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

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**EMAP Benthic Macrofaunal Sampling Protocols**

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<thead>
<tr>
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<th>East &amp; Gulf Coasts</th>
<th>West Coast</th>
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<tbody>
<tr>
<td><strong>Then</strong></td>
<td>0.04 m² grab 0.5 mm mesh sieve 5 -3 reps per station 30-50 stations</td>
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<tr>
<td><strong>Now</strong></td>
<td>0.04 m² grab 0.5 mm mesh sieve 1 rep per station 30-50 stations</td>
<td>0.1 m² grab 1.0 mm mesh sieve 1 rep per station 30-50 stations</td>
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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 m²) benthic macrofaunal sample versus 0.01 m² x 5 cm deep (two 8-cm dia core) sample
Tillamook Bay, Oregon
CDFs for Number of Species

- 0.01 m² x 5 cm deep sample data
- EMAP-W (0.1 m²) sample data
Linear Scale Transformation

adjusts for mean shift and scale change in distribution

\[ X_t = [Y_{\text{min}} - (X_{\text{min}} \times \text{range } Y)/\text{range } X] + (\text{range } Y/\text{range } X) \times X \]
EMAP-W (0.1 m² x ≥ 7 cm deep, 1.0 mm) data

versus

Linear Scale Transformed

0.01 m² 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 m² 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 m² x 5 cm deep sample data, transformed ———
F-based Wald test, p > 0.05
0.01 m² x 5 cm deep, 1.0 mm data

*versus*

Linear Scale Transformed

0.01 m² 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 m² 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 m²) from current EMAP-Estuaries benthic macrofaunal samples (0.04 and 0.1 m²).

• 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.