A Tale of Two Surveys:

Improving Biodiversity Monitoring Through Rapid Baseline Assessments

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INTRODUCTION

Monitoring biodiversity is crucial for **understanding ecosystem condition** and **regulating conservation efforts**. It is most effective when data is drawn from multiple sources, but **integrating diverse datasets is difficult**.

Biodiversity datasets arise from two main sources:

LONG-TERM ECOL. MONITORING
prioritize replication over space and time
yields a suite of ecosystem data

MARINe Multi-Agency Rocky Intertidal Network · RLS REEF LIFE SURVEY

RAPID BASELINE ASSESSMENTS
emphasize expert identification
yields species lists

BioBlitz · eDNA metagenomics inc.

Different sources of biodiversity data leaves us with the question:
How can we leverage species lists to inform biodiversity surveys?

METHODS

Biodiversity data were drawn from two separate ecosystems (Fig. 1) to create a framework to compare species lists against systematic surveys.

This allows for: **data integration and analysis** of local richness, detectability, community composition, and taxonomic uncertainty.

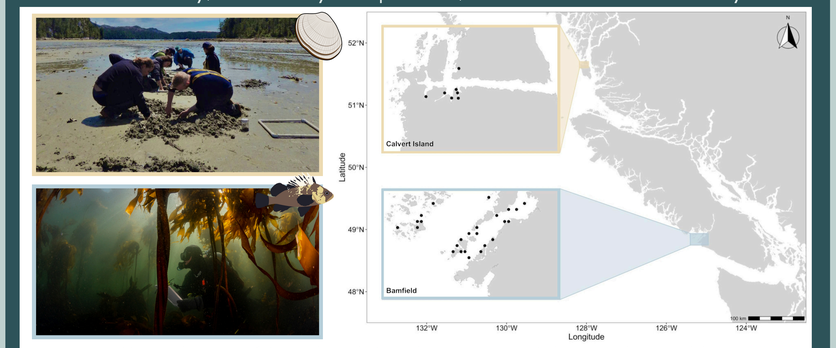
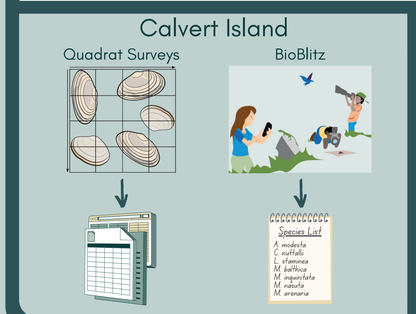
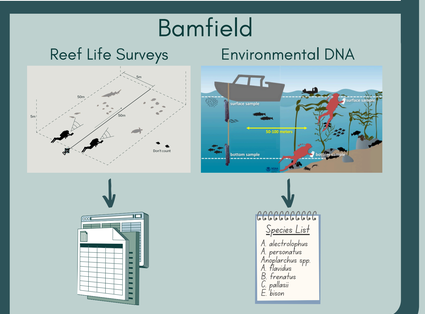


Figure 1. Map and images of Coastal British Columbia survey sites. Calvert Island surveys (clams; yellow border) in soft-sediment ecosystems, and Bamfield surveys (fish; blue border) in temperate kelp forest ecosystems. Rapid baseline assessments to develop species lists were conducted in the same locations.





RESULTS: WHAT DOES THIS FRAMEWORK LOOK LIKE AND HOW DO WE USE IT?

This framework **effectively integrates data from multiple sources**, enabling a **critical analysis** of **otherwise incomparable** survey methods.

1. Quantified the overlapping but dissimilar species pool, visualizing uncertainty (Figure 2 A,B).
2. Determined how diversity differs with sampling units in the LTEM compared to the species list diversity baseline (Fig. 2 C,D).
3. Created taxonomic trees to outline the similarities and differences in taxonomic resolution for each method (Fig. 3).

Calvert: LTEM* < BioBlitz - recommend changing sampling methodology and/or increasing sampling area

Bamfield: LTEM* > eDNA* - recommend increasing eDNA* sampling and increasing frequency of RLS* surveys

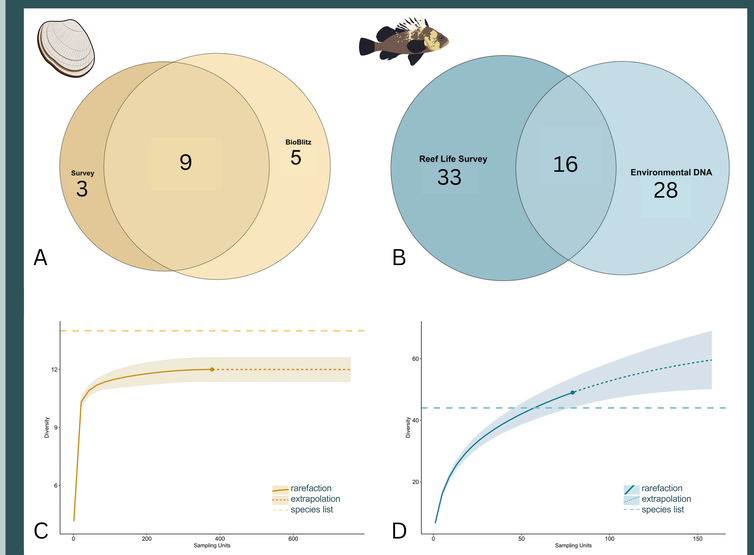


Figure 2. (A,B) Euler Diagrams depicting the intra-site community overlap between long-term survey methods and their respective species lists.
(C,D) Rarefaction and Extrapolation[2] curve (solid and dotted), quantifying species diversity generated from long-term survey data compared to species list gamma diversity (dashed line).

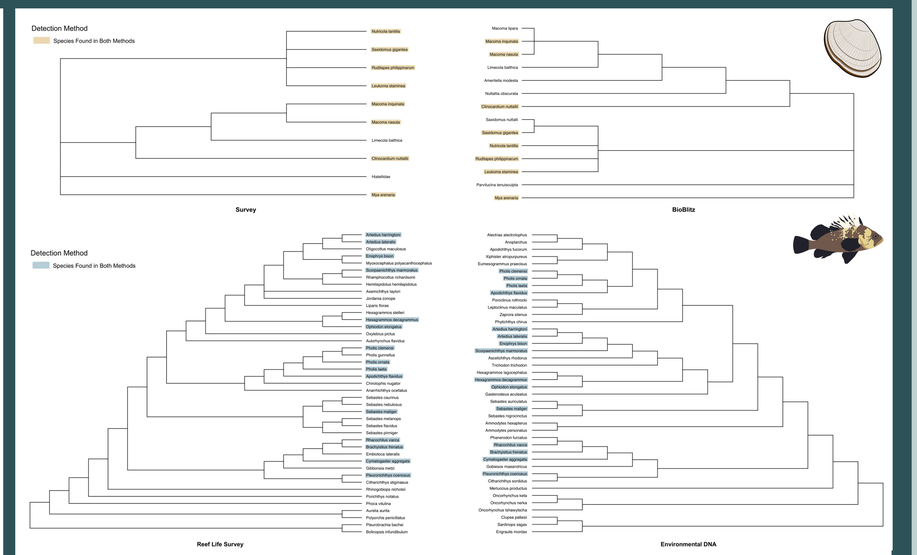


Figure 3. Taxonomic[3] trees constructed from species lists derived from both survey methods: long-term monitoring regime (left), and rapid baseline assessment (right), where species highlighted with colour have been detected by both monitoring technique. Ancestral nodes with detections were excluded from the final tree due to their redundancy.

CONCLUSIONS

Our standardized framework **enables integration** of diverse biodiversity data, leveraging species lists from rapid assessments with data from systematic surveys. We **offer guidance** for developing efficient, targeted monitoring protocols for practitioners facing limited resources and increasing demands for ecosystem assessment.

FUTURE DIRECTIONS

Using data from Belize, I will compare detectability through a multivariate community analysis.

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*LTEM = Long-Term Ecological Monitoring / Long-Term Monitoring, RLS = Reef Life Survey, eDNA = Environmental DNA

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