

Eyes on the Net: Acoustic Surveys & eDNA metabarcoding

Janet C Coetzee, Nerine van Wyk, Dagmar Merkle and Sophie von der Heyden

Paper submitted: Fisheries Research

Got to catch them all: eDNA metabarcoding expands marine biodiversity detection and offers a path to improved hydroacoustic biomass estimates

Nerine I. van Wyk, Janet C. Coetzee, Sophie von der Heyden



forestry, fisheries
& the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA



UNIVERSITY of the
WESTERN CAPE

Hydroacoustic surveys

Multiple co-occurring species contribute to echo



Sardinops sagax



Engraulis encrasicolus



Etrumeus whiteheadi



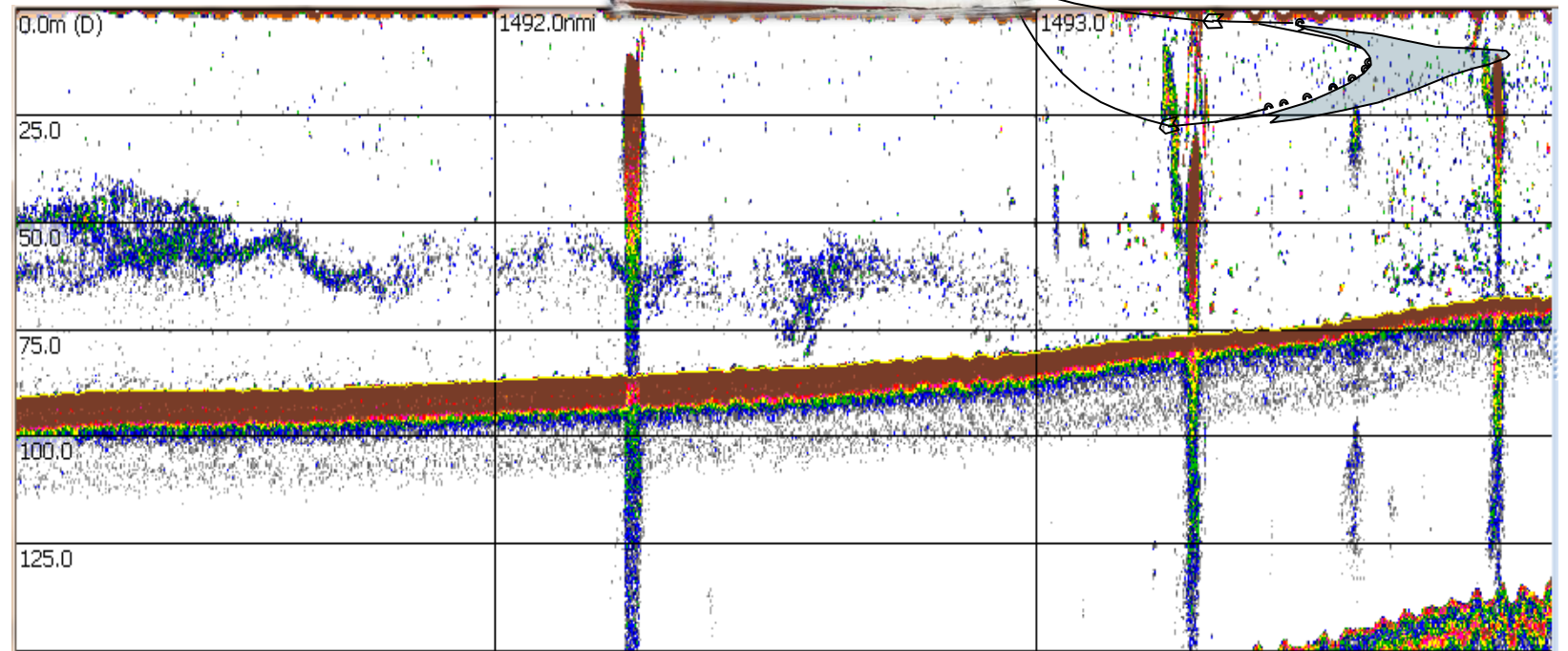
Scomber colias



Trachurus capensis

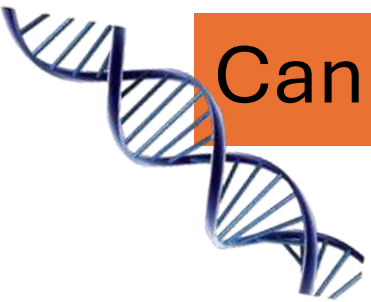
Species composition from trawl catch

$$\rho_j \propto \frac{W_j(S_A)}{\sum_j [W_j(\bar{\sigma}_{bs})_j]}$$



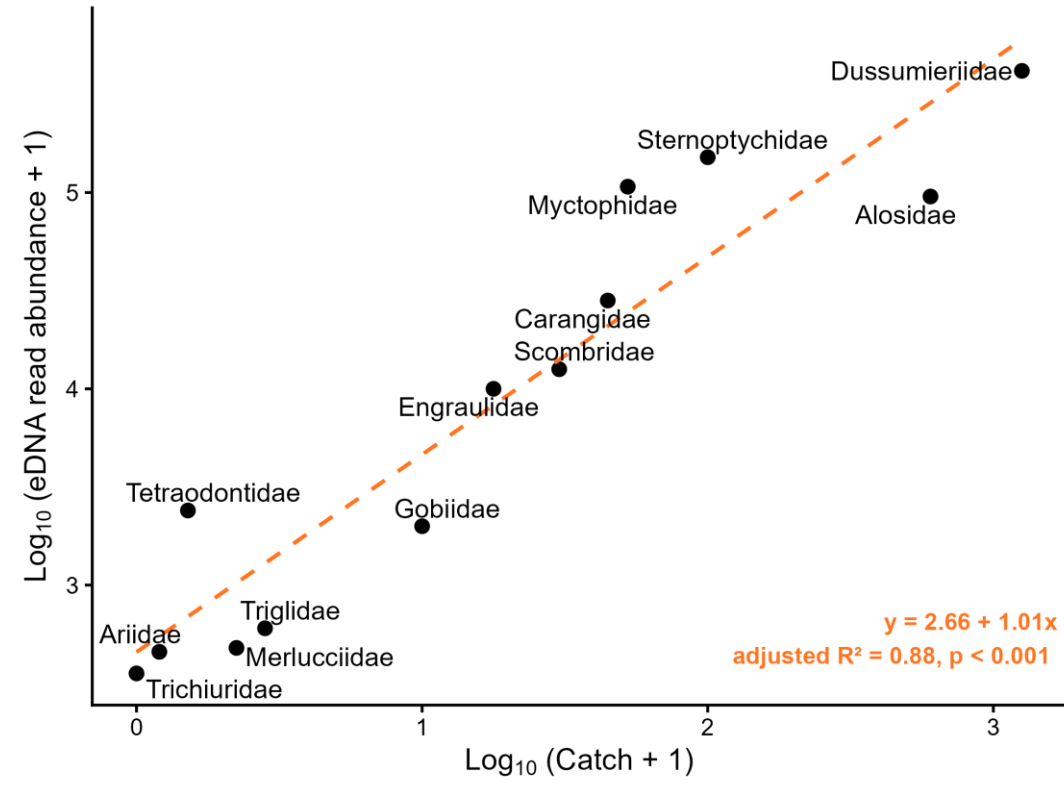
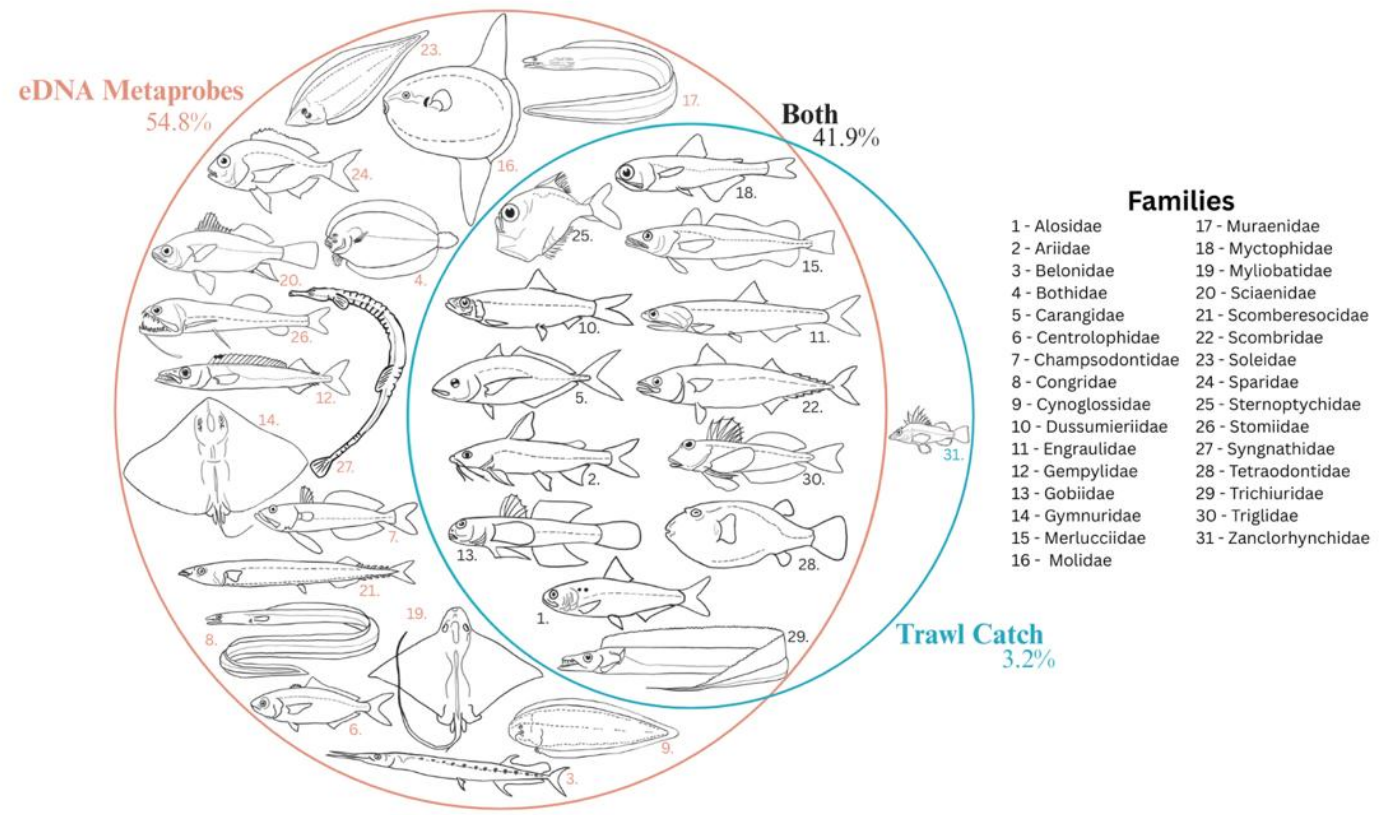
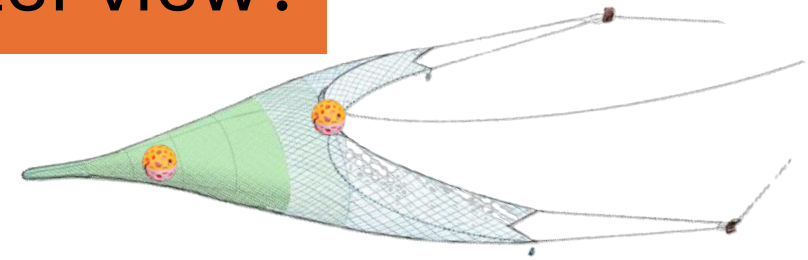
- Similar size
- Similar acoustic properties

- Variable fish behaviour and trawl selectivity leads to biased sampling
- Trawl sampling does not match spatial resolution of acoustic data



Can eDNA metabarcoding provide a better view?

Paired eDNA (headline and cod end) metaprobes deployed on 20 midwater trawls



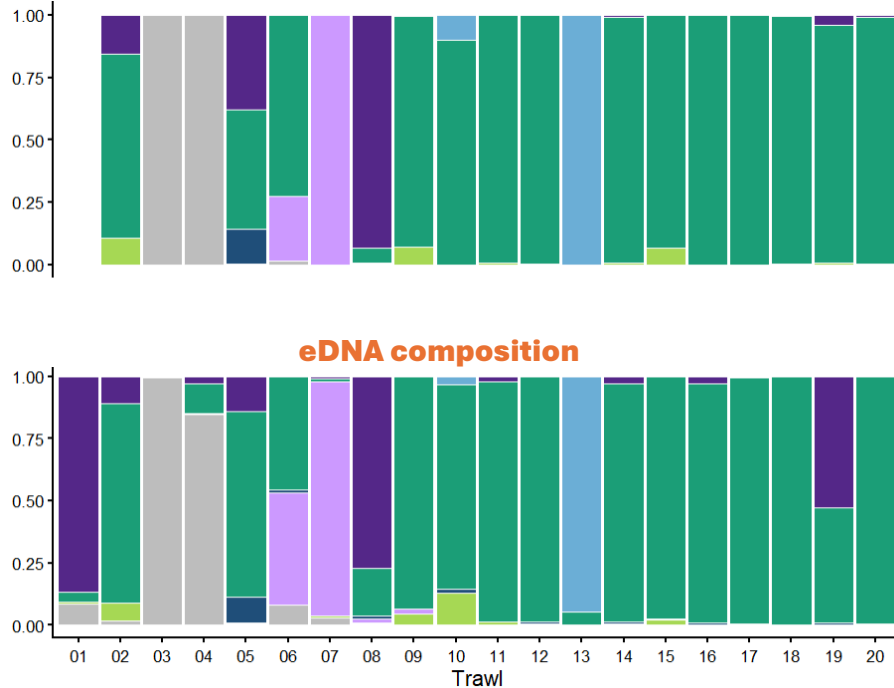
eDNA captured broader biodiversity than trawls

Strong, positive relationship between eDNA and trawl catch

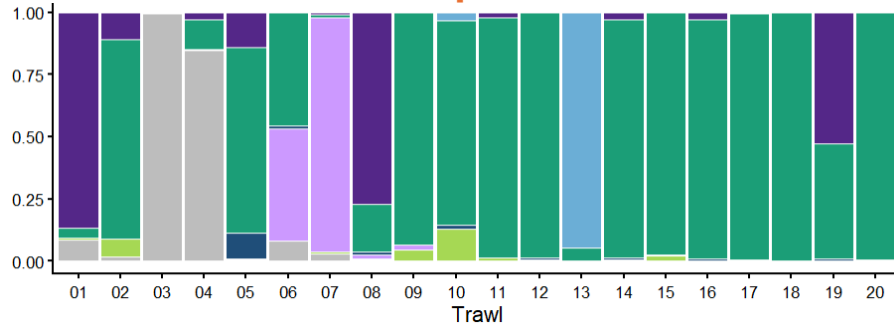
Species composition similar for dominant species

Biomass estimates are sensitive to composition

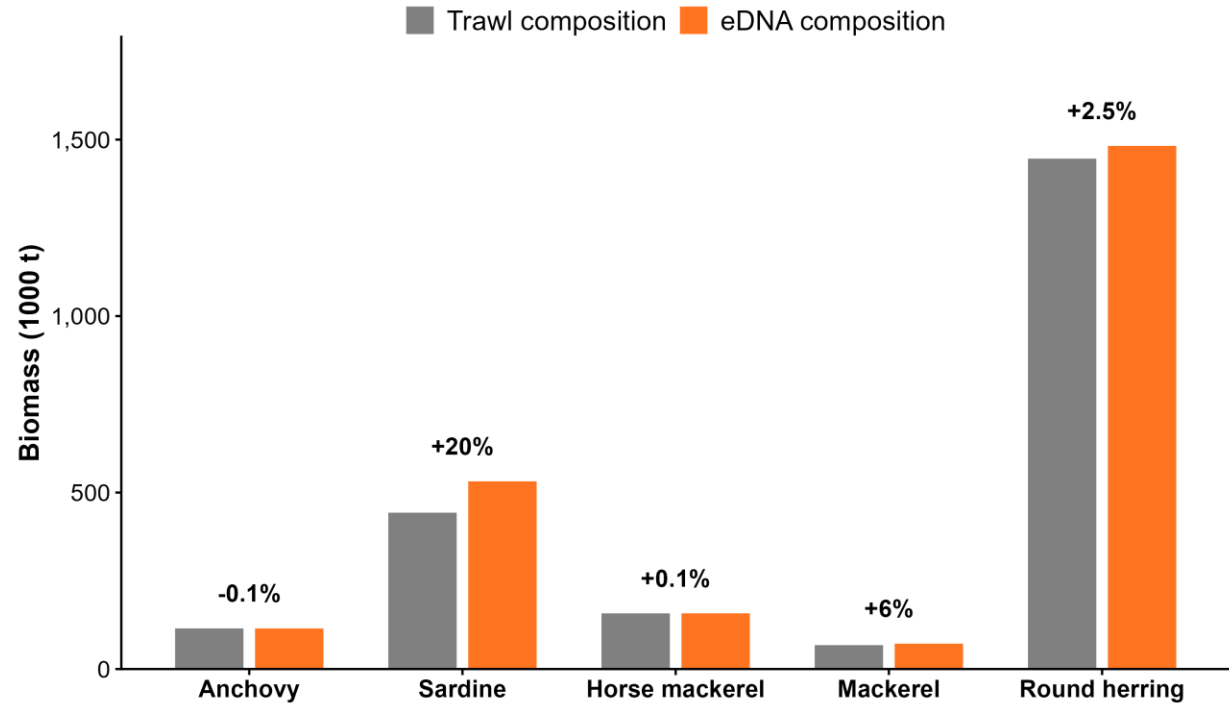
Trawl composition



eDNA composition



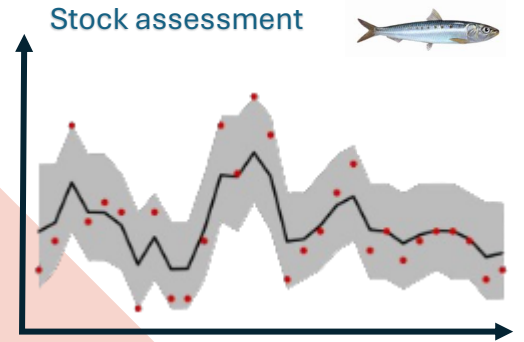
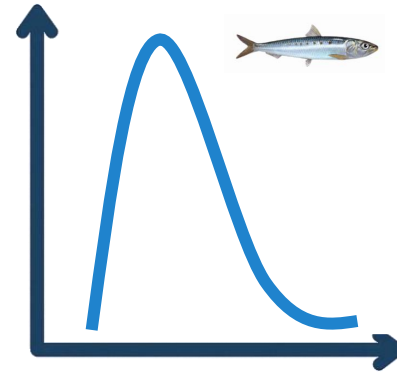
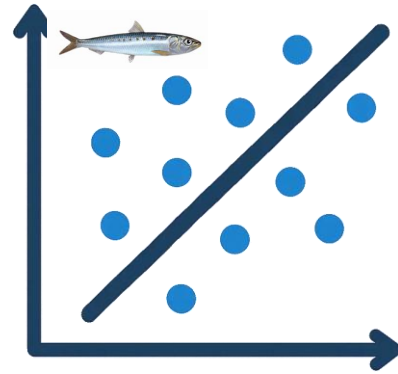
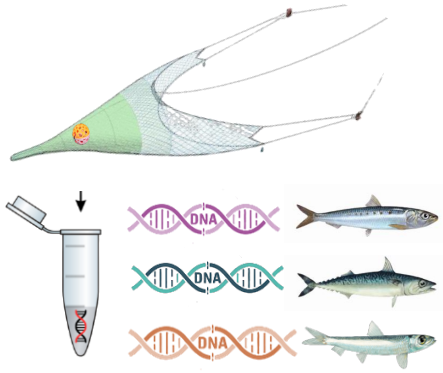
Small differences in composition



Measurable changes in biomass estimates

Based on 20 trawls (~100 typical per survey)
Larger effects are possible if eDNA composition were applied across the full survey.

What's next? Using eDNA realistically...



Further data collection

Estimate relationship between eDNA and trawl composition

Derive species-specific bias distributions

Incorporate into species-specific acoustic bias prior

eDNA cannot replace trawls - it can be used to quantify and reduce composition-driven bias

eDNA provides a broader and complementary view of species composition with clear potential to quantify and reduce bias in acoustic biomass estimates

Thank-you

