Box Core Macrofauna Species Counts collected Oregon and Washington Shelf 2021-2022

Website: https://www.bco-dmo.org/dataset/1004883
Data Type: Cruise Results
Version: 1
Version Date: 2026-08-12

Project
» Environmental consequences of expanded recruitment of an ecosystem engineer on a hypoxia-influenced continental shelf (Neotrypaea COP Effects)

Contributors	Affiliation	Role
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Abstract
Burrowing shrimp influence the sediment properties, animal populations, and ecological processes of the seafloor where they live through the construction and maintenance of their burrows. The burrowing ghost shrimp Neotrypaea sp. are commonly found in U.S. west coast estuaries (bays), sometimes occupying >80% of the intertidal area. In 2022, we documented a large population of ghost shrimp initially found offshore central Oregon in 2019 in waters 40-70 m (< 200 ft) deep where environmental conditions are substantially different from estuaries. Habitat suitability modeling suggested the potential for additional offshore populations on the Oregon and Washington shelves. We conducted ground-truthing sampling using a box core aboard the R/V Pacific Storm October 2021 to July 2022 on three cruises. Results from the ground-truthing cruises were used to target additional sampling areas in July to September 2022 across three more cruises. This dataset includes the macrofaunal counts from all six cruises.

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Coverage

Location: NE Pacific Continental Shelf of Oregon and Washington: 44.34 N to 46.99 N, depth 42 to 88 m.
Spatial Extent: **N**:46.9936 **E**:-124.03052 **S**:44.33766 **W**:-124.36483
Temporal Extent: 2021-10-19 - 2022-09-22

Methods & Sampling

At each station, samples were collected with a modified Grey-O'Hara 0.1 m^2 box core. One box core sample was taken at each station. Depth was recorded from the vessels' echosounder at the time the box corer hit

the bottom. Only samples with a penetration depth of at least 5 centimeters (cm) and no slumping or other evidence of disturbance (i.e., by washing) were accepted for processing. Approximately 80 milliliters (mL) of sediment were collected from the undisturbed surface layer for grain size analysis. Any organisms noticed in the sediment subsample at the time of collection were removed and placed in the organism sample jar. The remainder of the collected core was sieved onboard through a 1.0 millimeter (mm) mesh screen, and all organisms (both infauna living in the sediment and small epifauna which may have been on the surface – hereafter collectively called macrofauna) as well as debris retained on the screen were preserved in a mixture of 10% buffered formalin and seawater. Upon return to the Oregon State University (OSU) laboratory, samples were transferred to 70% ethanol. Organisms were then removed from the debris and sorted into major taxonomic groups using a dissecting microscope by trained laboratory staff/students. The residual portion (remaining debris after removal of organisms) of every sample was checked by a second lab personnel, and any found organisms were added to the sorted jars. Crustaceans, polychaetes, other worm-like creatures, and mollusks were then sent to contracted taxonomic experts. OSU staff identified the echinoderms.

Data Processing Description

The data received from the taxonomic experts have been reviewed to make sure there are no "duplicate" species due to misspellings and all species names have been updated if necessary to the currently accepted names according to WoRMS (World Register of Marine Species).

BCO-DMO Curation Notes

This section documents curation actions performed prior to publication review with the submitter, and additional information relevant to understanding and reusing this dataset. It distinguishes changes made to the submitted (meta)data from unresolved issues and/or enhancements that improve future reuse and interoperability.

CURATION ACTIONS PERFORMED ON DATA

- Loaded table COPcomplete_macrofauna_data.csv as table "cop_macrofauna_data", CSV format, header row 1, empty string, "nd", and "NA"
- Converted column Date_PDT from M/D/YY string format (e.g., 10/19/21) to ISO 8601 date format YYYY-MM-DD, overwriting the original column
- Output final table to file 1004883_v1_cop_macrofauna_species_counts.csv

CURATION ACTIONS PERFORMED ON METADATA

- Standard metadata entry and text formatting steps were performed.
- Adjusted the abstract references from 7 cruises to 6, since 6 are referenced the metadata and the dataset.

ISSUES POTENTIALLY IMPACTING REUSE

- Count parameter is a decimal, which could conflict with the definition submitted.

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Related Publications

Reimers, C. E., Henkel, S. K., Fogaren, K. E., Chace, P. J., Hughes, A., & Wakefield, W. W. (2025). Dynamic benthic oxygen fluxes lessen hypoxia effects on open continental shelves. Limnology and Oceanography, 70(10), 2998–3015. Portico. https://doi.org/10.1002/lno.70197
Results

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Related Datasets

IsRelatedTo

Henkel, S. K., Reimers, C. E. (2024) **Sample stations for the Neotrypaea COP (Community, Oxygen, & Productivity) Effects ground-truth cruises in 2021 and 2022.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2023-12-14 doi:10.26008/1912/bco-dmo.880760.2 [view at BCO-DMO]
Relationship Description: This dataset (version 2) is the list of sampling locations for the first 3 cruises for this project.

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Parameters

Parameter	Description	Units
Sample	Individual box core sample number	unitless
Vessel	Name of the ship. "Sproul" = R/V Gordon Sproul; "Storm" = R/V Pacific Storm	unitless
CruiseID	Internal or UNOLS cruise ID	unitless
Site	Name of sampling site	unitless
Time_PDT	Local time recorded when box core touched bottom (PDT time zone)	unitless
Sample_Date	Concatenated field of sample number and month-year of collection	unitless
Date_PDT	Sampling date (PDT time zone)	unitless
ISO_DateTime_PDT	Sampling date and time (PDT) in ISO 8601 format	unitless
ISO_DateTime_UTC	Sampling date and time (UTC) in ISO 8601 format	unitless
DecLat	Latitude of sample collection; positive values = North	decimal degrees
DecLon	Longitude of sample collection; negative values = West	decimal degrees
Depth_m	Boat echo sounder depth when box corer deployed, in meters	Meters
Depth_fa	Boat echo sounder depth when box corer deployed, in fathoms	Fathoms

Pen_cm	Penetration depth of box corer (depth the box corer penetrated the seafloor sediment) in centimeters	Centimeters
Organism_Group	Major Taxonomic Group of identified taxon	unitless
Taxon_Name_Identified	Name of taxon as identified	unitless
Count	Number of each taxon in each sample	unitless
Lowest_Identifiable_Taxon_Accepted	Name of taxon as currently accepted in WoRMS	unitless
AphiaID	ID of currently accepted taxon name in WoRMS	unitless
LSID	Life Science Identifier of currently accepted taxon name in WoRMS	unitless

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Instruments

Dataset-specific Instrument Name	modified Grey-O'Hara 0.1 m² box core built by Halco welding
Generic Instrument Name	Box Corer
Dataset-specific Description	At each station, samples were collected with a modified Grey-O'Hara 0.1 m2 box core. One box core sample was taken at each station.
Generic Instrument Description	General description of a box corer: A box corer is a marine geological tool that recovers undisturbed soft surface sediments. It is designed for minimum disturbance of the sediment surface by bow wave effects. Traditionally, it consists of a weighted stem fitted to a square sampling box. The corer is lowered vertically until it impacts with the seabed. At this point the instrument is triggered by a trip as the main coring stem passes through its frame. While pulling the corer out of the sediment a spade swings underneath the sample to prevent loss. When hauled back on board, the spade is under the box. (definition from the SeaVox Device Catalog) Box corers are one of the simplest and most commonly used types of sediment corers. The stainless steel sampling box can contain a surface sediment block as large as 50cm x 50cm x 75cm with negligible disturbance. Once the sediment is recovered onboard, the sediment box can be detached from the frame and taken to a laboratory for subsampling and further analysis. The core sample size is controlled by the speed at which the corer is lowered into the ocean bottom. When the bottom is firm, a higher speed is required to obtain a complete sample. A depth pinger or other depth indicator is generally used to determine when the box is completely filled with sediment. Once the core box is filled with sediment, the sample is secured by moving the spade-closing lever arm to lower the cutting edge of the spade into the sediment, until the spade completely covers the bottom of the sediment box. (definition from Woods Hole Oceanographic Institution).

Dataset-specific Instrument Name	dissecting microscope
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Organisms were then removed from the debris and sorted into major taxonomic groups using a dissecting microscope by trained laboratory staff/students.
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

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Deployments

COP2021

Website	https://www.bco-dmo.org/deployment/880767
Platform	R/V Pacific Storm
Start Date	2021-10-19
End Date	2021-10-19

COP2022A

Website	https://www.bco-dmo.org/deployment/880768
Platform	R/V Pacific Storm
Start Date	2022-04-07
End Date	2022-04-07

COP2022B

Website	https://www.bco-dmo.org/deployment/880769
Platform	R/V Pacific Storm
Start Date	2022-07-07
End Date	2022-07-10

SP2215

Website	https://www.bco-dmo.org/deployment/916941
Platform	R/V Robert Gordon Sproul
Start Date	2022-07-22
End Date	2022-07-25
Description	More information is available at R2R: https://www.rvdata.us/search/cruise/SP2215

SP2219

Website	https://www.bco-dmo.org/deployment/916944
Platform	R/V Robert Gordon Sproul
Start Date	2022-09-14
End Date	2022-09-19
Description	More information is available at R2R: https://www.rvdata.us/search/cruise/SP2219

COP2022E

Website	https://www.bco-dmo.org/deployment/916947
Platform	R/V Pacific Storm
Start Date	2022-09-21
End Date	2022-09-22

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Project Information

Environmental consequences of expanded recruitment of an ecosystem engineer on a hypoxia-influenced continental shelf (Neotrypaea COP Effects)

Coverage: NE Pacific continental shelf

NSF Award Abstract:
Highly productive US West Coast fishery species and marine mammals rely on benthic invertebrate communities for food. However, these communities are changing. This project addresses the potential ecological consequences of a new member to these benthic communities, the ghost shrimp Neotrypaea. In estuaries, Neotrypaea continuously rework the sediment via their burrowing activities. The combination of high shrimp abundances and the effects of burrowing mitigate the impacts of nutrient run-off (natural and human-induced) that can exacerbate low oxygen conditions. However, Neotrypaea are also considered threats to the oyster industry because of their sediment-excavating activities. An expansion of their distribution beyond estuaries may have additional unforeseen consequences for the Dungeness crab fishery (regionally valued at $33-74M/y) as Neotrypaea are both competitors with juveniles and prey for larger Dungeness crab. Thus, new data are needed to determine how offshore benthic communities are being altered by the recruitment of Neotrypaea into new habitats. This study is comparing communities with high and low shrimp abundances to understand their impact on offshore benthic communities. The shrimp's contributions to oxygen and carbon cycling are being estimated through field measurements. Benthic community assessments are quantifying changes to food resources on the seafloor caused by the presence of these relatively large shrimp. The coastal waters along the Oregon-Washington shelf are commercially valuable, yet they are also subject to growing human-related impacts. Sustainable management requires optimizing extractive, cultural, and recreational activities. The broader impacts of this research include key data for managers, commercial fisheries' stakeholders and oyster growers that inform decisions regarding ocean-use planning and management of burrowing shrimp. This project is providing research training for three graduate students and two summer undergraduate students. Curriculum development for elementary school students is focused on the ecology of soft-bottom benthos. The ocean sandy/muddy benthos are often unknown to K-12 students on the West Coast who are usually more familiar with intertidal and kelp forest systems.

Changing environmental conditions in shelf waters along the Oregon and Washington coasts and elsewhere have included increasingly frequent and severe hypoxia events, ocean acidification, and warming. These changes have affected biological communities and altered species distributions. An abundant mid-shelf population of the burrowing ghost shrimp, Neotrypaea sp. was documented in shelf waters following the Marine Heat Wave of 2015. Neotrypaea are ecosystem engineers that were previously known to be abundant in intertidal estuary mudflats with an insignificant presence in the open ocean. In estuaries Neotrypaea continuously rework the sediment via their burrowing activities. The shrimp can increase oxygen cycling due to

burrow irrigation and reduce impacts of nutrient loading such as low-oxygen conditions. However, enhanced benthic oxygen consumption linked to Neotrypaea sp. beds could have the opposite effect on the shelf by intensifying regional hypoxia. This study is characterizing the environmental conditions associated with the expanded distribution of Neotrypaea using a habitat-suitability modeling approach. Model predictions are being validated through extensive field sampling via box coring and video lander observations. In addition, the benthic samples are documenting changes in the benthic invertebrate communities within the Neotrypaea beds and how this is potentially affecting biological interactions. Analyses of aquatic eddy covariance and of core incubations in shelf areas with and without abundant shrimp are providing estimates of the shrimp's contribution to benthic oxygen fluxes and organic carbon cycling. These data are being used to quantify the shrimp's and their burrows' effects on the overall productivity of the mid-shelf benthos relative to reference areas. How Neotrypaea alter seafloor structure and biogeochemistry need to be characterized to predict the impact of these ecosystem engineers on the food supply for higher trophic levels and fisheries.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2126112

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