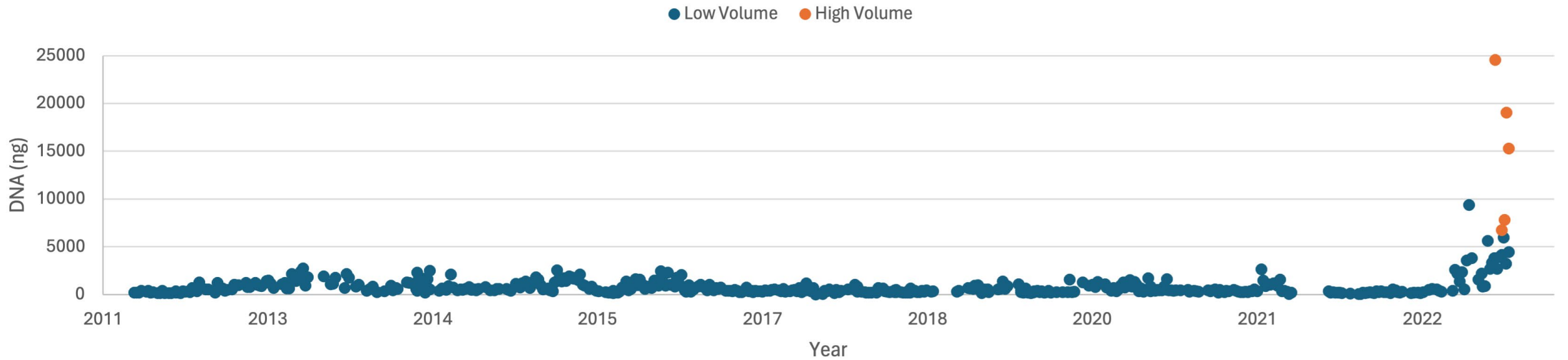
PML | Plymouth Marine Laboratory





Results

Volume of eDNA for All Samples



SAMPLES ANALYSED

460

Despite generally low DNA concentrations, all samples amplified successfully.

DNA MARKERS

3

Mitochondrial DNA barcode markers targeting marine vertebrates, fishes and elasmobranchs.

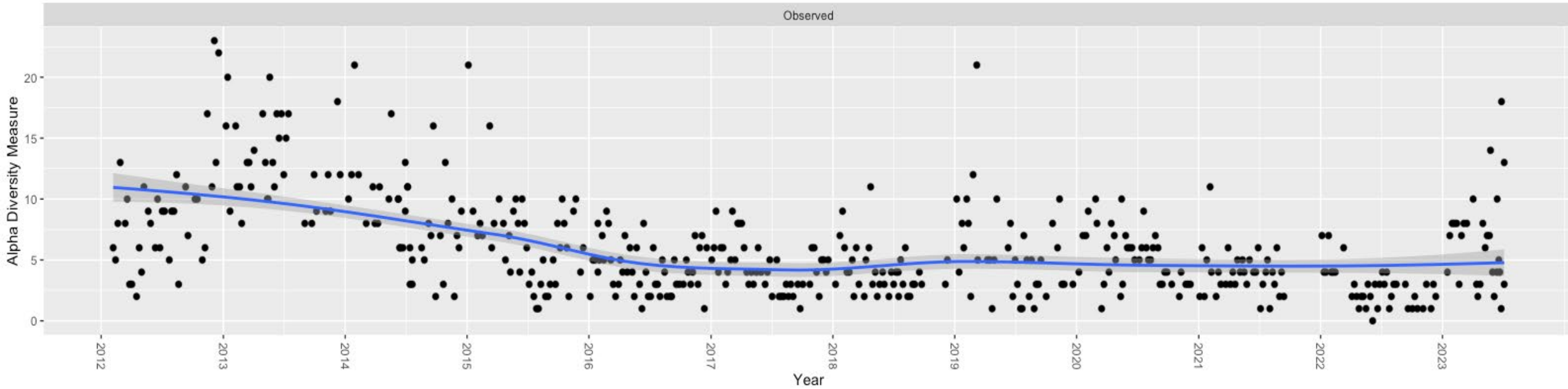
HIGH-VOLUME eDNA

20x

Large-volume inDepth eDNA samples contained more eDNA than small-volume samples

Results

Fish Alpha Diversity by Year (all samples)



LABORATORY ASSAYS

1,380

Total number of assays successfully analysed across 6 sequencing runs.

SUCCESS RATE

100%

All samples were successfully analysed with no sample failures.

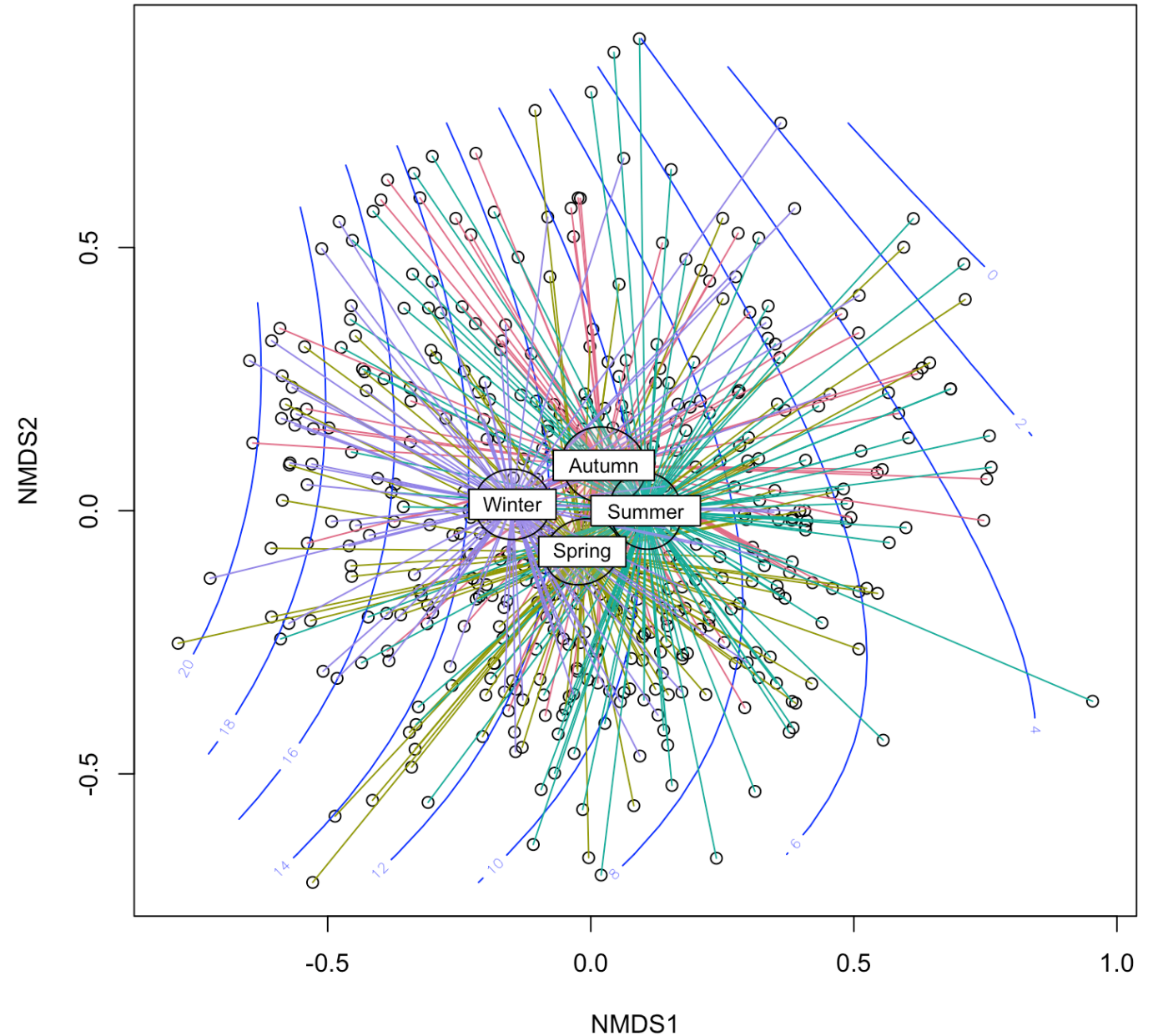
UNIQUE TAXA

213

Total number of unique taxa characterised to Species rank.

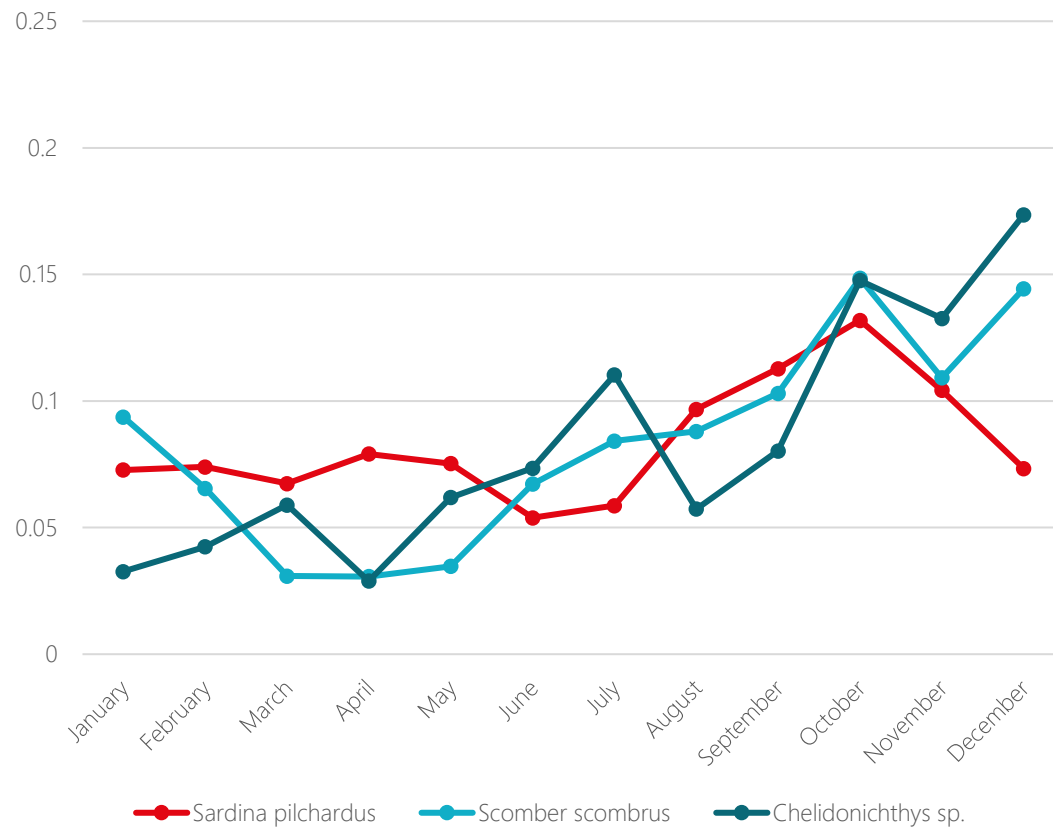
Seasonal Patterns

Seasonal trends developed from 10-year time-series

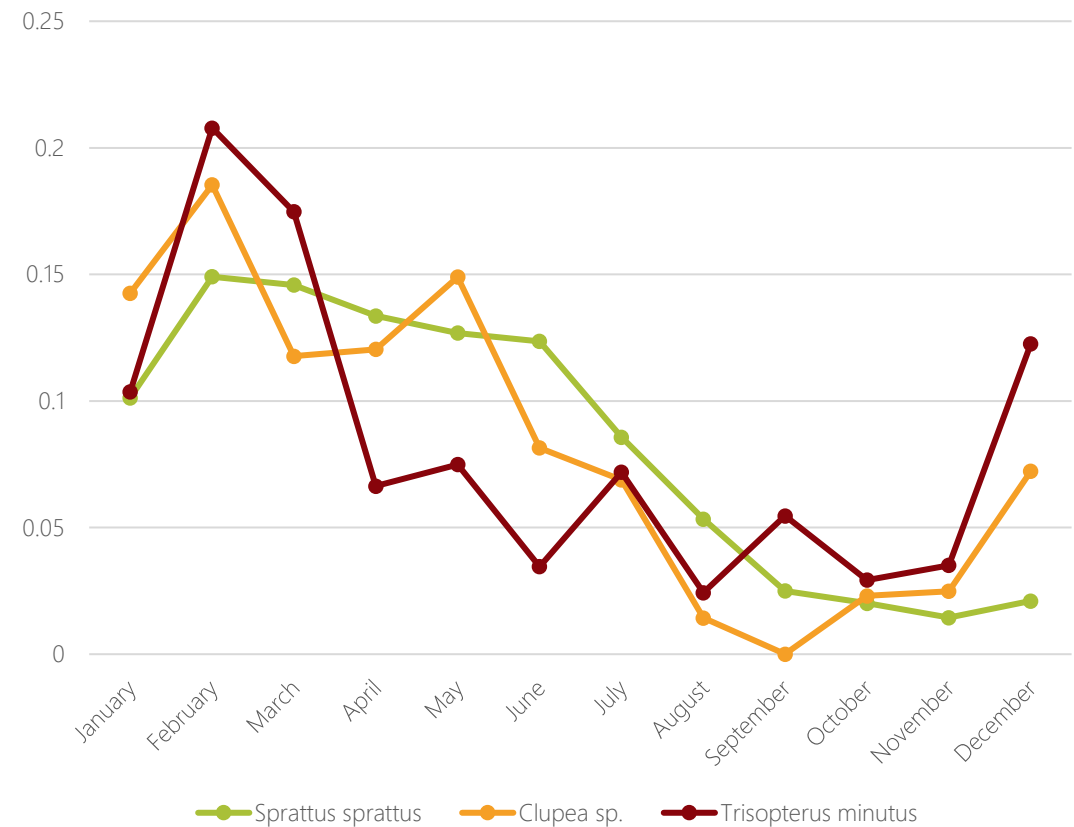


Seasonal patterns

Monthly Prevalence

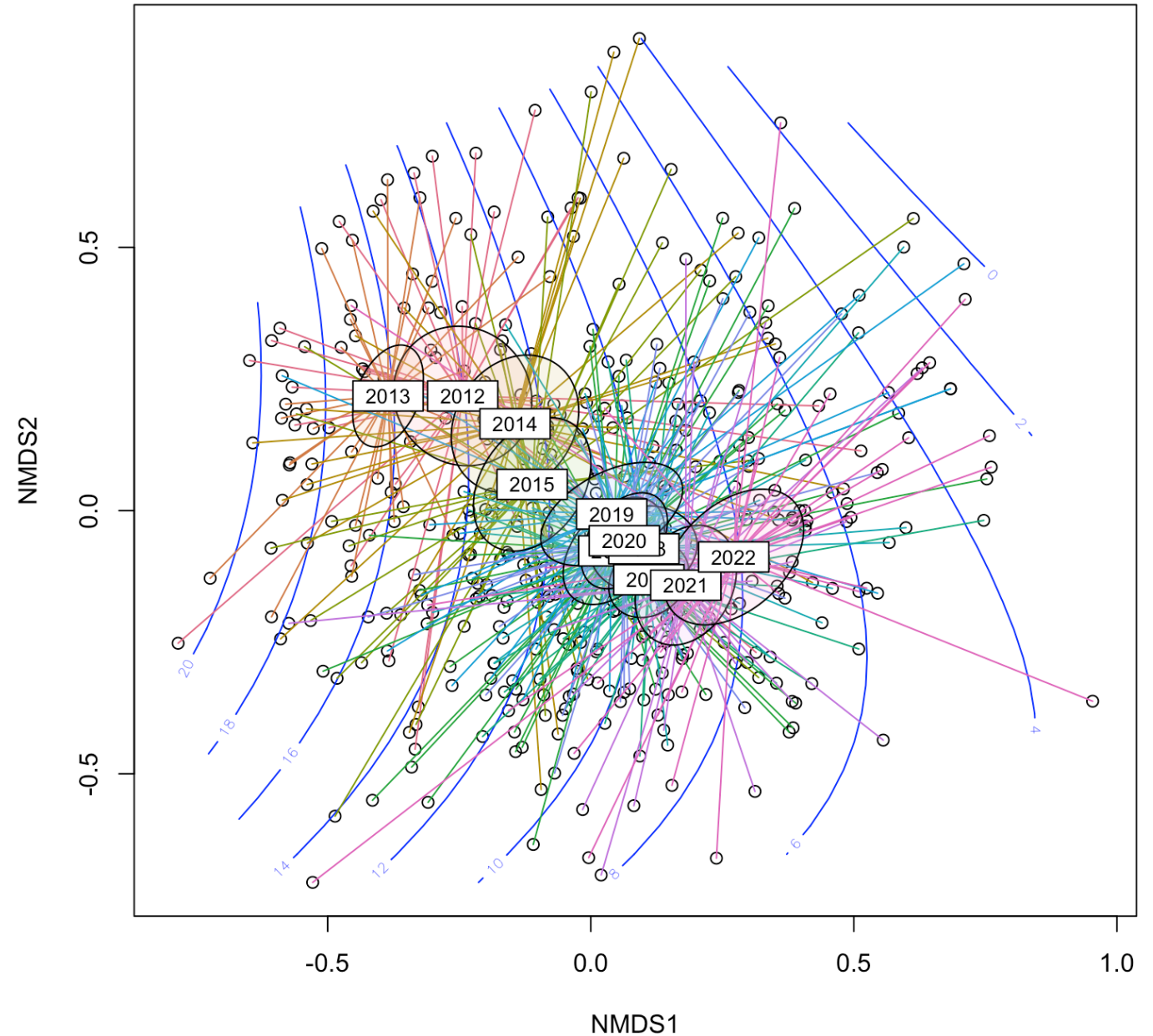


Monthly Prevalence



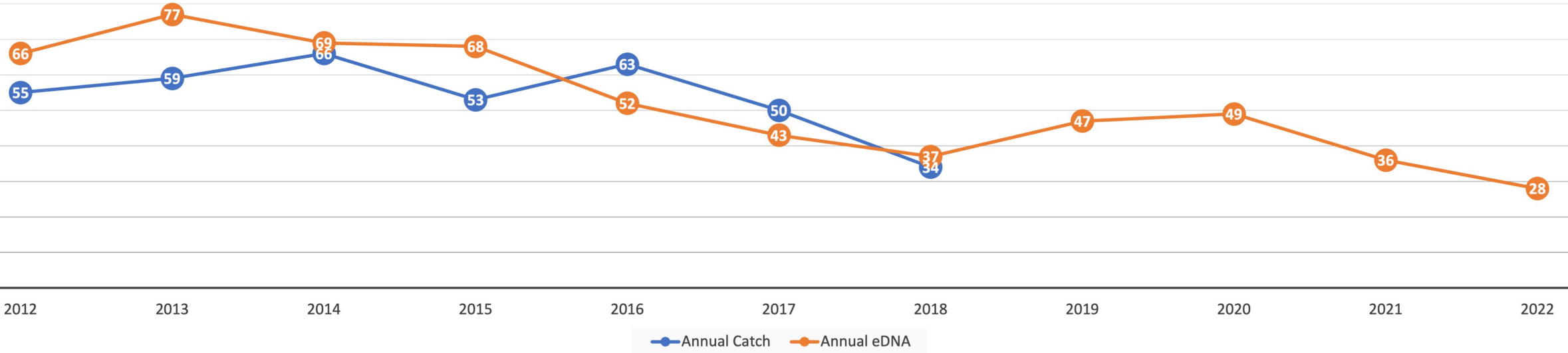
10-year Time-series

High-volume samples collected with the inDepth eDNA sampler vastly outperformed low-volume samples



Insights

Comparison of Annual Species Count Data Over Time



WEEKS SAMPLED

595

Samples were collected weekly over an extensive number of weeks.

MORE SPECIES

152%

eDNA characterised significantly more species compared to scientific trawling over the same time-period.

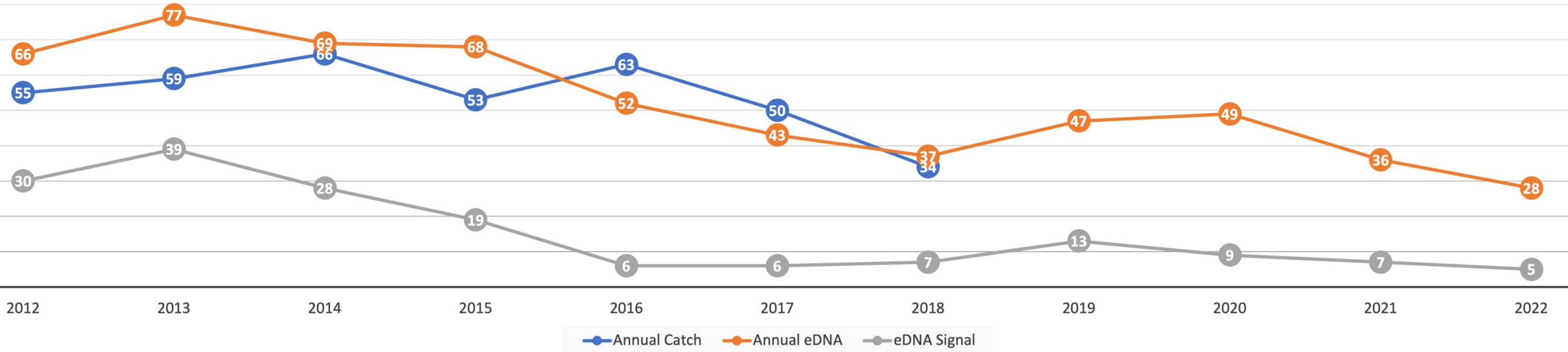
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There were a large variety of fishes detected across all samples.

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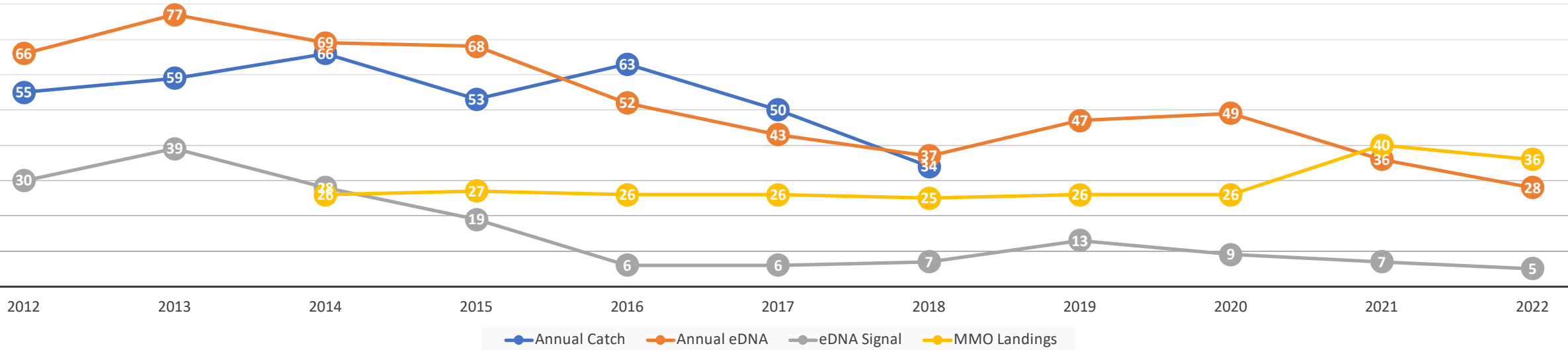
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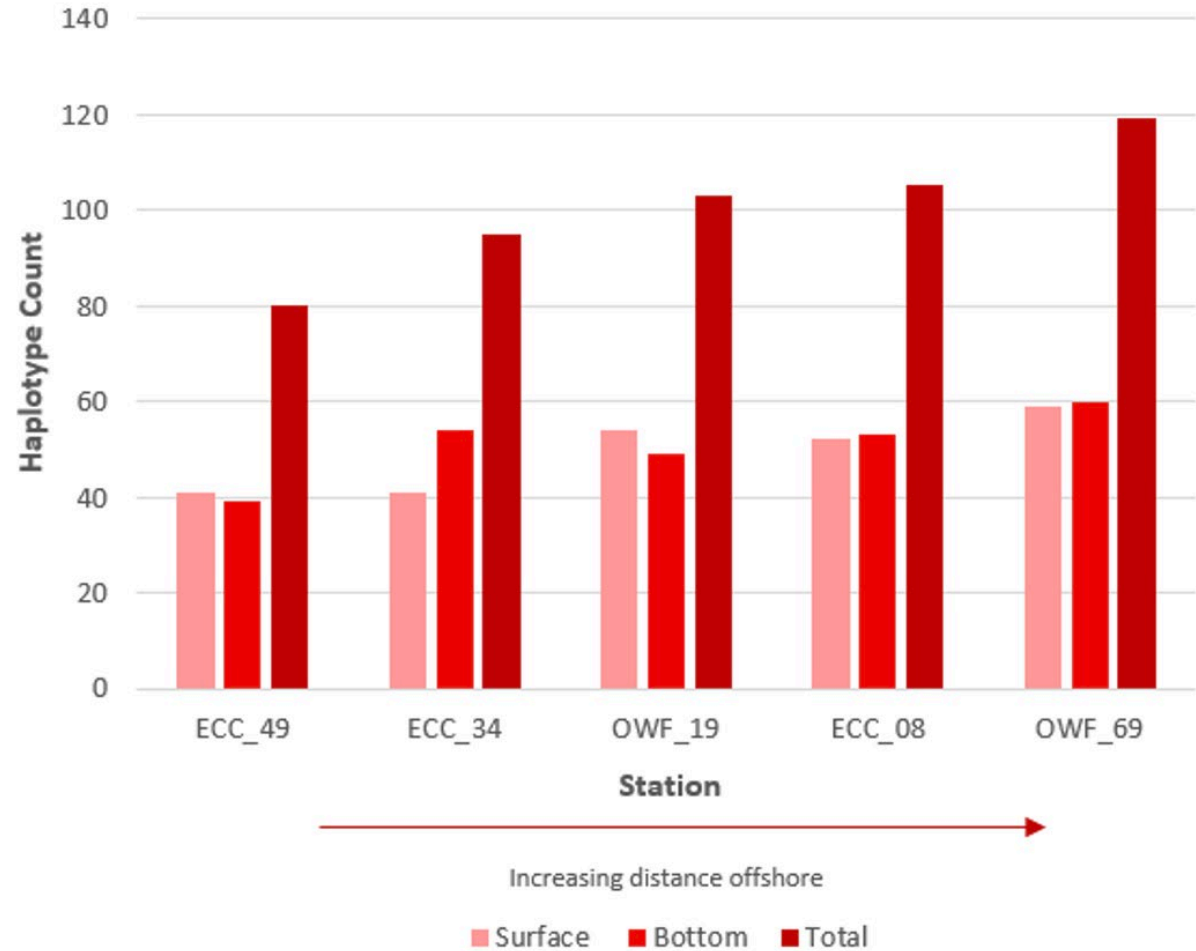
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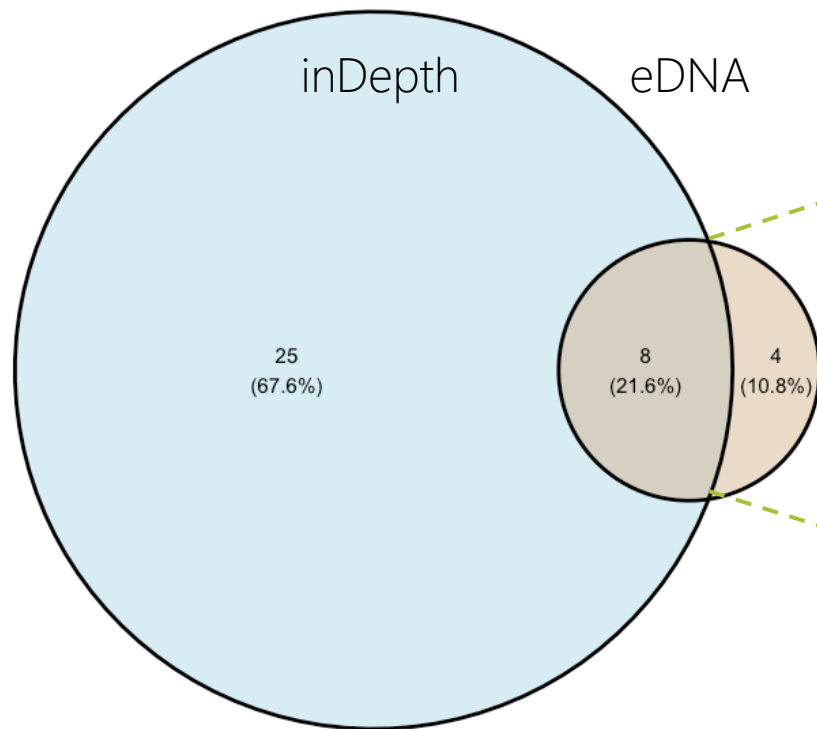
Example: Southern North Sea Wind Farm

Clear trends identified in genetic diversity using eDNA methods from leading 2021 project.

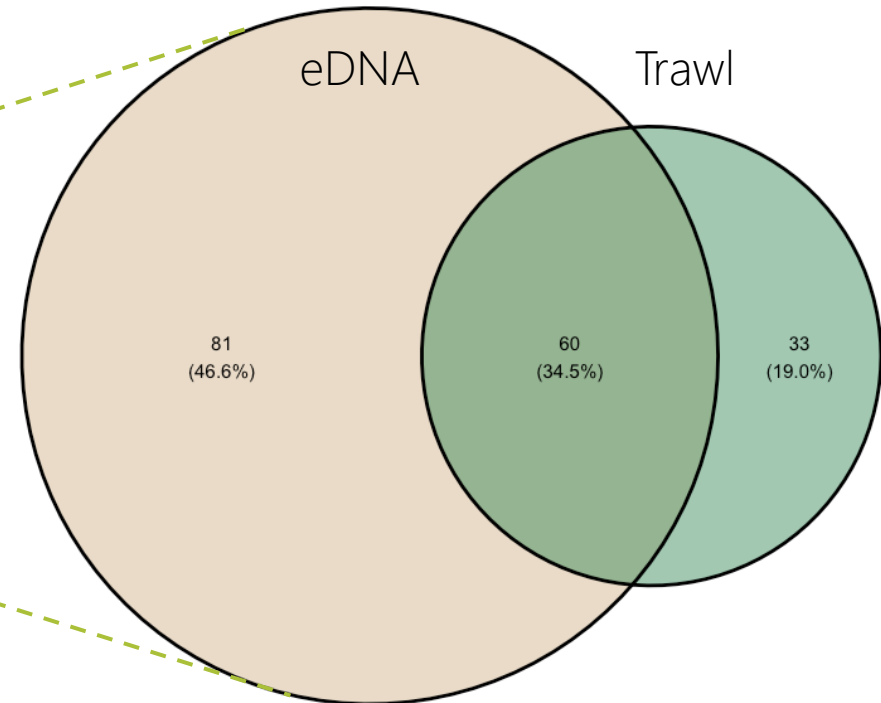


Effect of sample size on species recovery

Effect of sampling volume



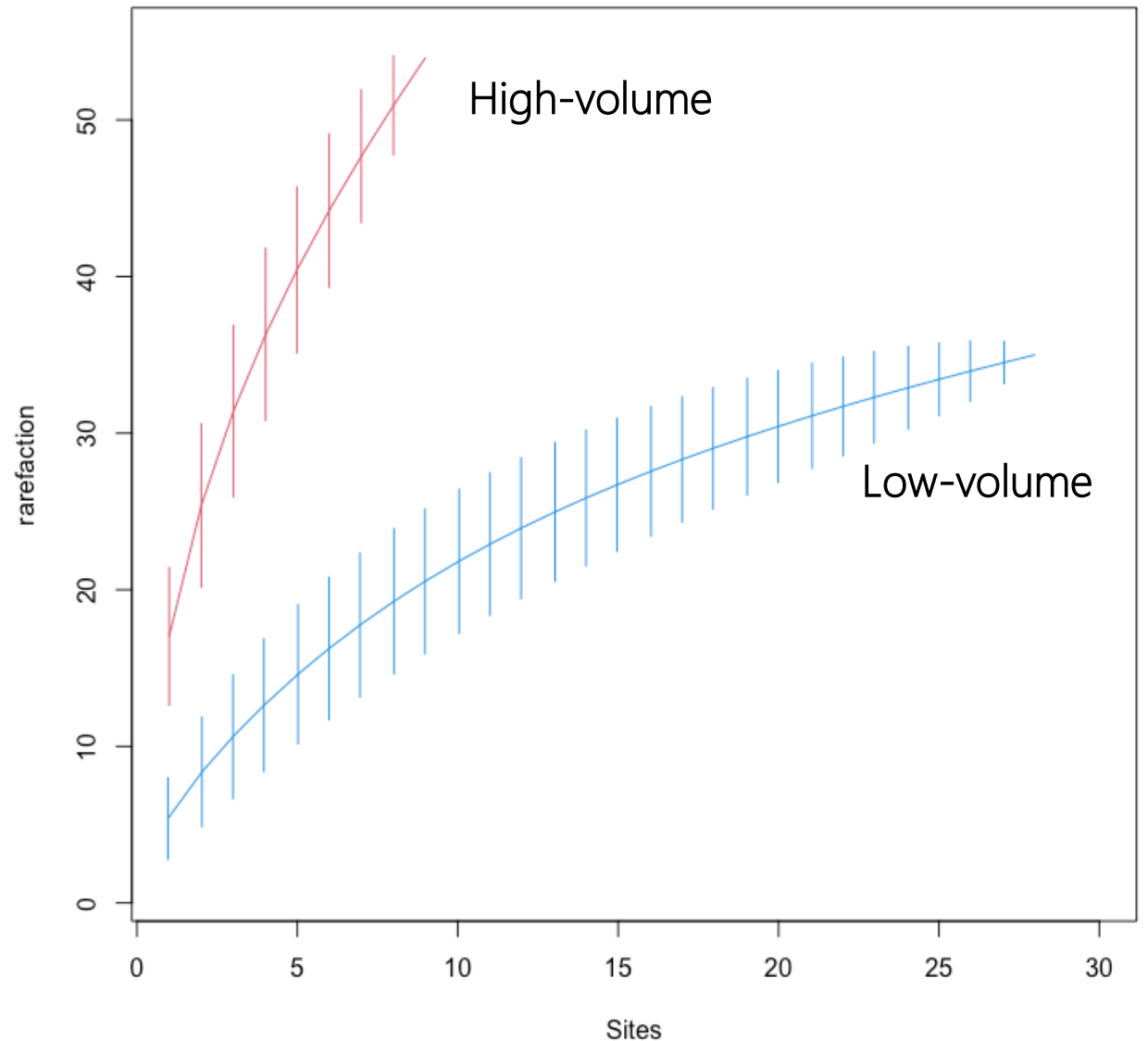
Methods comparison



Effect of sample size on species recovery

Validating observed differences in sample collection methods from Plymouth and Poole harbours.

Species accumulation curve of eDNA data by filter volume



Return on Investment

5:1 Cost of eDNA is significantly lower than scientific trawling

7:1 Larger eDNA samples deliver greater value

- ✓ eDNA is a non-destructive non-invasive method



Disclaimer:

No fish were harmed in the collection of this eDNA data



Applied
Genomics