Integrating Environmental DNA and Traditional DNA Barcoding Reveals Higher Zooplankton Species Richness

Zooplankton play central roles in marine food webs, energy transfer, and nutrient cycling, yet their biodiversity remains poorly documented. Environmental DNA (eDNA) metabarcoding offers a rapid way to assess species richness, but its performance relative to traditional approaches is still being evaluated. We compared hand-sorted zooplankton samples that were DNA barcoded to bulk eDNA samples that were metabarcoded at Friday Harbor Laboratories, WA, USA collected in 2021. These eDNA samples were re-queried against reference databases updated to 2026.

Both methods recovered diverse operational taxonomic units (OTUs), but each captured unique subsets of the community. eDNA was highly effective for broad biodiversity discovery, while hand sorting with direct sequencing added taxa and generated voucher specimens with images, improving reference libraries. Combining these complementary approaches yields a more comprehensive picture of local zooplankton diversity and strengthens future eDNA-based biodiversity assessments.

The re-analysis uncovered previously unidentified species across both day and night samples. However the newly identified species were subject to taxonomic bias reiterating that marine zooplankton remain understudied in reference databases, despite the long history of zoological research and routine DNA barcoding at FHL.