A more cost-effective EMAP-Estuaries benthic macrofaunal sampling protocol

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EMAP Benthic Macrofaunal Sampling Protocols

	East & Gulf Coasts	West Coast
Then	0.04 m^2 grab 0.5 mm mesh sieve 5 -3 reps per station 30-50 stations	
Now*	0.04 m^2 grab 0.5 mm mesh sieve 1 rep per station 30-50 stations	0.1 m^2 grab 1.0 mm mesh sieve 1 rep per station 30-50 stations

*U.S. EPA 2001. Environmental Monitoring and Assessment Program (EMAP): National Coastal Assessment Quality Assurance Project Plan 2001-2004. EPA/620/R-01/002.

Statement of Premise

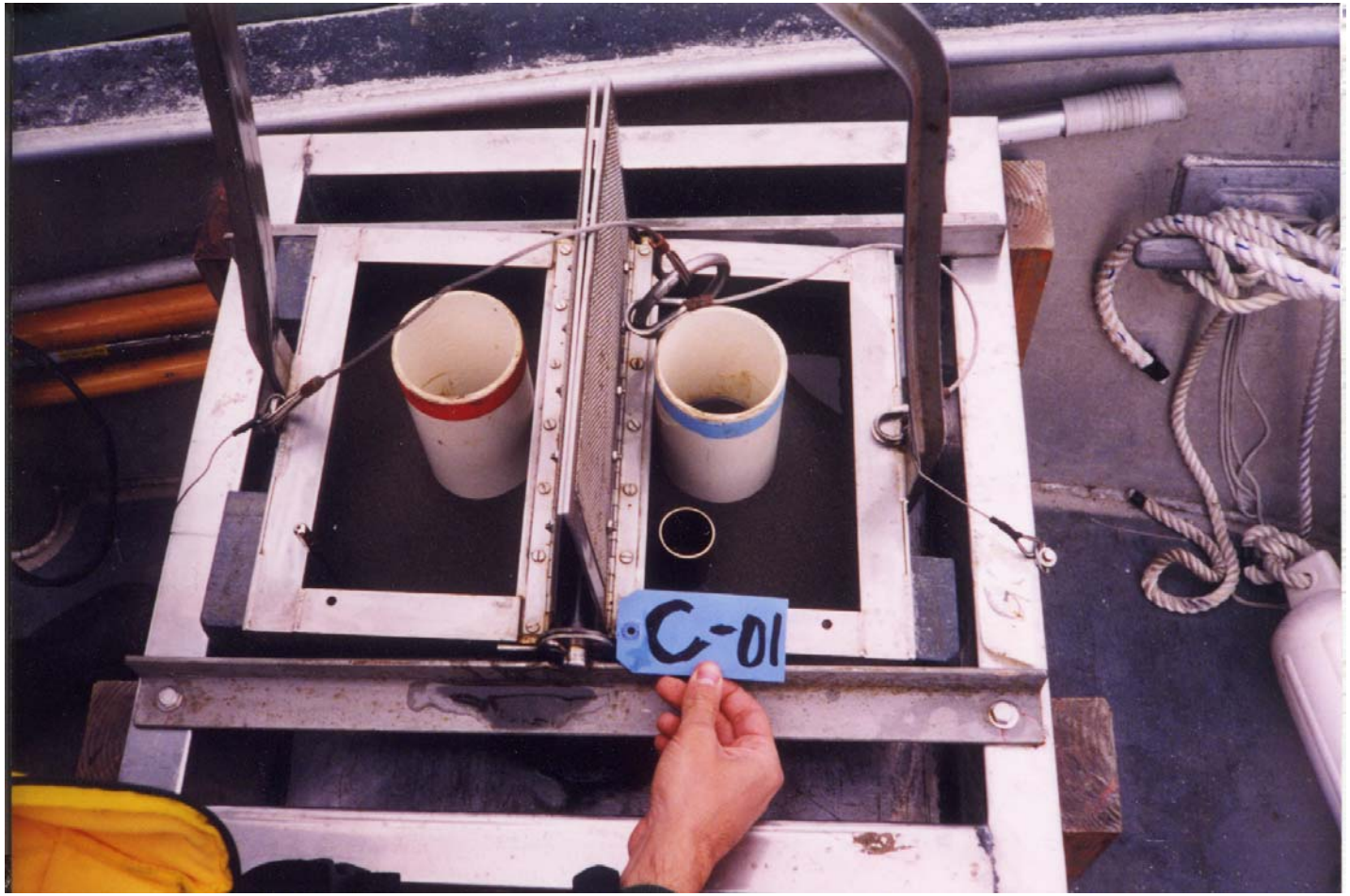
If the EMAP-W sample unit is effective, and

if an alternative sample unit provides data which is only different in scale to that obtained by the EMAP-W sample unit (i.e., equivalent conclusions are reached with both data), and

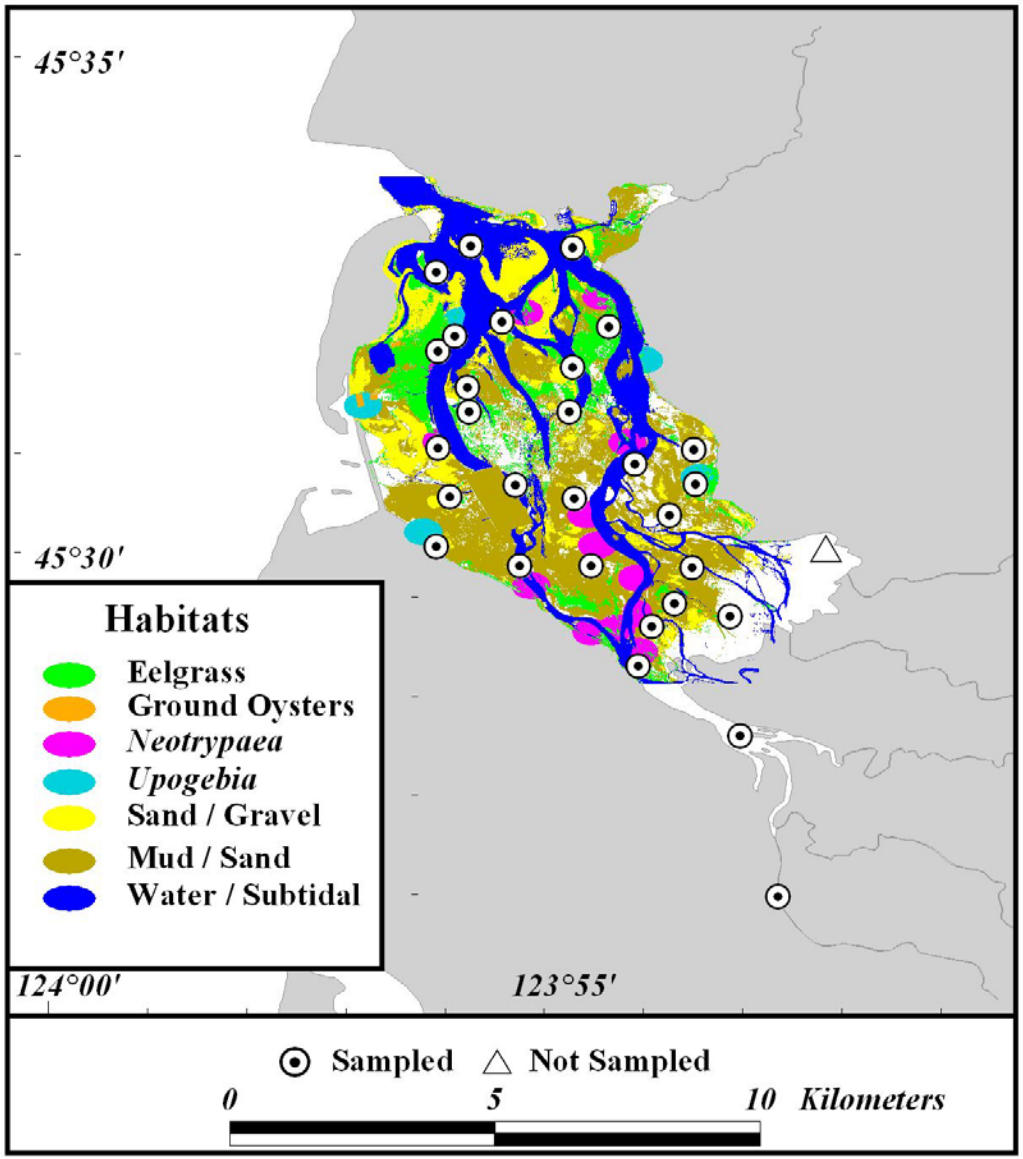
samples collected using the alternative sample unit are less costly to collect and process then the EMAP-W sample unit, then

the alternative sample unit is more cost-effective.

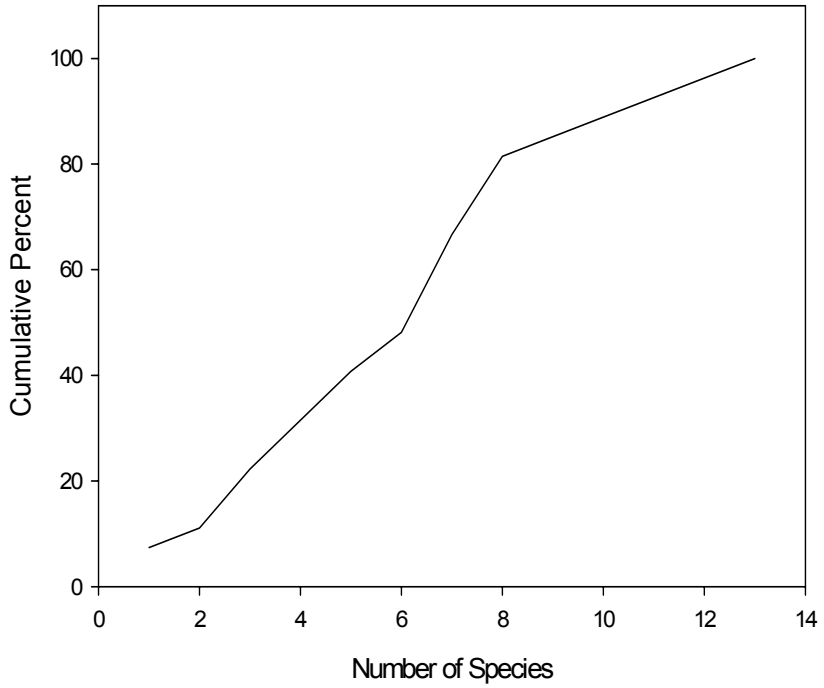
EMAP-W (0.1 m^2) benthic macrofaunal sample *versus* 0.01 m^2 x 5 cm deep (two 8-cm dia core) sample



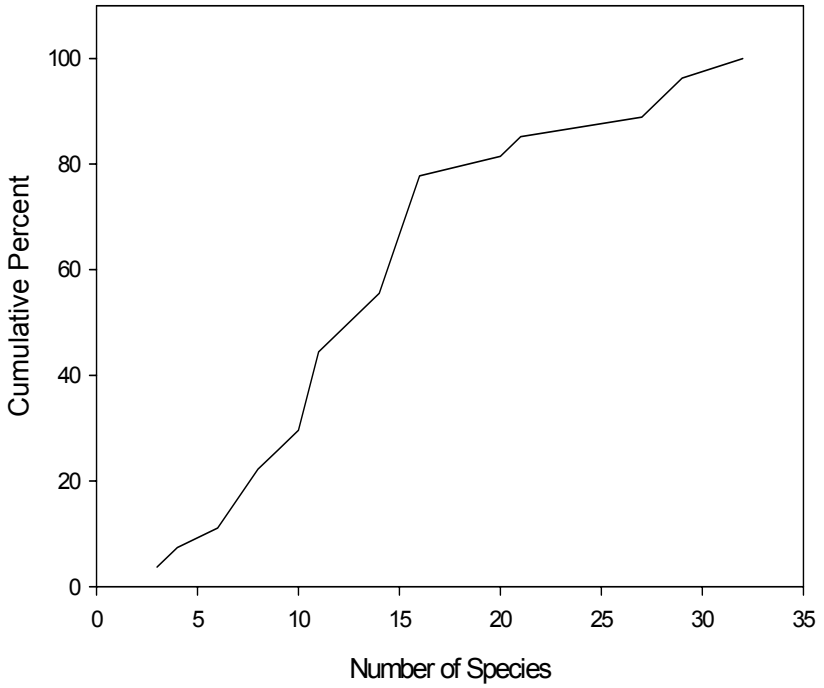
Tillamook Bay, Oregon



CDFs for Number of Species



0.01 m^2 x 5 cm deep sample data



EMAP-W (0.1 m^2) sample data

Linear Scale Transformation

adjusts for mean shift and scale change in distribution

$$X_t = [Y_{min}-(X_{min}* \text{ range } Y)/\text{range } X]+(\text{range } Y/\text{range } X)* X$$

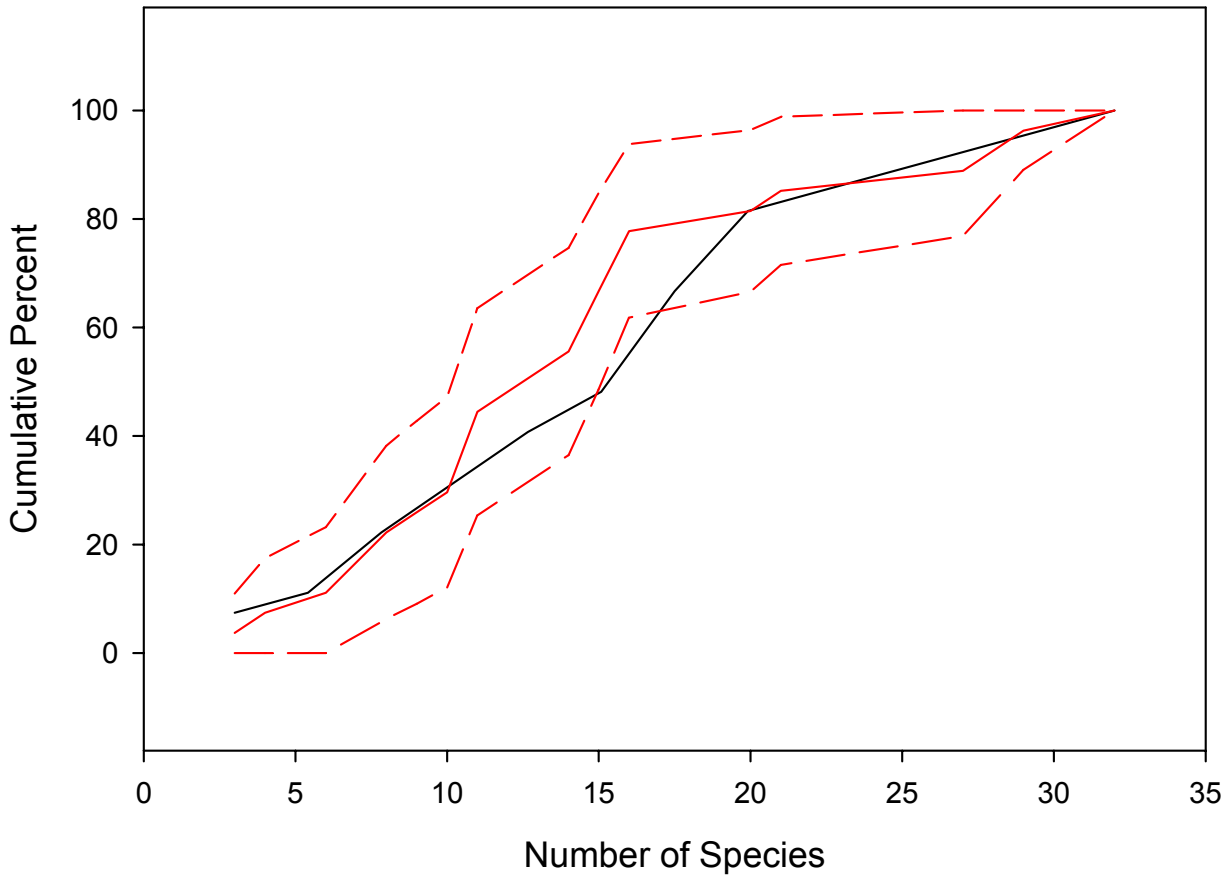
EMAP-W (0.1 m^2 x $\geq$ 7 cm deep, 1.0 mm) data

versus

Linear Scale Transformed

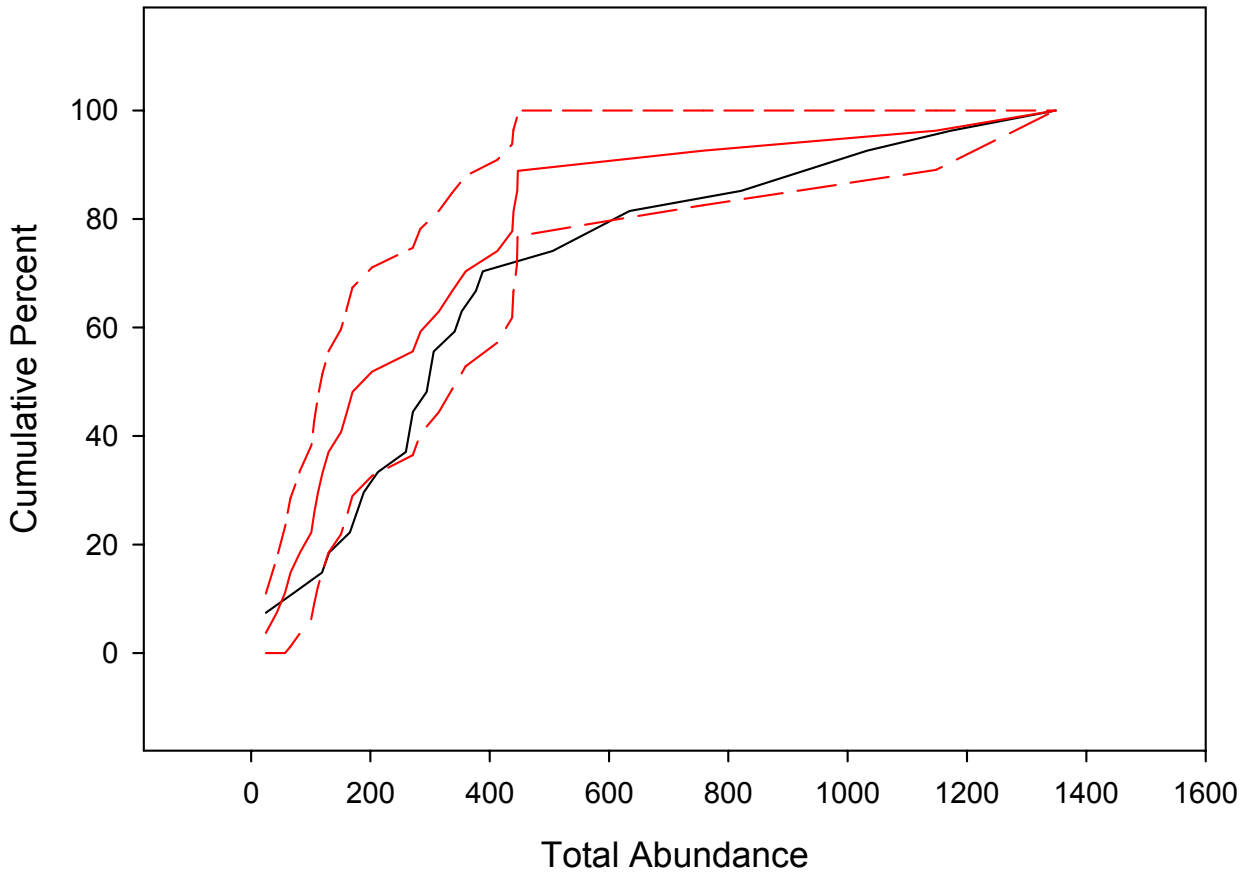
0.01 m^2 x 5 cm deep, 1.0 mm data

CDF for Number of Species



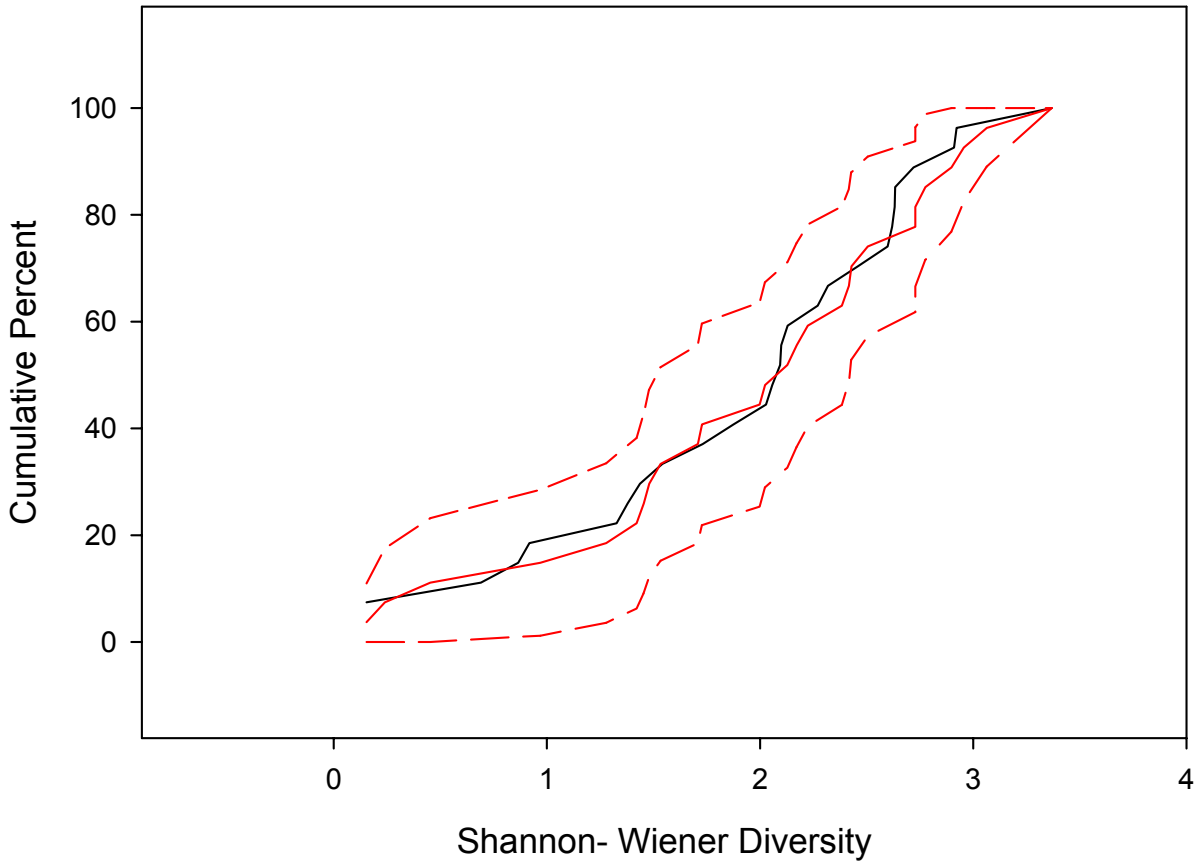
EMAP-W sample data ——— , 95% confidence limits - - - -
0.01 m² x 5 cm deep sample data, transformed ———
F-based Wald test, p > 0.05

CDF for Total Abundance



EMAP-W sample data ——— , 95% confidence limits - - - -
0.01 m^2 x 5 cm deep sample data, transformed ———
F-based Wald test, p > 0.05

CDF for Shannon-Wiener Diversity



EMAP-W sample data ——— , 95% confidence limits - - - -
0.01 m^2 x 5 cm deep sample data, transformed ———
F-based Wald test, p > 0.05

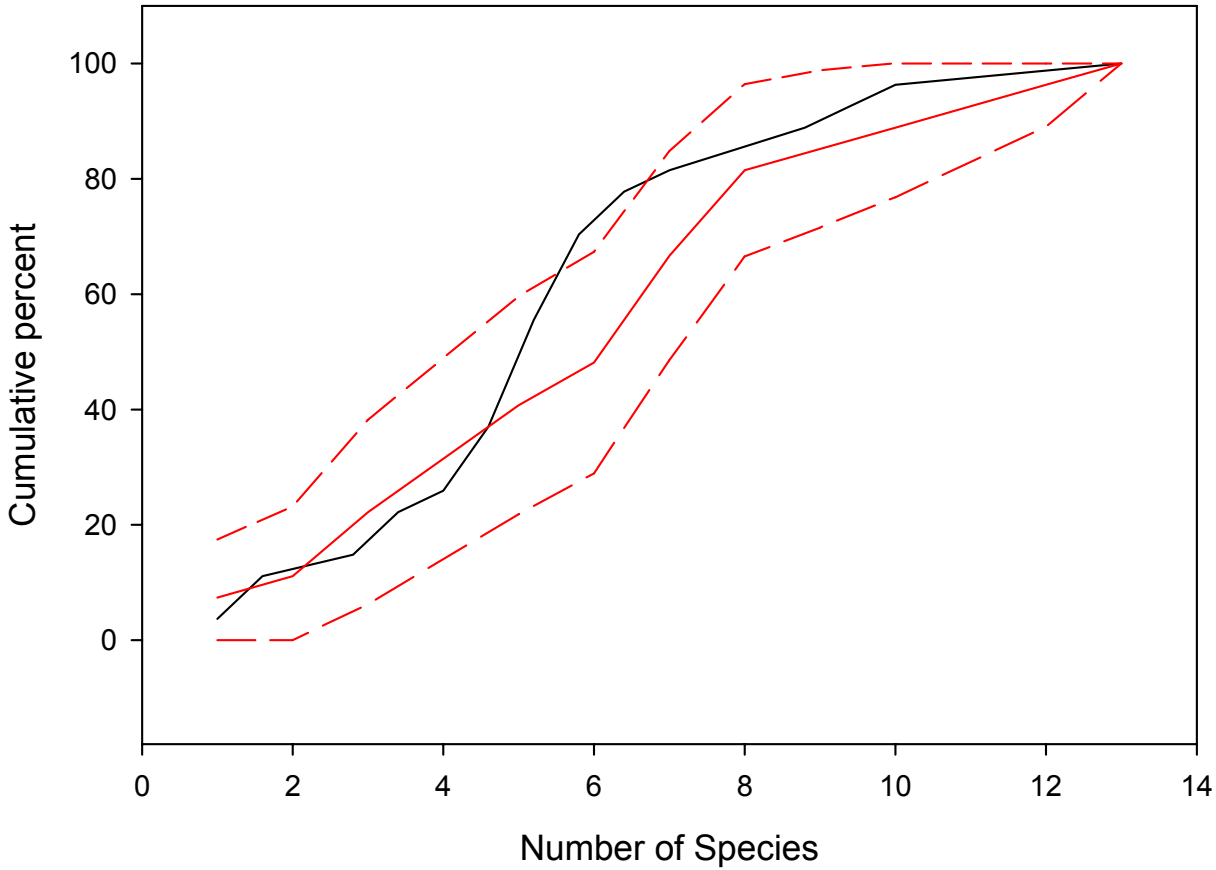
0.01 m^2 x 5 cm deep, 1.0 mm data

versus

Linear Scale Transformed

0.01 m^2 x 5 cm deep, 0.5 mm data

CDF for Number of Species

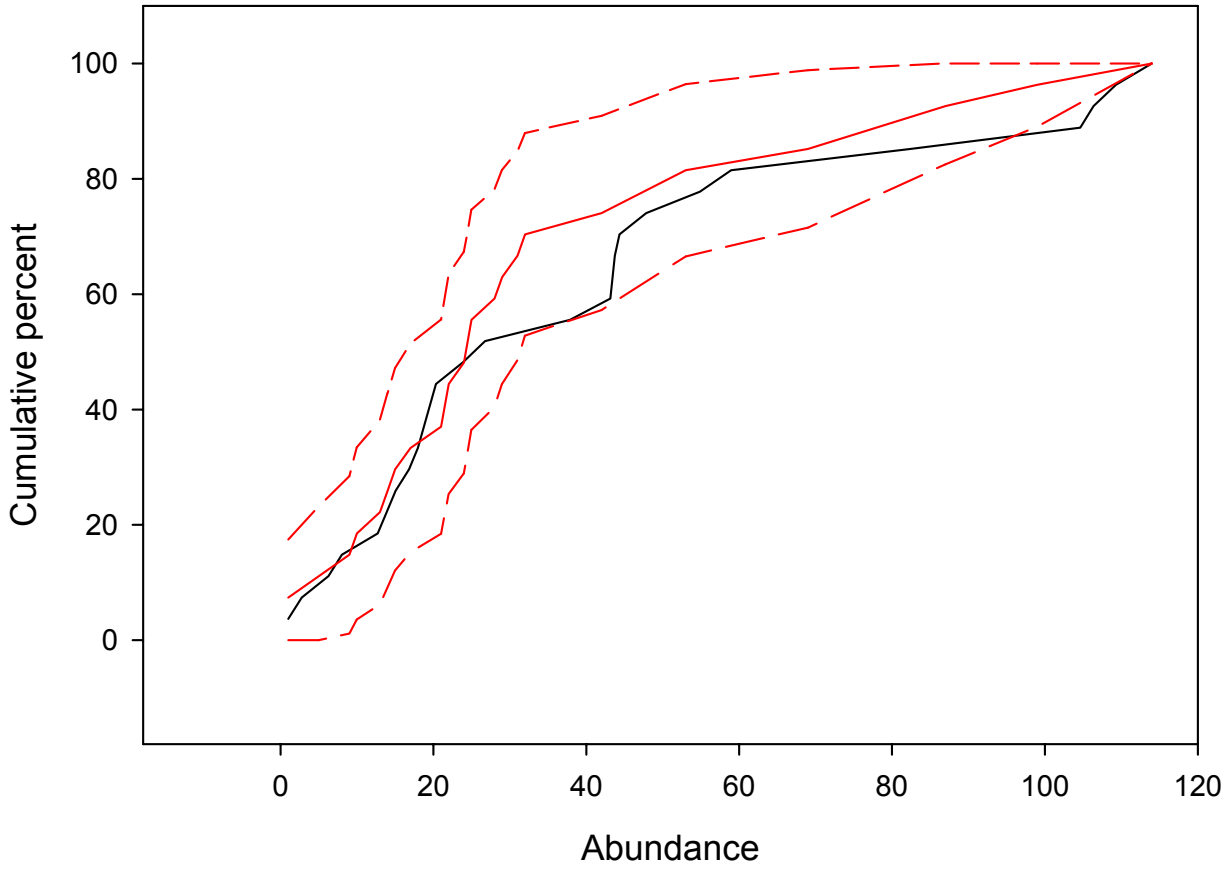


1.0 mm data ——— , 95% confidence limits - - - -

0.5 mm data, transformed ———

F-based Wald test, p > 0.05

CDF for Total Abundance

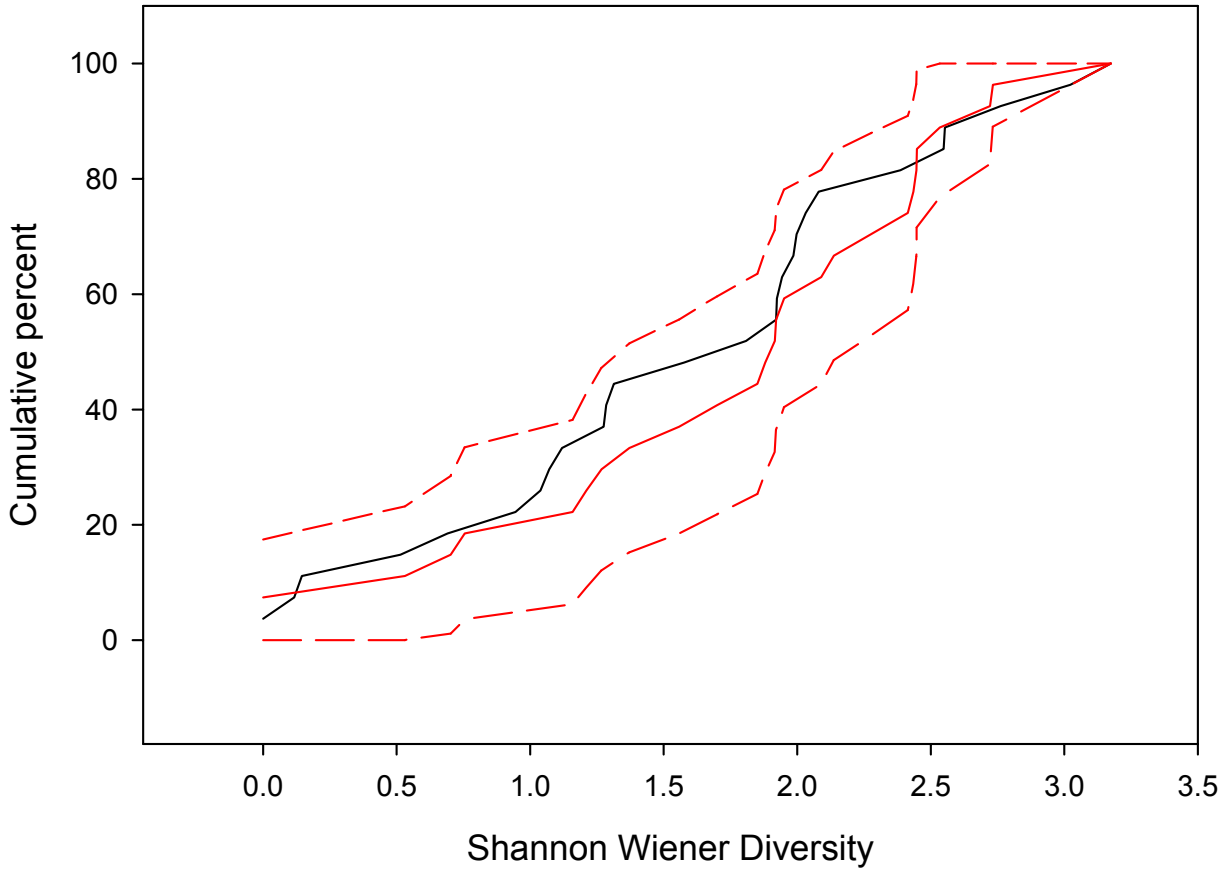


1.0 mm data ——— , 95% confidence limits - - - -

0.5 mm data, transformed ———

F-based Wald test, p > 0.05

CDF for Shannon-Wiener Diversity



1.0 mm data ——— , 95% confidence limits - - - -

0.5 mm data, transformed ———

F-based Wald test, p > 0.05

“Cost” Savings (excluding overhead)

- **~90% reduction in sample processing (sieve, sort, identify, and count specimens) time and effort.**

$ Cost Savings (including overhead)

Lab and field $ cost comparison for the Tillamook Bay EMAP-W benthic macrofaunal field study

EMAP-W samples: $50,000

0.01 m^2 x 5 cm deep samples: $27,500

Cost savings: $22,500 or 45%.

Some Reasons for Using a Particular Sample Unit

- only or best sample gear available ("It's what I got.")
- intuition ("I think it will meet my study's objective.")
- historical precedent ("I/We've always done it that way.")
- standardization ("I want to compare or combine my data with other data.")
- effective ("It meets my study's objective.")
- cost-effective ("It meets my study's objective, and it's least costly.")

Recommendation

- **Collect and separately process subsamples (e.g., 0.01 m^2) from current EMAP-Estuaries benthic macrofaunal samples (0.04 and 0.1 m^2).**

- **Compare CDFs based on subsample data and whole sample data on endpoints of interest after linear scale transformation of the subsample data.**

- **If the CDFs are consistently not significantly different, the test data can be used to calibrate subsample with whole sample data (providing continuity with the historical data), and more cost-effective future studies can be conducted using the smaller sample units.**