2022 STATE OF THE COAST

November 5, 2022

Gladys Valley Marine Studies Building

Hatfield Marine Science Center

BOOK OF STUDENT RESEARCH ABSTRACTS & ART

2022 State of the Coast Student Research & Art Exhibit

The student research and art exhibition is a dedicated time when conference participants can interact with student researchers and artists as they explain their marine-related work. This remains an opportunity for students to showcase their efforts and gain professional experience.

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Meagan Abele

Title: Modifications to Bottom Trawl Fishing Gear for Increasing Economic Utilization of Groundfish Stocks and Decreasing Trawl-Seafloor Interactions on the West Coast

Student Exhibition: Research

Co-Authors: Mark Lomeli, Waldo Wakefield
Institution: Oregon State University
Degree: Master's in Marine Resource Management (2023)

Abstract:
The West Coast groundfish bottom trawl fishery (WCGBT) is a multispecies fishery operated under catch share program and employs conventional bottom contact doors, sweeps and trawl nets along the continental shelf break and upper slope to harvest fish. These techniques are highly effective, as the WCGBT fishery attains one of the largest volumes of fish annually, but can create issues for the fishery. There is a lack of research on how to increase catch utilization while balancing ecosystem impacts, which constrains management decisions. This study applies two modifications of conventional bottom trawl fishing gear to address this deficit. Underutilization of quotas is due in part to increasing catches of juvenile fish in constrained species, such as sablefish (*Anoplopoma fimbria*), limiting the ability to target other co-caught species. A Flexigrid system has been developed in the Northeast Atlantic groundfish fishery to exclude juvenile fish based on body size, but this has not been tested in the Eastern Pacific. We tested the efficacy of a Flexigrid sorting device to reduce the bycatch of juvenile sablefish in bottom trawl fishing. Trawl-seafloor contact can impact habitat complexity and important benthic species, which led to the development of a semi-pelagic trawl to elevate the doors and sweeps decreasing seafloor contact. To test this setup in the WCGBT, we conducted a comparative study on catch size and composition between semi-pelagic and conventional trawl configurations. This study aims to provides managers with two technological innovations to maintain the productivity of the WCGBT fishery while balancing ecosystem needs.

Keywords: Fisheries, conservation, conservation engineering, trawl

Cash Adams

Title: Oregon Pelican - Wood

Student Exhibition: Art

Institution: Siletz Valley High School
Degree: High School (2025)

Narrative: This work is important to me because I like building pieces of artwork with different colors of wood. This work is connected to Oregon because some of the woods I used in this project are old growth fir and aspen which are native tree species in Oregon. I hope people will discover a new avenue of creative expression.

Artist's Statement: Hi my name is Cash, I am in 10th grade and I'm interested in oil spills, how they affect an area over a number of years, and ways that people are preventing disasters like this from happening again. My favorite thing to do after school is to play basketball outside and I love eating pizza any time of the day.

Risa Askerooth

Title: Hybrids hiding in plain sight: mapping the distribution and abundance of a newly-discovered, invasive beachgrass hybrid on Oregon and Washington coastal dunes

Student Exhibition: Research

Co-Authors: Rebecca Mostow, Hieu Ly, Rose Antaki, Malcolm Thieme, Drake Scrafford, Beck Harper, Sally Hacker
Institution: Oregon State University
Degree: MS, Integrative Biology (2023)

Abstract:
Over the last century, the native state of Pacific Northwest coastal dunes has been drastically altered through the introduction of two invasive, dune-building beachgrasses, *Ammophila arenaria* (European beachgrass) and *A. breviligulata* (American beachgrass). These beachgrasses present management tradeoffs, forming dunes that protect coastlines from extreme storms and sea level rise, but also leading to the decline of some native dune species. In the last decade, our research group has found that the two beachgrasses have bred, forming a hybrid beachgrass (*A. arenaria* x *A. breviligulata*). Since 2019, we have enlisted the help of citizen scientists and searched over 44 km of coastal dunes, detecting nearly 300 patches across a 250-km stretch from Pacific City, Oregon to Ocean Grove, Washington. The greatest number of hybrid beachgrass patches per search area occurred at the southern Washington sites of Grays Harbor (21 patches per km) and Ocean Shores (14 patches per km). We also determined the relative abundance of the hybrid's typical non-dominant parent, *A. arenaria*, and found that an average of 6 *A. arenaria* patches co-occurred with each individual hybrid patch but this pattern varied with latitude. This ongoing research into the distribution and abundance of the hybrid compared to its parents will be important in understanding the degree to which the hybrid has the potential to alter coastal dune functions and services, such as dune shape, coastal protection, and species diversity.

Keywords: Invasive, Hybrid, Dunes, Coastal, Ecosystem Engineer

Alexandra Avila

Title: "How Nearshore Currents affect Larval Dispersal and Genetic Connectivity of China Rockfish (Sebastes nebulosus) Along Oregon and Washington"

Student Exhibition: Research

Co-Authors: Scott Heppell, Will White, Felipe Barreto, Michael Harte
Institution: Oregon State University
Degree: PhD (2022)

Abstract:
Connectivity of fish populations is a crucial question for fisheries conservation and the development of spatial management plans. Both adult and larval movement define the extent and direction of ecological and evolutionary overlap between geographic regions and, therefore, how we define stocks for management purposes. Within that context, my work focuses on the dispersal of a nearshore, demersal species, the China Rockfish (*Sebastes nebulosus*), an economically important fishery in Oregon. In this research, I aimed to determine how larval transport affects genetic diversity and connectivity along the Oregon and Washington coasts. We found no pronounced genetic differentiation or population structure (i.e. high connectivity) among populations in the Oregon and Washington coast and these populations should be considered as one population for management considerations. Initial results from oceanographic ROMs modeling indicate levels of connectivity among the different sites. These results suggest that nearshore oceanographic currents could be useful for identifying patterns of genetic connectivity among species with similar life history to that of the China Rockfish. Since China Rockfish are nearshore dwellers and have a very limited home range, we expected to find low genetic diversity at a localized level (i.e., within a specific area like a marine reserve or MPA); and high genetic connectivity across the entire two-state study area, suggesting that larvae are mostly dispersed by nearshores ocean currents.

Keywords: Genetic connectivity, population genetics, oceanography, fisheries management, groundfish, rockfish

Mayah Baker

Title: Annual Abundance of blue and fin whales off the coast of Newport, OR using bioacoustic analysis

Student Exhibition: Research

Institution: Oregon State University
Degree: Fisheries, Wildlife, and Conservation Science (2023)

Abstract:
Bioacoustics is the emerging interdisciplinary field of science concerned with sounds produced by living organisms. Marine mammal bioacoustics employs acoustic technology to record and understand the sounds produced by marine mammals living in the ocean. It can be an important tool in understanding species distribution and behavior without having to be physically present. In the recent year, Oregon State University's Marine Mammal Institute was recently awarded 2 million dollars by the US Department of Energy to collect data on the distribution of cetaceans and seabirds along the Pacific Northwest coast. The data collected will be used to inform the development of offshore wind energy along the coast. The project, Marine Offshore Species Assessments to Inform Clean Energy (MOSAIC), utilized a variety of different techniques to gather data, including passive acoustic monitoring of cetaceans. My project focuses on analyzing previous acoustic data of blue and fin whales from the years 2018-2020 collected by a hydrophone that is located off the coast of Newport, OR. The data analyzed was used to plot graphs of annual blue and fin whale abundance at this location. For both the blue and fin whales, abundance of these species was highest during the fall and winter months (September-March) and lowest during the spring and summer months (April-August). This pattern is crucial for understanding blue and fin whale distribution off the coast of Newport, OR and the results will contribute to the MOSAIC project.

Keywords: blue whale, fin whale, bioacoustics, offshore wind, renewable energy, abundance

Clara Bird

Title: Individual behavioral specializations in gray whales documented through drone-based observation

Student Exhibition: Research

Co-Authors: Leigh Torres
Institution: Oregon State University
Degree: PhD (2024)

Abstract:
Quantifying the degree of individual behavioral specialization within a population can enable effective management, particularly regarding the degree of resource and habitat partitioning that may influence population resilience to environmental change and disturbance events. Gray whales in the Pacific Coast Feeding Group (PCFG) employ a variety of shallow water foraging tactics off the coast of Oregon, USA. Videos collected via drones provide an opportunity to observe, identify, and quantify these unique foraging tactics, link these data to individual whales through photo-identification, and examine the degree of behavioral specialization relative to individual, habitat, and time (months and years). From June through October of 2016–2021, we conducted over 500 drone flights over 150 individual PCFG whales. We developed a detailed ethogram of 5 primary and over 20 sub-behavior states to process 90 hours of drone footage where we identified specific behavior tactics employed by each individual. We link foraging tactics to individual whales and their demographic unit, morphology, benthic habitat type at the location, and temporal period. We use these data to test the hypotheses that (1) the degree of individual specialization is greatest at the monthly time scale compared to longer temporal periods due to environmental variability, and (2) individuals that are specialized in the same tactic share similar morphology. This study illustrates diverse behavioral specialization by individual baleen whales that are maintained across years. Such information establishes a foundation for investigating gray whale resource and space use under changing conditions, which can foster effective management of whale populations.

Keywords: gray whales; behavioral ecology; drone footage; individual specialization

Joshua Blockstein

Title: Exploring the connection between Community Assets and Social Capital among Latinx Coastal Community Members to support Community Resilience and Disaster Preparedness

Student Exhibition: Research

Co-Authors: Jenna Tilt, Felicia Olmeta Schult
Institution: Oregon State University
Degree: Master's in Marine Resource Management (2023)

Abstract:
Social capital, defined as one's networks of connections to people and organizations, is an important component to understanding how different community groups, particularly marginalized or underrepresented groups adapt and respond to natural hazards. The Latinx community is the fastest growing demographic in Oregon, with 2020 U.S. Census results showing the state's overall Latino population growing by 31%. Latinx is used in this academic context as a non-gendered term for this community. Prior research has indicated that Latinx-defined community assets are valued for facilitating interactions within their community and providing access to information. These are key elements of social capital, which can enable communities to respond faster and rebuild from disasters through collection action and support networks. My research builds upon this work by investigating through focus group interviews (N=45) with Latinx Newport residents the specific connections between community assets and social capital. While data from these interviews is currently being analyzed, preliminary results show that residents rely heavily upon familial networks for resources, have few trusted organizational connections, and desire more training related to Tsunami preparedness. This work sheds new light on how Oregon coastal communities consider adaptation strategies to reduce vulnerable community members. Further analysis can suggest interventions that utilize and augment existing support networks. For example, emergency management offices may wish to partner with trusted community partners to conduct pre-disaster training and distribute resources during recovery phases. This study is funded by the Cascadia Coastlines and Peoples Hazards Research Hub (CoPes Hub), National Science Foundation Award #2103713.

Keywords: community assets, social capital, latinx, coastal communities, community resilience, disaster preparedness, hazard awareness, community capitals

Lara Breitkreutz

Title: Reproductive Ecology of Eelgrass in South Slough National Estuarine Research Reserve

Student Exhibition: Research

Co-Authors: Fiona Tomas Nash, Ryan Mueller
Institution: Oregon State University
Degree: Marine Resource Management (MS) (2024)

Abstract:
Seagrass beds are foundation species that define and support coastal ecosystems globally, yet their persistence is threatened by human-induced climate change and disturbances. Seagrass die-offs and their associated ecological consequences are increasingly observed along the west coast of the US, including Oregon. This project aims to characterize the reproductive phenology and seed bank dynamics of Z. marina beds in South Slough and nearby lower Coos Bay sites to better understand the natural recovery potential of these eelgrass populations after a substantial, recently documented die-off temporally associated with a marine heatwave. Objectives at this stage of the project include 1) obtaining a quantitative baseline for reproductive shoot density across sites, 2) determining the- reproductive output of individual shoots across sites, and 3) quantifying the potential and realized eelgrass seed bank in 5 sites within South Slough and lower Coos Bay. Collected data from the 2022 growing season allows us to identify significant site-specific and depth-dependent variation in flowering shoot density, spadix density, and reproductive output. Additionally, we observe a vastly significant difference in the potential and realized seed bank, leading us to propose potential mechanisms of seed bank decline. Future directions include an experimental investigation of the effects of innate and external factors on Z. marina seed and seedling resistance to thermal stress under predicted warming due to climate change.

Keywords: eelgrass, reproductive ecology, seed bank, zostera marina, restoration, natural recovery

Leanne Cohn

Title: Using GIS to Illustrate the Intersection Between Climate Change, Energy, and Fisheries

Student Exhibition: Research

Co-Authors: Chris Harvey, Flaxen Conway, and Blake Feist
Institution: Oregon State University
Degree: M.S. Marine Resource Management (2023)

Abstract:
There is a geospatial and socioecological intersection between climate change, energy, and fisheries. As global demand for energy increases, countries, and communities around the world study methods for reducing CO2 emissions via renewable energy. Marine renewable energy (MRE) generation efforts are currently being planned, studied, and initially implemented in the US. The Bureau of Ocean Energy Management (BOEM) is working with NOAA and state and local governments to establish offshore wind energy sites off the West Coast. Taking an interdisciplinary approach to assess the potential impacts of this new infrastructure on marine ecosystems will minimize negative impacts and given the rapid pace of offshore wind siting, this is a timely endeavor for NOAA and others. For example, potential impacts from MRE are of interest to the fisheries research, management, and seafood harvest communities. NOAA has conducted fishery-independent surveys along the West Coast for decades, and the agency needs to understand how offshore MRE operations may impact these survey efforts. For my NERTO internship, our team translated 20 years of Rockfish Conservation Area (RCA) closure descriptions into a geospatial data layer that can be used to compare fishing and species distributions within and outside RCAs, allowing resource managers to better understand how these closures affect rockfish populations. Similarly, characterizing the impacts of offshore wind facilities on fishery-independent surveys and the information derived from those surveys will provide essential tools for informing fisheries management for NOAA and other decision-makers in the future. This is the focus of my graduate research, which will be completed in 2023.

Keywords: GIS, Climate Change, Fisheries, Energy, Marine Energy, Renewable Energy, Offshore Wind

Raquel Gilliland

Title: Utilizing Cooperative Fisheries Research To Better Understand Harmful Algal Blooms Along The Oregon Coast

Student Exhibition: Research

Co-Authors: Maria Kavanaugh, Jennifer L. Fisher, and Anna E. Bolm
Institution: Oregon State University
Degree: Marine Resource Management (2023)

Abstract:
Harmful algal blooms (HABs) are a problem for coastal communities, fisher people, and coastal organisms. *Pseudo-nitzschia* spp. is a regularly occurring diatom in Oregon's coastal waters. At times, *Pseudo-nitzschia* spp. can facultatively produce domoic acid, a neurotoxin that can bio-accumulate in the food chain. While regular shore-based sampling provides information on the relative abundance of *Pseudo-nitzschia* spp. and domoic acid concentration, offshore sampling is limited, hindering our understanding of the environmental drivers of blooms and their toxicity. To address this gap, we utilized the concept of cooperative fisheries research to frequently and broadly collect surface water samples along Oregon's coast for early detection of HABs. Commercial and charter fishermen were recruited to collect water samples during regular fishing excursions. The fishermen were equipped with sampling kits to collect temperature, salinity, and preserved seawater for phytoplankton counts. Samples were later processed with an Imaging Flow Cytobot (IFCB) to quantify the relative abundance and size of *Pseudo-nitzschia* cells. Cooperative sampling revealed a spike in *Pseudo-nitzschia* abundance in late July and early August 2022, agreeing well with other regional analyses such as NOAA's Pacific Northwest HAB Bulletin. Sample collection began in June, and will continue through November to get a strong picture of the seasonal and spatial variations. This collaboration with the fishing community showcases an untapped resource that collaborative fisheries research can fill, benefiting both science and fishermen alike. Frequent and regular offshore monitoring allows for early bloom detection, providing stakeholders with advanced warning to make appropriate management decisions.

Keywords: phytoplankton, harmful algal blooms, cooperative fisheries research, monitoring

Aleah Hahn

Title: Individual based modeling of Stage 0 treatment on juvenile Chinook

Student Exhibition: Research

Co-Authors: Desiree Tullos, Steve Railsback
Institution: Oregon State University
Degree: MS Marine Resource Management (2023)

Abstract:
The South Fork McKenzie (SFM) river in the Oregon Cascade range became single threaded and incised following construction of Cougar Dam. In 2018, 1 kilometer of the SFM was modified to the Stage 0 condition, reflecting the expected pre-disturbance conditions for the benefit of ESA-listed Chinook. This method raised the incised channel to the geomorphic grade line, reconnected historic side channels, increased floodplain connectivity, and distributed large wood throughout the reach. This study examines Stage 0 treatment habitat changes for spawning adults and rearing juveniles through the application of the individual-based model inSALMO. Changes in hydraulics, food availability, and water temperatures will be applied to inSALMO between a treated and untreated site. The simulation results will examine the mechanisms through which changes in these habitat characteristics impact juvenile Chinook growth rates and relative abundances across water years and reservoir releases. Hydraulic profiles of depth and velocity were collected in both the treated reach and an untreated upstream section. Early results suggest the increased area of the Stage 0 reach provides a greater quantity of food and more diverse depths and velocities, resulting in more and larger ocean-bound juveniles. Given the diversity of Stage 0 sites, quantitative results from SFM may not be generalizable to all Stage 0 projects. However, the model results can provide insight to future projects regarding the mechanisms by which Stage 0 can produce larger and more juveniles.

Keywords: Chinook salmon, river restoration, individual based model

Jess Hume-Pantuso

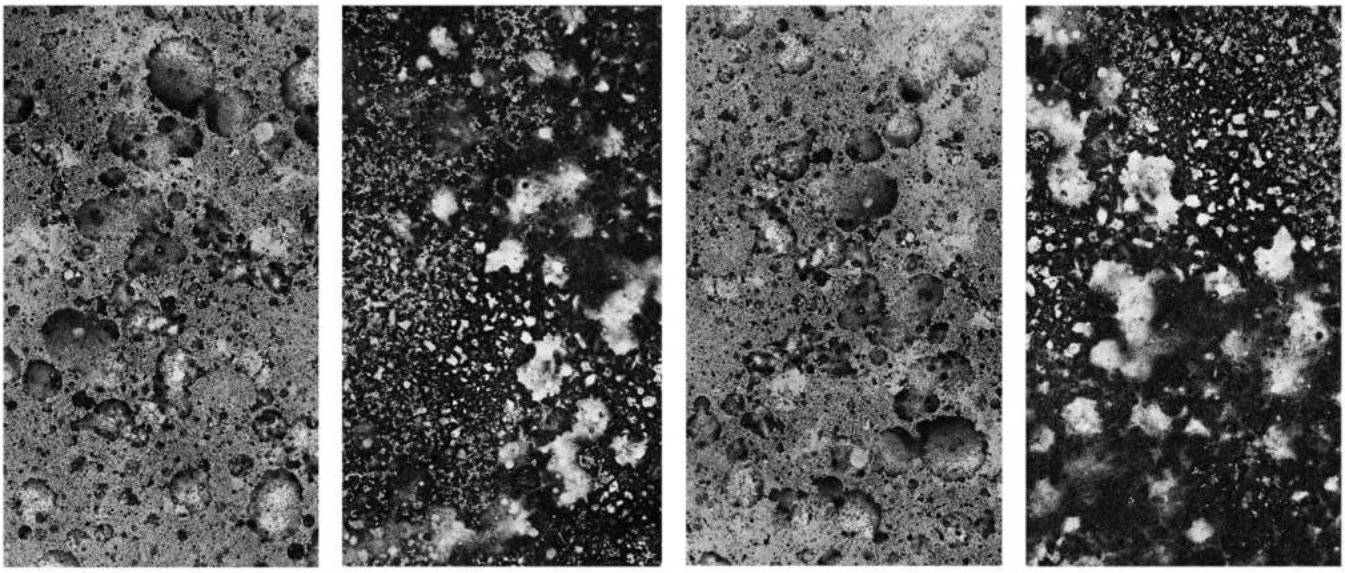
Title: Begin/End (Repeat) - Digital Photographs, Ash and Rainwater on paper

Student Exhibition: Art

Institution: Oregon State University
Degree: BFA Photography (2022)

Narrative:
Begin/End (Repeat) is created from burned wood collected from the fire pits at the Cape Perpetua Campground in the Siuslaw National Forest, traditional lands of the Alsea people. The burned wood was shaved down into ash, to mimic the act of nature naturally breaking down the wood, which precipitated naturally onto the paper. The pieces were left out in the rain which gave them their unique patterns and characteristics. I photographed unique patterns within these pieces and arranged them as a quadriptych for display.

Begin/End (Repeat) is a series of visual meditations on the idea of the cyclical balance of life, death, and the environment. The medium and elements used to create the ink like patterns are representative of the death of my former self and the emergence and acceptance of the death of my mother, as well as the resilience of nature.



Clare Jayawickrama

Title: Investigating Microbial Enzyme Kinetics in Low Oxygen Systems

Student Exhibition: Research

Co-Authors: Sarah Wolf, Francis Chan, Stephen Giovanonni
Institution: Oregon State University
Degree: bioengineering (2023)

Abstract:
The oxygen content of the global ocean is decreasing as a result of increases in ocean temperature and stratification driven by global climate change. Oxygen minimum zones (OMZs) occur seasonally on the Oregon Coast, threatening marine biodiversity and coastal fishing Economies. A comprehensive understanding of cellular biochemical functions is essential for predicting and adapting to changes in ocean conditions in the future. Unfortunately, our understanding of the processes that structure the response of OMZs to climate change are not well resolved. Observed dissolved oxygen (DO) concentrations in OMZs asymptotically approach 25 µM O_2. However, metabolic studies indicate that aerobic respiration can occur at DO concentrations much lower than 25 µM. The overall purpose of this study is to investigate whether some external factor is preventing full microbial utilization of the available DO. This project aims to determine the Michaelis-Menten constant (K_m) in seawater from the Oregon coast by determining the microbial respiration rates at target levels of oxygen concentrations and generating a Michaelis-Menten curve with respiration rate as a function of oxygen concentration.

Keywords: hypoxia, Michaelis-Menten constant, enzyme kinetics, oxygenase enzymes

WooJae Jung

Title: Attenuating effect of Alaska Pollock (Gadus chalcogrammus) Milt hydrolysate on Muscle Atrophy

Student Exhibition: Research

Institution: Oregon State University
Degree: PhD (2024)

Abstract:
Fish protein is consumed throughout the world and bioactive compounds such as polyunsaturated fatty acids, minerals, and diverse peptides are rich in fish. Recent studies elucidated that fish protein has an effect on anti-hypertension, anti-oxidation, anti-inflammation, and enhance muscle synthesis. Alaska Pollock (*Gadus chalcogrammus*) is the most caught fish in the northern parts of the Pacific Ocean and around 60-70% of the fish weight is considered a byproduct. Fish byproduct hydrolysate has the potential to functional foods and nutraceuticals in processing fish byproducts to expand the food production industry which could eliminate waste, add value, protect the environment, and improve human health. In this study, the potential of milt hydrolysate on the anti-muscle atrophy efficacy was evaluated on the C2C12 cell line. The dried milt powder was rehydrated and digested with commercial enzymes to produce hydrolysates. The soluble fractions were obtained and treated on dexamethasone induce muscle atrophy in vitro model. The milt digest samples recovered the myotube diameters reduced by dexamethasone and the molecular mechanism showed a reduced amount of muscle degradation-related RNA levels via inhibiting the ubiquitin-proteasome pathway. These results suggest that the milt hydrolysate peptide could be used as a potential natural product to inhibit muscle waste and further research is needed to confirm on in vivo model and deeper molecular mechanisms.

Keywords: Alaska pollock, milt, hydrolysate, muscle atrophy

Abby Knipp

Title: Reshaping the Narrative of Marine Conservation: A Case Study of the Proposed Chumash Heritage National Marine Sanctuary

Student Exhibition: Research

Co-Authors: Kelsey Emard
Institution: Oregon State University
Degree: Master's in Marine Resource Management (2023)

Abstract:
Marine protected areas (MPAs) are a useful tool for adaptation and mitigation of climate change as they function to manage fisheries and preserve sites of cultural significance while protecting marine resources. Stakeholders and rightsholders play an important role in the decision-making process of MPAs and their participation in the management of marine resources is becoming increasingly critical to MPA success. The first US-based, Indigenous-led proposal for a marine sanctuary was made in 2015 by the Northern Chumash Tribal Council in California. This proposal is an important step towards moving the discourse on conservation from a western focus to a global one that is inclusive of local and Indigenous knowledge and perspectives. Using the unfolding case of the proposed Chumash Heritage National Marine Sanctuary, this project identifies the potentials and ongoing challenges for participatory decision-making approaches in the establishment of U.S.-based marine protected areas. Scholars are calling for analyses of knowledge and power in ocean governance and its consequent effects on marginalized voices. This study asks whose knowledge claims are used in MPA creation, how those knowledge claims influence the decision-making process, and how community led initiatives share and spread knowledge. The theoretical framework for this study sits within political ecology which addresses *why, for whom, by whom* and *with whom* MPAs should be implemented. The knowledge generated from this study will help inform Oregon's Marine Reserves Program as they continue expanding and affirming relationships with local stakeholders and rightsholders on the Oregon coast.

Keywords: marine protected areas, political ecology, participatory decision-making, equity and access

Ellie Lafferty

Title: Noise - Cinematography (Digital; DSLR)

Student Exhibition: Art

Institution: Oregon State University
Degree: New Media Communications (2022)

Narrative:
Noise is neglected. We're so visually driven, and often forget about all the mystifying sounds around us. Sound is precious, yet it seems we only really notice it when its loud. Working with sound artist Lisa Schonberg during a camping trip with Oregon State, she opened up a world of noises with her tiny microphones. These microphones picked up tiny noises, such as an ant drumming its head against a leaf, or mussels moving around on rocks. There's an entirely different world of noises, but few notice the noise at all. Every sound in the video was recorded with the intention of showing how bizarre, yet mystifying noise is on the Oregon Coast.

Artist's Statement:
Ellie is an undergraduate student in the College of Liberal Arts, creating both photos and videos that seek to tell a story. She uses her camera as a tool to document moments, share stories of science and marine life, and to spark wonder in others.
She seeks to share these stories in hopes that it creates meaning, and curiosity within others. She has published photographs in magazines, and has many short films highlighting science and marine life.

Link to video: Creative Coast 2022 (YouTube Link)

https://www.youtube.com/watch?v=l9h2MOCuFis&t=147s

Marina Larson

Title: Bounty over Barren - Acrylics on canvas

Student Exhibition: Art

Institution: Oregon State Universtity
Degree: Bachelors in Science (2023)

Narrative:

This piece is my rendition of what Oregon's coastal waters could look like if sea otters, a keystone species, were successfully reintroduced. A healthy and biodiverse kelp forest ecosystem that is as beautiful as it is robust and resilient. I painted this in honor of my mother; Dr. Shawn Larson, a sea otter specialist, and it has been donated to the Elakha Alliance to help fundraise their mission to bring sea otters back to Oregon. I have poured more than 75 hours into this piece and it has been a dream come true to paint. Here are some of the species you can find in this painting:

Yelloweye rockfish, China rockfish, Copper rockfish, Black rockfish, Canary rockfish, Pile perch, Kelp greenling, Lingcod, Cabazon, Wolf eel, Chinook salmon, Bat ray, Harbor seal, Sea otter, Tufted puffin, Gray whale, Giant pacific octopus, Salmon shark, Top smelt, Giant kelp, Sunflower sea star, Purple urchin, Red urchin, Vermillion sea star, Plumose anemones, Giant green anemone, Aggregating anemone, Red abalone, Opalescent nudibranch, Starry flounder, Pacific Sea nettle, Red rock crab Rock, scallops, Giant acorn barnacle, and more species of limpet, sponges, many kinds of algae, other little marine invertebrates!

Artist statement:

I am inspired by the wonders of life on this planet, especially marine life. I have always known that I want to dedicate my life to the conservation of nature, but I have struggled to find the best way for me to contribute to this cause. One part of me that I left behind when I first came to university was creating art, and in recent years, I have realized how essential creating is to my well-being and sense of self. Now, after a year of pursuing art again in my personal life, I feel my excitement and purpose growing when I get to work on a piece. The fulfillment that comes with bringing my visions to life, and the joy that washes over me when I see how people react to my work, is what pushes me to create. And it is a great honor to have the opportunity to spread awareness and inspire others with my work.

Aspen McCallum

Title: Humans at the Coast - Mixed Media (Posca markers, pen and ink, colored pencils)
Student Exhibition: Art

Institution: Oregon State University
Degree: Bachelor of Fine Arts (2025)

Narrative:
Over the past summer I attended the Creative Coast class with Andy Myers and Michael Boonstra. At this week-long camping experience, I gathered information at Cape Perpetua to create a zine about human involvement in the area. One side of the zine focuses on human involvement including my classmates and guest speakers as well as general interactions I noticed between nature and humanity. The other side of the zine includes daily journaling about my time at Cape Perpetua.

Artist statement:
Made partially as a summary of my trip and as an exploration into human involvement at this natural area, this double sided zine tackles a few major explorations of thought. First, I wanted to explore human involvement at not only Cape Perpetua, but in nature in general. I did this by drawing some of the sites of human interaction with nature which include: signs, carvings, littering, and general human activity. Inspired by Paul Inglemire's talk given about conservation of natural areas, I was influenced to devote part of this zine to protection and preservation of Cape Perpetua, hence the definitions. My overarching thought here was to translate the idea of preservation of natural areas through art and how I can use my platform to do so. I attempted to capture the ways in which humans mistreat the environment while also highlighting the purpose of the class: getting field research. On the other side of the zine, I included daily summaries from my time at the coast, as well as some organisms that I came into contact with. Overall, this zine highlights my trip to Cape Perpetua and some of my goals of conservation that I hope to develop further.

Amina Meselhe

Title: An Integrated Social-Science and Engineering Approach for Evaluating Community ‚ÄúIslanding‚Äù following Natural Hazards

Student Exhibition: Research

Co-Authors: Dylan Sanderson, Daniel Cox, Jenna Tilt, Joshua Blockstein, Andre Barbosa, Natasha Fox
Institution: Oregon State University
Degree: PhD student in Civil Engineering (2027)

Abstract:
The last earthquake associated with the Cascadia Subduction Zone (CSZ) resulted in the dramatic lowering of the coastline and a subsequent tsunami. The predicted occurrence of another rupture of the CSZ within the next century emphasizes the urgency of investigating the resilience of both local and regional infrastructure systems. This research presents an integrated social-science and engineering approach to quantify the resilience of Oregon's transportation network following a rupture of the CSZ. Resilience, as defined herein,extends beyond transportation network damage and connectivity to consider increases in travel time to services within a community, such as food, education, and healthcare. Loss of access to such services could result in community members facing a sense of isolation or "islanding". This work integrates the use of community identified assets from underrepresented coastal groups with the analysis of transportation network damage and recovery following a CSZ ground shaking and inundation scenario. This fusing of transportation network performance with direct community input results in a bottom-up framework for mitigation planning. This bottom-up approach is considered within the context of larger regional transportation network recovery. Also revealed, is the value of community oriented metrics, especially those of underrepresented groups, in constructing narratives that inform disaster policies and engineering practices. This study emphasizes the necessity of integrating the needs of underrepresented communities within engineering approaches to understand, mitigate, and recover from large-scale hazard events.

Keywords: decision support modeling, disaster equity, community resilience

Zechariah Meunier

Title: Regime shifts in rocky intertidal communities associated with a marine heatwave and disease outbreak

Student Exhibition: Research

Co-Authors: Bruce Menge, Sally Hacker
Institution: Oregon State University
Degree: PhD (2023)

Abstract:
Long-term, large-scale studies of succession provide important understanding of how species assemble into communities and how they respond to changing environmental conditions. When environmental stressors are severe, they can trigger abrupt transitions from one type of community to another in a process called a regime shift. From 2014-2016, rocky intertidal ecosystems in the northeast Pacific Ocean experienced extreme temperatures during a multiyear marine heatwave (MHW; known as “the blob”) and sharp population declines of the keystone predator due to sea star wasting disease (SSWD). In a 15-year succession experiment conducted at 13 field sites in Oregon and northern California, we quantified community structure in fixed plots before, during, and after the MHW onset and SSWD outbreak. We found evidence of regime shifts associated with the MHW and SSWD. Prior to 2015, sessile invertebrates were dominant in central Oregon, while algae and surfgrasses were dominant everywhere else. However, from 2014 to 2016 communities shifted from algae and surfgrasses to sessile invertebrates at many field sites in northern Oregon, southern Oregon, and northern California. The sudden loss of kelps was associated with the 2014-2016 MHW because kelps are susceptible to extreme temperature stress. Furthermore, the increase in mussels and gooseneck barnacles from 2015 to 2017 was associated with SSWD, as the dramatic loss of large sea stars reduced predation pressure. Consequently, this study demonstrates how warming temperatures and loss of major predators can result in widespread regime shifts in marine ecosystems.

Keywords: community ecology, sea star wasting disease, climate change

Charles Nye

Title: A Gut Feeling: DNA Metabarcoding of Prey Species from Fecal Samples of Gray Whales in the Pacific Coast Feeding Group

Student Exhibition: Research

Co-Authors: C Scott Baker, Debbie Steel, Leigh Torres, Lisa Hildebrand
Institution: Oregon State University
Degree: PhD (2024)

Abstract:
Gray whales (*Eschrichtius robustus*) in the Pacific Coast Feeding Group (PCFG) forage in nearshore waters along the coasts of northern California, Oregon, Washington, and British Columbia during the summer months. These whales employ diverse foraging behaviors to capture a wide variety of nearshore benthic / epibenthic prey. Conventional methods to identify gray whale prey include in-situ observations, benthic sampling, and stomach contents taken from necropsied individuals. Here, we present a non-invasive mitochondrial DNA metabarcoding approach to identify prey using fecal material collected from PCFG gray whales (n = 82).

Fecal samples were collected via small watercraft between the years 2016-2020. We sequenced a 313-base pair fragment of the metabarcoding gene cytochrome C oxidase subunit I (COI). We assigned sequence taxonomy using a GenBank BLAST query and the MEGAN6 last-common ancestor algorithm. Off-target and gray whale reads were removed bioinformatically, resulting in a post-processing average of 2,337 prey occurrences per sample. 61 taxa were identified to species-level across 18 Orders (mean Shannon Index = 0.79).

Our results suggest diet composition varies significantly within sampling years as opposed to between (ANOSIM: R = 0.082, p = 0.005), though an interaction between year and month may be notable (PERMANOVA: F = 1.6209, p = 0.075). We hope to better discern drivers of variation by expanding our sample size and modeling methods. As changing conditions and human activity continue to affect the Oregon coastal environment, an understanding of the PCFG's ecological interactions is integral for conservation efforts.

Keywords: gray whale, whale, DNA, metabarcoding, diet

Trisha Patterson

Title: The Hazards-Housing Nexus: Assessing the Consideration of Hazards into Coastal Housing Strategies

Student Exhibition: Research

Co-Authors: Jenna Tilt
Institution: Oregon State University
Degree: Master of Public Policy (2023)

Abstract:
Oregon's unique landuse planning system has paved the way for innovative strategies to produce housing for many income levels and types. These strategies, aptly named "housing production strategies" are typically contained within regional comprehensive planning documents and cover a wide range of strategic decisions and actions a jurisdiction may take in order to meet its housing goals. For coastal Oregon communities, which are prone to flooding and face the growing risk of a major Cascadia Subduction Zone (CSZ) earthquake and tsunami, housing strategies that recognize, incorporate, and adapt to these risks is a necessity. Yet, little is known about what strategies are currently implemented by practitioners, what strategies practitioners would like to see implemented, and how to remove barriers to implementing hazard safe housing strategies. To address this gap, we will conduct semi-structured interviews among key stakeholders and implement a policy scan aimed at assessing the gaps between the hazards and housing planning spheres. While still in its early research stages, this study has revealed the complex structures of comprehensive planning documents and hazard mitigation plans, and various ways these two fields of planning compliment and are at odds with each other. Preliminary results suggest that: a) additional support and flexibility may be needed for critical activities to bridge the gap between the hazards and housing planning spheres; and b) promising strategies that support hazards safe housing include proactive public facilities planning, financial strategies, and building code updates.

Keywords: Housing production strategies, hazard mitigation, policy gap analysis, coastal housing policy, adaptive capacity

Xesca Reynés

Title: Carbon metabolism and bioavailability of dissolved organic carbon (DOC) fluxes in seagrass communities are altered under the presence of the tropical invasive alga.

Student Exhibition: Research

Co-Authors: Rocío Jiménz, Fiona Tomas, Luis Gonzalo Egea, Julia Máñez, Jose Lucas Pérez, Cristina Romera
Institution: UIB
Degree: Marine Biologi (2026)

Abstract:
Seagrass beds act as blue carbon sinks globally as they enhance the trapping of recalcitrant organic carbon in their sediments. Recent studies also show that the recalcitrant fraction of the dissolved organic carbon (DOC) pool in seawater has an important role as long-term carbon sequestration in oceans. Until now, little attention has been given to its biodegradability, which ultimately determinates its fate in the coastal carbon cycle. In turn, invasive algae are a major global concern in seagrass ecosystems since they can deeply modify their structure and functions, which may affect carbon metabolism and DOC release.

This work assesses how the presence of invasive calcareous macroalga (*Halimeda incrassata*) modifies carbon metabolism and DOC fluxes in invaded areas dominated by the seagrass *Cymodocea nodosa*. Our results show that stands with the presence of this seagrass had the highest production values, acting as high DOC producers in both winter (mainly of labile DOC; DOCL) and summer (mainly as recalcitrant DOC; DOCR). In contrast, monospecific *H. incrassata* beds exhibited low production values, and its presence (monospecific or mixed beds) triggered the shift from a net DOC-producing system in summer to a net DOC-consuming-system in winter. This work thus suggests that the spread of this invasive alga might decrease the C export capacity of seagrass meadows. Such a shift would imply the reduction of a quick and efficient transfer of carbon and energy to higher trophic levels, and might reduce the blue carbon potential of seagrasses as dissolved form in the water column.

Keywords: Blue carbon, seagrasses, Alien species, Invasion impact, Productivity, Recalcitrant DOC.

Caroline Rice

Title: It's Hammer Time: Determining Sea Urchin Return Rate after Culling Events To Identify Best Practices for Kelp Forest Restoration

Student Exhibition: Research

Co-Authors: Sarah Gravem, Tom Calvanese, Sara Hamilton
Institution: Oregon State University
Degree: Integrative Biology with option in Marine Biology (2023)

Abstract:
Kelp forests had undergone a massive decline along the Oregon Coast in recent years. A leading cause of this is sea star wasting disease, which wiped out the sunflower sea star, the primary predator of purple sea urchins. In turn, purple urchin populations have increased and overgrazed kelp creating urchin barrens. This has substantial negative impacts on the kelp forest ecosystem and local coastal communities that rely on them. The Oregon Kelp Alliance (ORKA) has begun urchin culling as a strategy for their kelp restoration work. The efficacy of culling is not fully known, because we do not know how quickly these urchins repopulate culled areas. To assess the return rate of urchins after culling, we culled purple urchins in a 7m radius circular plot at Nellie's Cove in Port Orford, Oregon in Aug 2022. Following the culling, we surveyed the culled zone for 2.5 months by dropping a weighted quadrat (0.25 m^2) and camera from a kayak to capture 20-40 images of the culling zone and surrounding area. We determined the return rate by observing the density of urchins compared to the distance from the center of the culled zone over time. After 1 month, no significant returns of urchins were observed, but surveys will continue this fall. With a known urchin return rate, ORKA will be able to strategize future culling events based on the frequency needed and surface area required to keep urchin densities low over the long-term, leading to a more effective restoration strategy.

Keywords: Kelp forest restoration; Strongylocentrotus purpuratus; Urchin culling; Urchin return rate

Carly Ringer

Title: Oregon Coastal Dune Management: Creating a guidebook and understanding managed dune morphology

Student Exhibition: Research

Co-Authors: Meagan Wengrove, Meg Reed, Peter Ruggiero, Sally Hacker, Risa Askerooth
Institution: Oregon State University
Degree: Masters (2023)

Abstract:
Foredunes are an important feature on the Oregon coast, as they provide protection from storms, habitat for diverse species, and recreation opportunities for humans. However, the human impact on the natural environment has made managing the foredunes a complex problem; the introduction of non-native beachgrasses in the early 1900s completely altered the dune system, and current dune grading and replanting practices vary within and between coastal communities. There is a need to (1) understand how past and present management practices affect foredune morphology, and (2) provide coastal decision makers with updated management recommendations. In Oregon, dune grading (i.e., flattening) in developed areas must occur under an official foredune management plan, and there are currently six communities in Oregon with official plans. To understand how management activities affect dune morphology, we conduct quarterly to annual topographic surveys in the six management plan areas. From this data, we extract and compute dune morphometrics (elevations, slopes, volumes, widths) to explore the morphological differences between graded and ungraded areas. We expect the results of the morphology analysis to inform future dune management decisions. Additionally, through a dune management questionnaire and a 1-day workshop with coastal decision makers, we gathered perspectives and requests for what to include in a new Oregon Dune Management Guidebook. The Oregon Dune Management Guidebook will serve as a reference for local planners, contractors, and state agency managers when making dune management decisions. Additionally, a condensed version will provide homeowners, visitors, and other stakeholders with an overview of Oregon dune management.

Keywords: dunes, management, morphology

Brenna Rothman

Title: Evaluating the Growth and Reproduction of an Endangered Sea Star to Inform Species Recovery.

Student Exhibition: Research

Co-Authors: Ken Collins (USGS), Sarah Traiger (USGS), Katie Gavenus (Center for Alaskan Coastal Studies), Fiona Francis (DFO Canada), Jan Kocian and Sarah Gravem (OSU)
Institution: Oregon State University
Degree: Biology with an option in Marine Biology and a Chemistry minor (2022)

Abstract:
Sea star wasting disease (SSWD) has rapidly depleted sea star populations along the North American west coast, with potentially profound ecosystem impacts. SSWD has had a catastrophic effect on the sunflower sea star, *Pycnopodia helianthoides*. Sunflower sea stars play a central role in kelp forests as a top predator that suppresses herbivore populations and benefits kelp. This is especially important in coastal ecosystems because kelp provides food and habitat for hundreds of species that are crucial fisheries in West Coast economies. We are interested in predicting whether the sunflower sea star will recover. This project helps fill these gaps in knowledge by asking when are they reproducing and if there's any correlation to the lunar cycle.

We analyzed the reproductive seasonality of *Pycnopodia* by collecting non-lethal arm snips from juvenile and adult animals, which at first suggested they're ripe in the summer. However, we tested the reliability of the arm snip method and found that they are unreliable for assessing gonad index, unlike in other sea star species. Lethal dissections suggested they are ripe in spring, but spotty data made seasonality unclear. We gathered information from field observations of spawning and found that these events primarily took place in spring, so it is likely that spring is the peak reproductive season. We also tested if the moon phases influenced spawning, but found no clear pattern. Overall, these key measures will be invaluable as scientists consider the best practices for the recovery of this critically endangered species.

Keywords: Sea star, recovery, endangered, reproduction, invertebrate, sea star wasting

Katie Russell

Title: Let's Talk About Climate Change: An Interpretive Guide for Education Volunteers at The Marine Mammal Center

Student Exhibition: Research

Institution: University of Oregon
Degree: M.Sc. Environmental Studies (2022)

Abstract:
According to the Association of Zoos and Aquariums, over 200,000,000 people in the United States visit accredited facilities annually. This provides an opportunity to reach a broad audience and engage in conversations about climate change. Zoos and aquariums are trusted sources, so people may be more receptive to taking in information about typically challenging or political topics.

Research conducted by Bord et al. (2000: 216) demonstrates the key determinant of action to mitigate climate change is an accurate knowledge of the anthropogenic causes. Higher risk perception, support for climate policy, and willingness to engage in climate solutions are due to understanding that climate change is caused by humans (Smith & Kingston, 2021 and Kumar et al., 2022). “Conversely, public misattribution of the cause of climate change creates a barrier to identifying and enacting appropriate solutions” (Bergquist et al., 2021:2). Cultivating awareness and inspiring action to mitigate climate change will benefit all life on this planet—human and marine mammals alike.

By changing how we talk about climate change, we can change what people hear. Utilizing evidence-based communication strategies, we can deliver climate education in an accessible, empowering, and hopeful way. I researched ocean and climate change communication best practices and utilized my findings to write an interpretive training guide for education volunteers at The Marine Mammal Center for my master’s project. The Center is supported by more than 1,300 volunteers, and guide is now being used to structure new volunteer trainings.

Keywords: Climate, education, communication

Carmen Sanchez-Reddick

Title: Heavy Machines, Fragile Bodies: How Massive Plankton Nets Help Us Explore a Fragile World - Photography

Student Exhibition: Art

Institution: University of Oregon
Degree: Marine Biology (2022)

Narrative:
Gelatinous zooplankton are fragile jelly-like animals that form the base of many marine food webs, including those off the Oregon coast. Sampling their populations poses a challenge to researchers. While a gentle hand and patience are necessary to avoid destroying their delicate bodies during sampling, their entry onto dry land is associated with heavy, noisy machinery and demanding physical labor. This three-photo story asks the viewer to seek out such dichotomies: in the researcher who is pushed both physically and mentally pushed and in the soft bodied animals that are central to marine environments yet are frequently understudied and misunderstood.

Artist's Statement:
Carmen is an undergraduate student at the University of Oregon who offers the unique viewpoint of a marine biologist and science communicator. As a science communication intern in the Sutherland Lab of the UO's Oregon Institute of Marine Biology, she joined a two-week research cruise off the Oregon coast. Her aim was to learn about the collaborative research between the Sutherland Lab and the Cowen/Sponaugle Lab at OSU on zooplankton and how to communicate it to coastal communities.

Carmen uses photography as a medium to translate science to new audiences, and enjoys providing her skills to scientists, who are often too focused on the science to take photos of the science. She hopes to continue to merge her interests in biology and communications as she grows as a researcher and artist.:



Andrew Scherer

Title: Nearshore Nitrate Response to Wind Forcing on the Newport Hydrographic Line
Student Exhibition: Research

Co-Authors: Melanie Fewings, Thomas Connolly
Institution: Oregon State
Degree: PhD in Physical Oceanography (2027)

Abstract:
The upwelling of nutrient-dense water along the Oregon coast is a vital process for primary production, which provides the energy needed to sustain fisheries that coastal communities depend on. The upwelling of nitrate is of particular concern as nitrate is usually the limiting nutrient for primary production on the Oregon shelf. Satellite-based remote sensing proxies for nitrate are often poor predictors of the near-shore conditions, and monitoring of in-situ nitrate is currently limited to moorings, since the power consumed by nitrate sensors limits their use in more flexible deployments. Using eight years of moored observations from the Ocean Observatories Initiative Coastal Endurance Array in conjunction with ship-based sampling on the Newport Hydrographic Line, we introduce an empirical model for the nearshore nitrate concentration that is based only on the along-shelf wind stress. The proposed nitrate model uses a logistic fit to the nitrate data based on the observed presence of both a minimum and a maximum nitrate concentration. In addition, the model uses an exponentially decaying averaging of the recent wind stress to account for the delayed response of upwelling to wind stress. From the best-fit decay scale of the exponential average, we find that the nitrate concentration responds to changes in the wind stress on a time scale of four to eight days, in agreement with previous research into the outcropping of the pycnocline on the Oregon coast. The development of this model contributes to an improved understanding of the drivers of variability in nearshore nutrients and primary productivity.

Keywords: coastal physical oceanography, upwelling, nitrate

Hazel Seivers

Title: Decline and Renewal (Triptic) - Mixed Media (acrylic, clay, marine debris)

Student Exhibition: Art

Institution: Corvallis High School
Degree: High School (2026)

Narrative:
Together, these three art pieces are the product of a year-long 8th grade project exploring marine science and environmental issues on the Oregon Coast. Under the mentorship of Lindsay Carroll, marine educator at Hatfield Marine Science Center, I investigated three ecosystems and the challenges they are facing due to human disturbances. I then created three art pieces to represent that. The three ecosystems and issues I investigated are (1) sea star wasting disease in the rocky intertidal zone, (2) kelp forest decline due to sea otter loss in the kelp forest ecosystem and (3) plastic pollution on sandy beaches.

Artist Statement:
For this project I wanted to combine my love of art and interest in marine science with my deep and growing passion to help the planet. Since I first attended Marine Science Camp at Oregon State University's Hatfield Marine Science Center almost six years ago, I have wanted to someday become a marine scientist, and by doing this project I hoped to gain a better understanding of what it might be like to work in that field. Through my artwork, I also hope to bring more awareness about these beautiful places so everyone can be inspired to protect them.

In September of 2022 (the beginning of my 8th grade year), I had to pick a project that I would continue throughout the school year, with a mentor, on a topic of interest for a future career. Since I have always been interested in marine science I decided to choose that as my topic. I chose three ecosystems along the Oregon coast to focus my research on: rocky intertidal zones (tide pools), kelp forests and sandy beaches. My mentor and I then identified how humans have negatively impacted these ecosystems (i.e. climate change, plastic pollution, decline or extinction in animal populations). I visited tide pools at Coquille Point and Cape Arago; kelp forests off the coast of Port Orford, and various beaches along the north/central Oregon coast. Inspired by these places, I created an art piece for each ecosystem to visually show the negative effects that humans have caused on each environment. I wanted to convey to people, primarily youth, the dire situations these ecosystems on the Oregon coast are facing and motivate them to protect these critical marine environments..

For the tide pool/rocky intertidal zone art piece, I sculpted a mixed media piece displaying the progression of sea star wasting disease by making five ceramic sea stars and mounting them on a repurposed myrtlewood board. This piece is showing the effects of this very harmful disease on the sea star population and in turn the population of the entire tide pool.

For the kelp forest art piece I demonstrated a decline in a critical animal population. I created a 16” x 40” acrylic painting on canvas of a sea otter, split in half. One half of the otter is healthy and surrounded by a thriving kelp forest, while the other half is the skeleton of an otter, surrounded by a dead kelp forest, in this case what is known as an “urchin barren.” This piece shows how, without sea otters, a kelp forest cannot thrive.

For sandy beaches, I made a sculpture entirely from marine debris I had collected on the beach in Newport over a span of about 8 months. I was very inspired by artists at Washed Ashore in Bandon, OR. The piece is an approximately 1' x 2’ mounted sculpture of an anglerfish on a wooden block. I thought it would be symbolic to make an anglerfish to show how plastic is a lure to humans, and that we need to learn how to control our use of it for the sake of all life on this planet.

Faith Townsend

Title: Measurement of Juvenile Temperate Reef Fish Recruitment in Fished and Protected Nearshore and Intertidal Waters of Southern Oregon

Student Exhibition: Research

Co-Authors: Tate Scarpaci, Cameron Royer, Tom Calvanese
Institution: oregon state university
Degree: Oceanography and Environmental Science (2024)

Abstract:
For temperate reef fishes in Oregon, recruitment of pelagic juveniles to benthic habitats is an essential stage in their life cycle and in replenishing adult populations. Therefore, quantifying recruitment amounts in and out of protected nearshore regions such as marine reserves is a crucial measurement for understanding the success and value of the reserve. In addition, quantifying recruitment in healthy and unhealthy intertidal regions is key to understanding the region's dynamics and if future restoration practices are successful. Quantification will be completed using minnow traps and standardized monitoring units for the recruitment of fishes (SMURFs) to collect fishes. Collecting in this fashion will simulate the natural habitat, have the most negligible impact on the habitat, and yield the easiest collection method.

Keywords: Juvenile fish, Southern Oregon

Katrina Vickery

Title: Implementation and Evaluation of a Novel Framework for Public Engagement with Climate Change

Student Exhibition: Research

Co-Authors: Dr. Shawn Rowe, Dr. Andreas Schmittner, Dr. Lisa Gaines
Institution: Oregon State University
Degree: M.S. Marine Resource Management (2023)

Abstract:
As climate change and its subsequent environmental and socioeconomic impacts become increasingly severe and imminent throughout the state of Oregon, it has become imperative for local communities to be aware of and engaged with this issue. Public science engagement has the potential to highlight the scientific, cultural, and socioeconomic dimensions of environmental issues, increase the societal impact of scientific research, and establish a collaborative community that actively works to learn about, mitigate, and adapt to climate change. However, scholarly literature has drawn attention to a number of areas for improvement within this field; this includes the lack of adequate training for scientists who wish to engage with the public, the lack of opportunities for dialogue and mutual learning between scientists and local communities, and the lack of robust evaluation protocols to measure the outcomes of outreach programs. This study seeks to address these critiques and strengthen Oregon's adaptive capacity by implementing and evaluating a novel two-phase framework for public science engagement. In the first phase of this study, climate change scientists have been trained on the research-based best practices for communicating their research to disengaged communities. The design, rationale, and outcomes of this workshop will be presented, with a focus on how the workshops influenced the participants' self-efficacy relative to public science engagement. The upcoming second phase of this study, which will consist of dialogue events that foster mutual learning between climate change scientists and local communities, will also be discussed.

Keywords: climate change, education, public engagement, science communication

Colleen Walker

Title: A 30-year look into the fish assemblage of the South Slough Estuary: Trends of declining productivity and biodiversity

Student Exhibition: Research

Co-Authors: Shon Schooler, Bree Yednock, and Daniel L. Bottom
Institution: Clackamas Community College
Degree: AS, Biology (2023)

Abstract:
South Slough estuary, located within the greater Coos Estuary, is an important resource supporting the region's fisheries. It's tidally dynamic mudflats, tidal forests, salt marshes, and eelgrass beds serve as nursery grounds and adult habitat for many Pacific Northwest fishes. To understand what fish species are inhabiting the estuary and whether the fish assemblage of South Slough has changed over time, we examine trends in species biodiversity, abundance, biomass, and seasonality. This study reviewed seining data collected in 1987, 2016, and 2017 from four sites in the estuary. Data analysis focused on directly comparable seining efforts from both low and high tides between late April to early October of each year. Findings indicated a strong downward trend of average biomass per seine effort from 1987 to 2017, a generally low but steady abundance rate in fishes from ODFW's sensitive species listing, and high variability in annual abundance rates in a number of species that rely on estuarine nurseries. Through the development of a temporal fish assemblage database and the continuation of fish assemblage sampling in South Slough, we can better identify areas of research needed to improve our understanding and develop management options for the future.

Keywords: Biodiversity, biomass, estuarine habitat, fish nurseries, seasonality, temporal fish assemblage database

Sarah Wolf

Title: Effects of Hypoxia on Microbial Processes in Oregon Coastal Seawater

Student Exhibition: Research

Co-Authors: Clare Jayawickrama, Curtis Deutsch, Francis Chan, Stephen Giovannoni
Institution: Oregon State University
Degree: PhD, Microbiology (2023)

Abstract:
Global oxygen minimum zones (OMZs) often reach hypoxia but seldom reach anoxia. Recently it was proposed that respiration slows in ocean ecosystems as they enter hypoxia because the Michaelis Menten constants (K_m) of oxidative enzymes are orders of magnitude higher than respiratory K_m values. A possible explanation for the slowing of respiration as ecosystems enter hypoxia is the inhibition of complete microbial oxidation of dissolved organic matter (DOM) by the oxygen requirement of catabolic oxygenase enzymes. Both hypoxia and suboxia occur on the Oregon Coast where they have substantial negative impacts on marine ecosystems and fisheries. We conducted laboratory based mesocosm experiments using Oregon Coast seawater to measure the impacts of hypoxia on rates of DOM oxidation. A phytoplankton bloom was created to provide a source of labile and complex DOM for heterotrophic microbes to utilize. After the bloom senesced, seawater was shifted to dark conditions and divided into two treatments: hypoxic (~10 µM O_2) and saturated (300 µM O_2) where respiration rate, chlorophyll, total organic carbon, and microbial amplicon-based community composition were measured for fifteen weeks. Over 100 days, microbial respiration rate observed in hypoxic conditions was 20% lower than in the saturated treatment. These observations could be a consequence of oxygen limiting the activity of oxygenase enzymes or other processes. Understanding the impacts of oxygen concentrations on enzyme kinetics may lead to a better understanding of the trajectory of OMZs during oxygen declines and increase our ability to predict ecosystem transformation and coastal community resilience to climate-driven changes.

Keywords: hypoxia, respiration, microbes, oxygen

Hailey Zhou

Title: In silico Prospecting for Novel Bioactive Peptides from Seafoods: A Case Study on Pacific Oyster (Crassostrea gigas)

Student Exhibition: Research

Co-Authors: Dr. Jung Y. Kwon
Institution: Oregon State University
Degree: MS in Food Science and Technology (2023)

Abstract:
Oysters are the most cultured shellfish worldwide and are used in traditional Eastern medicine for various purposes. Pacific oyster (*Crassostrea gigas*), an abundant bivalve consumed across the Pacific, is known to possess a wide range of bioactivities beyond its high nutritional value, and thus gaining tremendous research interest in their bioactive components and therapeutic potential. However, the discovery of bioactive peptides (BAPs) remains limited due to the resource-intensive nature of the existing discovery pipeline. To overcome this constraint, an *in silico*-based prospecting framework is employed to accelerate BAP discovery. Existing bioinformatic platforms and tools were carefully vetted to identify advantages and limitations. Major oyster proteins were digested virtually under simulated gastrointestinal condition to generate virtual peptide products that were screened against existing databases and Machine Learning-based predictive models for peptide bioactivities, toxicity, bitterness, stability in the intestine and in the blood, and novelty. Five peptide candidates were shortlisted respectively, showing antidiabetic, anti-inflammatory, antihypertensive, antimicrobial, and anticancer potential. In addition, amino acid and dipeptide compositions, physicochemical properties, and peptide-protein interactions of the top candidate peptides were assessed to strengthen the predictions. Future work will involve 3-D molecular docking and quantitative structural analyses, peptidomic identification and *in vitro* bioactivity validation studies. By employing this approach, oyster BAPs were identified at a faster rate, with a wider applicability reach. With the growing market for peptide-based nutraceuticals, this provides an efficient workflow for candidate scouting and end-use investigation for targeted functional product preparation from nutritious seafood and beyond.

Keywords: in silico, bioactive peptides, functional food, health benefits, Crassostrea gigas, oyster proteins

Alex Zinck

Title: Measuring the Effects of Automobile Tire Microparticles on Pacific Oyster Larvae

Student Exhibition: Research

Co-Authors: MacKenna Hainey, Chris Langdon
Institution: The Evergreen State College, REU at Oregon State University
Degree: Biology (2023)

Abstract:
Microplastics are present in marine environments worldwide and include inorganic substances such as automobile tire microparticles, which enter aquatic and marine ecosystems through stormwater runoff. This research investigated the effects of automobile tire microparticle ingestion and exposure on Pacific oyster (*Crassostrea gigas*) larvae. The impacts of microplastics on oysters should be studied because of the ubiquity of microplastic pollution in marine ecosystems, the critical ecosystem services provided by oysters, and the historical role of oysters as seafood for human consumption. Acute toxicity effects of tire microparticles on embryonic oysters were determined using a 48-hour bioassay, and chronic toxicity effects on larval oysters were determined using an 11-day exposure test. Survivorship curves and average growth of Pacific oyster larvae exposed to tire microparticles were determined using data from these acute and chronic toxicity tests. The results of this research provide substantial evidence that exposure to tire microparticles has detrimental effects on the growth and survivorship of Pacific oyster larvae.

Keywords: Microplastics, road-wear particles, microparticles, automobile tire, toxicity, aquaculture