Bioturbation Database for Benthic Invertebrates
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Introduction

Bioturbation, the reworking of sediment particles, can contribute to contaminant transport in marine environments through burrowing in the sediment and mixing the particles of the sediment into the water. Understanding how bioturbation affects each area is, therefore, crucial in order to understand the marine ecosystem and how contaminants may be transported. In this study, we adopted standard trait-based rating system proposed by Solan et al. to estimate community-level bioturbation and modified further to enhance its applicability. The original potential of community-level bioturbation (BPₐ) proposed by Solan et al. as

\[
BP_{\alpha} = \sum_{i}^{n} L_i^\alpha \times A_i \times M_i \times R_i.
\]

- B: Biomass
- A: Abundance
- M: Mobility (1-4)
- R: Types of sediment reworking (1-5)

The modified potential of community-level bioturbation (BPₐ') is defined as

\[
BP_{\alpha}' = \sum_{i}^{n} L_i^\alpha \times A_i \times M_i \times R_i
\]

- L: Size of taxon
- \(\alpha\): Scaling exponent (0.5 – 1.5)

Methods

The database of benthic invertebrate originates from Euro DB, which assigns semi-quantitative bioturbation traits for 1033 benthic invertebrates in northwest Europe. The extended Euro DB with full taxonomic information extracted from World Register of Marine Species (WoRMs) using Aphia ID. Size data was collected from the Marine Macrofauna Genus Trait Handbook, the World Register of Marine Species (WoRMs), and the Marine Species Identification Portal and made into a range. The data was incorporated into the Extended European Database (Figure 1).

![Figure 1. Extended European database (Euro DB): scientific name, Aphia ID (blue), bioturbation traits (green), taxonomic classification (orange), and size traits (purple).](https://www.marinespecies.org)

Using code established for the extended EuroDB, we move to the first case study in the Northeast of the United States. The Northeast Fisheries Science Center (NEFSC) from the National Oceanic and Atmospheric Administration (NOAA) constructed huge database of benthic survey data, which were collected from more than 20,000 sampling sites, during 1881 to present. The master list of invertebrates consists of over 3000 species.

The R code matches the taxon between the NEFSC data and the Extended EuroDB to assign size and bioturbation traits to the organisms in the NEFSC dataset. Figure 2 shows part of the NEFSC data table it is run through the R-code. The database continuous growth will lead to some of the “NoMatch” organisms to having a match, so that the community-level bioturbation potential will become more accurate.

![Figure 2. Northeastern invertebrate database](https://www.fisheries.noaa.gov/inport/item/25749)

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Future Work

- Data analysis for case study (BPₐ')
- Apply Extended EURO DB for other benthic data: Ex. SF Bay Area, East coast, Gulf of Mexico
- Assess impact of BPₐ' on compound availability

References

7. Northeast Fisheries Science Center, 2020: Benthic Habitat Database. NOAA National Centers for Environmental Information, [https://www.fisheries.noaa.gov/inport/item/25749](https://www.fisheries.noaa.gov/inport/item/25749)