2023 STATE OF THE COAST

November 3-4, 2023
Gladys Valley Marine Studies Building
Hatfield Marine Science Center

BOOK OF STUDENT RESEARCH ABSTRACTS & ART

2023 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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Student Research Posters

Student: Sarah Stone
Title: Examining the socioeconomic vulnerability of Alaskan communities to temperature-driven changes in Pacific cod spatial distribution
Poster #:27

Co-Authors: Lorenzo Ciannelli, Sarah Wise, Michael Harte, Kirstin Holsman
School: Oregon State University
Degree:Marine Resource Management

Keywords: pacific cod, temperature, community vulnerability

Abstract:
The Eastern Bering Sea (EBS) supports highly productive commercial Pacific cod (*Gadus macrocephalus*) fisheries and is projected to experience accelerated oceanic warming. Temperature drives life history traits of Pacific cod; and warming temperatures have initiated a large-scale northward redistribution of the stock in the EBS. This shift in the spatial distribution of Pacific cod poses potential threats to both sustainable fisheries management and the economies of coastal Alaskan communities reliant on this resource. Our approach incorporates 40 years of field data collections in the EBS to: 1) assess the vulnerability of Pacific cod to temperature, and 2) use these results within an exposure-vulnerability assessment to analyze the socioeconomic risk facing coastal Alaskan communities to changes in the distribution of the stock. We spatially fit data on EBS Pacific cod abundance, temperature, and community socio economic values for each coastal Alaskan Census Area. We used statistical models to enable predictions of landings based on available temperature-related biomass. Community vulnerability was quantified by considering the economic value of Pacific cod (exposure) and the communities' adaptive capacity and reliance (sensitivity). Elements of community vulnerability were then combined within a risk assessment framework, and categorized as having high, moderate, or low risk. Our preliminary results indicate temperature-driven shifts in Pacific cod distribution pose challenges to coastal Alaskan communities, particularly those with historically high reliance and current socioeconomic strains. Understanding these vulnerabilities is crucial for effective management and mitigating socioeconomic impacts related to changes in Pacific cod stock.

Student: Miles Rough
Title: Exploring the impact of sunflower sea stars on localized grazer densities
Poster #:24

Co-Authors: Miles Rough, Kristy J Kroeker, Aaron WE Galloway, Jacob Metzger, and Sarah Gravem
School: Oregon State University
Degree:Biology with an option in Marine Biology

Keywords: Pycnopodia, sunflower sea star, urchin, purple sea urchin

Abstract:
Kelp forest ecosystems provide food, shelter, and nursery habitats for many species. Many kelp forests on the North American Pacific Coast are currently threatened by herbivorous sea urchins, whose populations have increased dramatically in recent years. A possible contributing cause of the sea urchin increase in recent years has been the loss of their predator, the sunflower sea star (*Pycnopodia helianthoides*), whose population has decreased due to sea star wasting disease. Compared with other sea urchin predators, such as sea otters, there has been little research investigating the potentially important role that *P. helianthoides* have on kelp forest dynamics. To test if *P. helianthoides* affect the localized density of their grazer prey and create a 'halo of influence,' we quantified subtidal grazer densities around wild stars up to four meters away from stars, encountered using SCUBA in benthic rocky reefs. We did not detect a significant effect of *P. helianthoides* on green sea urchin (*Strongylocentrotus droebachiensis*) or pinto abalone (*Haliotis kamtschatkana*) densities. However, we found that red sea urchin (*Mesocentrotus franciscanus*) densities were lower in a 1.5 meter radius around *P. helianthoides* in the field. This work suggests that sunflower sea stars affect localized sea urchin density in the wild, and helps us better understand whether *P. helianthoide* reintroductions may be a useful tool for restoring kelp forests and benefitting our coastal ecosystems, fishing industry, and recreational economies.

Student: Devin Forest-Hines
Title: Above the Salt: Monitoring Green Crab Abundance in Relation to Salinity Within Three Arms of the Coos Estuary
Poster #:11

Co-Authors: Shon Schooler
School: Portland State University
Degree:Bachelor of Science in Environmental Science

Keywords: Green crabs, invasive management, estuaries, Carcinus maenas, salinity fluctuations

Abstract:
The invasive green crab (*Carcinus maenas*) has been present in the Coos Estuary since 1998 and their populations have been trending upward in recent years due to successful recruitment, wide range of environmental tolerances, and their adaptivity as a generalist. *C.maenas* is well-known for being euryhaline and can withstand salinities lower than native Oregon crab species. This project sought to 1) determine the relationship between salinity and green crab abundance within three arms of the Coos Estuary, 2) observe whether *C.maenas* is present at less saline sample sites of the upper arms, and 3) convey the data spatially so as to improve green crab management in future work. 22 sites were chosen using average summer bottom-salinity data from a hydrodynamic model and additional *in situ* salinity data was collected. 3 traps were set at each site along both Catching Slough and Coos River for a total of 36 traps for both arms. The 10 sites sampled annually by South Slough Reserve we used 6 traps per site, for 60 traps at South Slough sites. All traps were set at low tide and retrieved after 24 hours during low tide. Green crab abundance was determined using CPUE (catch/trap/day). It was found that *C.maenas* is not abundant under 20 ppt in summer salinities. Such data tells us where to focus management resources and where monitoring is not necessary within the Coos Estuary, which becomes critical as the return of El Nino is projected to cause a significant increase in *C.maenas* populations.

Student: Trever Gelling
Title: Dungeness face high predation risk from green crabs across increased temperatures at different salinities
Poster #:13

Co-Authors: Catherine de Rivera, Elise Yu, Vanessa Partida, Woeser Lhamo
School: Portland State University
Degree:Environmental Science

Keywords: Dungeness, European green crab, predation, estuary, climate change

Abstract:
Marine heatwaves, altered precipitation regimes, and other changing climate conditions are altering the abiotic conditions of Oregon's estuaries. Furthermore, warmer water temperatures are correlated with the range expansion and population growth of the invasive and broadly tolerant, *Carcinus maenas*, the European green crab, in Oregon. *Metacarcinus magister,* Dungeness crab, Oregon's most valuable fishery species, is also facing these climate stressors, and their young often recruit to estuaries where they overlap with *C. maenas* adults. Therefore, we wanted to determine impacts of *C. maenas* on young-of-the-year (YOTY) *M. magister* and the roles of salinity and temperature in mediating these impacts. We predicted that *C. maenas* would eat most *M. magister* under warm water scenarios and in the freshest conditions. Where *C. maenas* is expected to be less impacted by the stressful conditions, than *M. magister*. A fully crossed, laboratory study examined predation upon Dungeness, with three temperatures (16.5°C, 18.5°C & 20.5°C) and two salinities (22ppt & 32ppt). One adult *C. maenas* was added into each replicate 80L tank with four *Mytilus californianus,* as alternative prey, and three juvenile *M. magister.* We observed crab behavior and predation across 48 hours. *C. maenas* ate the majority of Dungeness across all temperature and salinity combinations but ate the most Dungeness in 18.5°C and 32ppt. We also found high predation rates on tethered Dungeness YOTY when they were outside of eelgrass. Hence, Dungeness face high risk from *C. maenas* where they overlap in estuaries, and this risk is not measurably affected by changing climatic conditions.

Student: Lauren Rice
Title: California and Oregon Shellfish Farmers: Perceptions of Stressors and Adaptive Strategies
Poster #:21

Co-Authors: Ana Spalding, Arielle Levine, Erika Allen Wolters, Melissa Ward, Kristen Green, Sara Hamilton
School: Oregon State University
Degree:M.S. Marine Resource Management

Keywords: adaptive capacity, resilience, vulnerability, shellfish, climate change

Abstract:
U.S. West Coast shellfish farmers confront a myriad of challenges from changing oceans, with ocean acidification (OA) posing a significant threat to their products, particularly in terms of growth and survival rates. Seasonal regional upwelling and eutrophication compound the pH stress from OA. Economic, social, and regulatory stressors, such as labor costs and lengthy permitting processes, heighten vulnerability among shellfish farmers. To safeguard their livelihoods, it is crucial to identify specific stressors and adopt locally-relevant adaptive strategies. Through semi-structured interviews with commercial shellfish farmers in California and Oregon, we explored their perceptions of environmental, social, economic, and regulatory stressors, uncovering the strategies they employ or consider to adapt to changing ocean conditions. Results reveal a sense of threat among shellfish farmers due to OA and other stressors, with many unable to discern when or how OA impacts them. Some farmers perceive OA as a hatchery-specific threat due to larval shellfish OA vulnerability. Farmers identified 18 adaptive strategies across the categories of science (e.g., monitoring ocean conditions), policy/networking (e.g., cross-discipline communication), and farm management (e.g., modifying culture techniques). Successful implementation of these strategies hinges on farmers' assets, flexibility, and agency. Combining strategies broadly enhances farmers' resilience. This research underscores the importance of building networks among farmers, scientists, and policymakers to facilitate knowledge sharing and support adaptive strategies to ocean changes. We underline that specific strategies identified herein may be unique to shellfish farmers, but broad categories underpin adaptive capacity across numerous vulnerable coastal communities.

Student: Jake Marshall
Title: Effects of temperature-driven population distribution shifts of Pacific hake and Oregon offshore wind energy and on Oregon's hake fishery
Poster #:16

Co-Authors: Mary E. Hunsicker, Michael J. Malick, Lorenzo Ciannelli, Lori A. Cramer
School: Oregon State University
Degree:Masters of Marine Resource Management

Keywords: offshore wind energy, hake fishery, GAMs,

Abstract:
Pacific hake (*Merluccius productus*) is the most plentiful and commercially harvested groundfish (by volume) of the U.S. and Canadian West Coast. A distinguishing attribute of hake is its annual migration between wintertime spawning grounds in Southern California/Mexico and summertime feeding grounds off the northern U.S. and Canadian West Coast. Ocean temperature has been observed to have a linear but spatially varying effect on hake migration patterns and distribution. Therefore, there is a growing interest in the impacts of climate on the hake fishery. Additionally, the groundbreaking Oregon Offshore Wind Energy (OWE) project is a quickly developing undertaking that is gaining a lot of attention over its potential environmental impacts on ocean resources. The Bureau of Ocean Energy Management (BOEM) has chosen two wind energy areas (WEAs) on which to put floating wind turbines, one located off the coast of Coos Bay and the other off Brookings, both of which overlap with historic hake fishing grounds. Fishing vessels will not remain operational in these areas due to safety and gear concerns. To quantify the effect of this fishing exclusion, I first modeled the change in hake biomass caused by increases in temperature along the Oregon Coast. Then, I quantified the change in biomass both inside and outside these WEAs, producing the average change in hake biomass due to temperature increase in each region. Here I present my preliminary findings.

Student: Grace Roa
Title: Age-and-growth relationships of an ecosystem engineer shrimp and its invasive parasite
Poster #:22

Co-Authors: John Chapman, Brett Dumbauld, Will White
School: Oregon State University
Degree:Master's

Keywords: Population dynamics, *Upogebia pugettensis*, *Orthione griffenis*, Introduced species, Oregon estuary

Abstract:
The northeast Pacific intertidal blue mud shrimp, *Upogebia pugettensis*, is in steep decline range-wide due to intense infestations of the introduced Asian bopyrid isopod parasite, *Orthione griffenis*. The absence of refuges for mud shrimp from the invasive parasite preclude assumptions of host resilience or otherwise long-term co-existence. Intervention by delaying or reversing the decline of mud shrimp will only be possible through understanding the ecology, energetics, and population dynamics of this system, which has not been resolved for any other marine bopyrid isopod and hosts. Bopyrid parasites effectively castrate their female hosts by hemolymph extraction, leading to total reproductive losses in female mud shrimp. Although host biomass can only be lost to isopods, mud shrimp mass-per-length does not decline with increasing parasite load. The energetics of this interaction are critical for understanding the population dynamics of this system. However, there are no simple direct measurements of growth, and if mortality rates also change with size, it is challenging to deduce size-dependent growth rates from observations of population size distributions over time. We have addressed that problem by developing size-based integral projection models that incorporate the temporal variation in size frequency of mud shrimp and their parasites. Our model analysis narrows the range of possible patterns of size-dependent age and mortality for infected and non-infected mud shrimp, suggesting new testable hypotheses for the key drivers of mud shrimp population dynamics.

Student: Sean McCollum
Title: Monitoring Changes in Water Quality to Identify Stressors in Eelgrass Extent Throughout the Coos Estuary
Poster #:17

Co-Authors: Maya Hall, Gabriel Halaweh, Zoe Simon-tov
School: N/A
Degree:M.S.

Keywords: eelgrass, water quality, estuary, remote sensing, GIS

Abstract:
The Coos estuary in Southern Oregon supports a variety of habitats, including eelgrass (*Zostera marina*) meadows. Eelgrass meadows provide habitat to local and migratory wildlife, including commercially important fishes, and cultural resources to local communities. These ecosystem services establish eelgrass as an ecologically, economically, and culturally important resource. However, the extent and density of eelgrass meadows within this estuary have declined substantially since 2005, threatening the ecosystem services they provide. NASA DEVELOP partnered with the South Slough National Estuarine Research Reserve and the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians' Department of Natural Resources to generate time-series maps of the water quality conditions (chlorophyll-a, turbidity) and eelgrass extent in the Coos Estuary from 2016 to 2023 to better understand the conditions driving eelgrass decline. The DEVELOP team used NASA Earth observations including Landsat 8 Operational Land Imager (OLI), Landsat 9 OLI-2, and the European Space Agency's Sentinel-2 Multispectral Instrument (MSI) to generate these time-series maps. The team faced limitations in the feasibility of detecting eelgrass within the Coos Estuary, including spectral resolution, tidal phase, and turbidity. These limitations indicate additional *in situ* data collection will be necessary for accurate eelgrass assessment. Meanwhile, the team determined it is feasible to assess turbidity and chlorophyll-*a* within the Coos Estuary using remote satellite data. These tools enabled the research partners to assess water quality characteristics within the Coos Estuary at a greater spatial scale and may provide a method of inexpensive preliminary investigation of eelgrass meadow locations.

Student: Kristine Alford
Title: Short-Term Changes in Dissolved Oxygen as a Response to a Large Dam Removal
Poster #:1

Co-Authors: Advisors: Desiree Tullos and James Peterson
School: Oregon State University
Degree: Fisheries, Wildlife, and Conservation Sciences

Keywords: dam removal, water quality, dissolved oxygen

Abstract:
The impending removal of the Iron Gate Dam in the Klamath River is expected to release a substantial amount of suspended sediment into the river, potentially leading to decreases in dissolved oxygen levels, which can pose a risk for riverine wildlife. Limited data exist explaining short-term dissolved oxygen trends and processes immediately downstream of large dams during drawdown – particularly those with fine sediment stored in reservoirs. This study aims to measure sediment-derived oxygen demand during and after the drawdown period and assess how far downstream, how long in duration, and to what magnitude the reservoir sediment pulse contributes to reduced DO. Additionally, the research aims to evaluate the accuracy and limitations of current models in estimating DO and biochemical oxygen demand (BOD) resulting from sediment pulses.

Student: Luke Stuntz
Title: Predation of seabirds by terrestrial carnivores in southern Oregon
Poster #:28

Co-Authors: NA
School: Oregon State University
Degree:M.S., Wildlife Science

Keywords: predation, seabirds, storm-petrels, otters, mammals, foraging, prey selection, animal behavior, social behavior

Abstract:
The northern river otter *Lontra canadensis* is a highly adaptable generalist predator. Capable of living in almost any aquatic habitat, the river otter will readily alter its social structures and foraging strategies to best utilize available resources. While this species commonly forages in near-shore marine systems, its behavior in these environments has received limited research attention. The Leach's storm-petrel *Hydrobates leucorhous* is a long-lived burrow nesting seabird species with declining global populations and few behavioral adaptations to avoid terrestrial predators. Roughly 450,000 Leach's storm-petrels nest on near-shore islands and rocks along a twenty-mile stretch of southern Curry County, Oregon, where native river otters are also active in the coastal environment. During 2023, we used a combination of camera trapping, predator sign surveys, and scat analysis to monitor the occurrence of predation at major colony islands within the Oregon Islands National Wildlife Refuge. River otters actively hunted storm-petrels at two important nesting colonies. This on-island foraging activity was carried out in short-lived bursts of nocturnal activity by small, but clearly defined, river otter social groups. Predation of storm-petrels followed a clear seasonal trend, reaching a peak during the early spring when river otters appeared to target socially active adult birds congregating near the colonies and prospecting for burrowing sites. This seasonal specialization on seabirds in river otter diets has not previously been described elsewhere, and we will expand our work to include a systematic review of otter predation observations at seabird colonies throughout North America.

Student: Marlena Penn
Title: Quantifying native Olympia oyster growth responses to environmental conditions in a space for time experiment in Yaquina Bay, Oregon
Poster #:19

Co-Authors: n/a
School: Oregon State University
Degree:M.S. Marine Resource Management

Keywords: Olympia Oyster, Yaquina Bay, Growth Response, Native oyster, Estuary

Abstract:
Small mountainous river estuaries experience both daily and seasonal variations in temperature, salinity, carbonate chemistry, and food availability. Motile organisms may evade these changes, but for a sessile organism, such as an oyster, these variations are inherent. The only native oyster to the eastern Pacific Coast, the Olympia oyster (*Ostrea lurida*), persists in these highly dynamic estuaries even after near extinction occurred due to overexploitation and habitat degradation through the late 1800s and early 1900s. While historic concerns of deforestation and pollution have been addressed in many of these estuaries, we still face the modern issue of global climate change. Climate change effects, such as altered rainfall, global temperature, and/or upwelling, coupled with estuarine dynamics may reduce or enlarge suitable habitat within these ubiquitous estuaries. The critical need for Olympia oyster restoration resulted in fewer studies of growth rates in the field with quantified environmental conditions. Therefore, we lack information on how successful and sustainable restoration will be in the future. We conducted a space for time experiment to determine Olympia oyster responses to estuarine conditions in Yaquina Bay, Oregon. We chose five sites based on prior monitoring to deploy oysters. The natural estuarine environment results in a 5 °C gradient in maximum temperature and a 9 PSU gradient in average salinity over 8-km during the dry or wet season respectively. Our field studies tracked the wet weight and shell area of Olympia oysters, carbonate chemistry, and suspended particulates on a bi-weekly or monthly basis with continuous *in situ* temperature and salinity, and pH at three sites. Growth rates during sample intervals were then compared to corresponding discrete and continuous data to determine sensitivities of growth to conditions. Over the 8-km distance we found significant differences in growth rates. We found that wet weight growth can range from 0.386 g $week^{-1}$ to 0.195 g $week^{-1}$. Other findings thus far are not always intuitive, for example, changes in total wet weight and area do not always align, suggesting complex controls on oyster physiology. We will discuss the implications for climate change impacts on suitable Olympia habitat. With these insights, management and restoration efforts could target habitats that are suitable both now and in the future, ensuring the presence of Olympia oysters on the Eastern Pacific Coast.

Student: Hannah Brachfeld
Title: Marine Renewable Energy Siting and Policy: Roles and Responsibilities of the Department of Defense and the Department of Homeland Security
Poster #:6

Co-Authors: Hilary Boudet, Bryson Robertson
School: Oregon State University
Degree: Marine Resource Management

Keywords: Military, Coast Guard, offshore wind, Oregon, Virginia, stakeholders, Bureau of Ocean Energy Management, renewable energy policy

Abstract:
The goal of this research is to identify outcomes of DOD and DHS engagement, propose policy improvements if necessary, and to encourage stakeholders to practice transparent and consistent influence of MRE policy. This research will focus on two case studies of interest: Coastal Virginia and Coos Bay, Oregon. These areas were selected based on being in federal waters where Department of Defense (DOD) and Department of Homeland Security (DHS) consistently operate and where there is suitability for wave and wind energy. The case studies will be built around qualitative analysis of publicly available documents and semi-structured stakeholder interviews to provide insight to how DOD and DHS engage in Marine Renewable Energy (MRE) siting. By adding to the general knowledge of MRE policy and stakeholder engagement in this way, DOD and DHS stakeholders can be better understood and more transparent to decision makers when planning MRE projects throughout the United States.

Student: Sof Fox
Title: One Nudibranch One Sponge? Using Genetic Barcoding to Analyze the *Rostanga pulchra* Species Complex and Prey Differentiation
Poster #:12

Co-Authors: Richard Emlet
School: University of Oregon
Degree:BS, Marine Biology

Keywords: molecular biology, genetic barcoding, nudibranch, species complex, predator-prey interactions, intertidal

Abstract:
The sea slug *Rostanga pulchra*, known as the Red Sponge Dorid, is commonly found in the intertidal of the Northeast Pacific, including along the Oregon Coast, though its range extends from Alaska to Panama. *Rostanga* can be found on orange sponges on which it feeds and lays its eggs. These sponges provide habitat, protection, and food, and have been shown to induce settlement of the planktonic larvae of *Rostanga*. Previous work has found that the species known as *Rostanga pulchra* is a species complex, and likely has three or more individual species on the Oregon Coast. Specimens were collected in Washington, Oregon, and California and their DNA sequenced using the cytochrome c oxidase subunit 1 (COI) gene. Through this genetic barcoding, further evidence supporting the cryptic species complex has been found, with new specimens for the three operational taxonomic units previously identified. Further, sponge spicules were used to identify the sponge that individual nudibranchs were collected on, indicating that *Rostanga* spp. are found on multiple species of sponge. This study furthers our understanding of the species profile of *Rostanga pulchra* in the Northeast Pacific, and specifically in Oregon, as well as examines their connection to sponges, contributing to our understanding of the biodiversity of sea slugs and their behavior.

Student: Clarissa Raguso
Title: Effects of Tire Wear Micro- and Nanoparticles in the Model Estuarine Species Fish *Menidia Beryllina*
Poster #:20

Co-Authors: Kashiwabara L., Arriola S., Harper S., Harper B., Brander S.M.
School: University of Milano-Bicocca & Oregon State University
Degree:Environmental Sciences

Keywords: Plastic pollution, Tire particles

Abstract:
Tire wear particles (TWP) represent the most commonly found microplastics in the environment. They are released by tires undergoing friction on the road and enter the environment by being transported by wind, gravity, and currents, causing direct or indirect adverse impacts on marine and terrestrial organisms. Considering the limited available data regarding the tire particle toxicity on organisms, this study aims to provide information about TWP exposure impacts on growth, internalization and behavior of the model species Inland Silverside (Menidia beryllina). Particularly, 5-day post fertilization embryos were exposed to micro (1-20 μm) and nano (< 1 μm) tire particles at four concentrations (10, 100, 1000 and 10,000 particles/ml), to 0.014% TP leachate and River Natural organic matter (NOM), following the guidelines provided by the Environmental Protection Agency (EPA). After the 96h exposure, behavioral assays were performed using a DanioVision Observation Chamber (Noldus, Wageningen, the Netherlands) where each fish was subjected to a dark: light cycle stimuli. Growth measurements were assessed through the index (W = width, L = standard length, d = days the organisms were exposed to tire particles) and organisms were cleared with CUBICTM clearing reagents (Cubic-L and Cubic-R solutions) to visualize and count the internalized particles. Previous studies have already demonstrated tire particles to have behavioral toxicity and negative effects on growth in Menidia beryllina. This study has the potential to provide additional important knowledge, leading to a more comprehensive perspective of what organisms are experiencing in the real environment.

Student: Jamon Jordan
Title: Seascape Applications: Swordfish Habitat in Chumash National Marine Sanctuary
Poster #:15

Co-Authors: Elliott Hazen and Maria Kavanaugh
School: Oregon State University
Degree:Marine Resource Management

Keywords: Modeling, Seascapes, Swordfish, Marine Sanctuary

Abstract:
Swordfish are the most widely distributed billfish species in the world and play a crucial role in commercial fisheries. The Chumash People are an indigenous tribe that have occupied the central coast of California for 20,000 years. There is currently a proposed National Marine Sanctuary that will be located within the California Current region and designated to the Chumash People if passed. The Chumash People have extensive linguistic, written, and archaeological evidence showing their important relationship with the swordfish. Despite the importance of swordfish, it is unknown how climate change will shift their habitat selection preferences. It is specifically an area of concern if climate-induced stressors will result in swordfish habitat compression. Previous satellite tagging studies have been conducted to gain insight into swordfish distribution, but they have been limited in spatial and temporal resolution. More recently, a framework was developed to predict the spatiotemporal distribution of swordfish globally using modeling techniques, but this framework did not consider the ecological and physiological variables that influence swordfish movement behavior. Seascapes are a novel tool for classifying water masses based on sea surface characteristics and phytoplankton community composition collected from satellites and modeling. There is potential to use seascapes as a proxy for predicting pelagic habitat for certain species. This study aims to fill these gaps by using seascapes coupled with ecological parameters related to prey to examine the habitat compression of swordfish within the California Current. The partitioning of pelagic habitat and temporally dynamic nature of seascapes should provide unique insight on swordfish distribution in a changing climate that are not found in typical models for highly migratory species. Understanding the habitat compression of swordfish will inform the decision process for the Chumash National Marine Sanctuary. It will also provide insight on the present and future accessibility of swordfish by the Chumash People.

Student: Ali Trueworthy
Title: Community-Drive Design for Marine Renewable Energy
Poster #:30

Co-Authors: Molly Grear, Bryony DuPont
School: Oregon State University
Degree:PhD/MA

Keywords: Wave energy, coastal communities, energy justice, sustainable futures

Abstract:
Energy transitions, once thought of as a singular, large-scale switch from fossil fuels to renewables, have gained a broader set of requirements, including the need for justice and environmental protection. While discourse around policy and process has grown to consider these requirements, the focus of design of new renewable energy technologies remains dominantly fixed on maximizing energy production. Renewables are falling far short of bringing about the necessary energy transitions. Meanwhile, in other areas of design, new theories and approaches have emerged which explicitly consider justice in terms of both process and outcomes. One of those approaches, which we call community-driven design, aligns well with current justice and community-focused research in renewable energy and has the potential to expand the focus of renewable energy technology design. In this presentation, I talk about the principles of community-driven design and how I translated and applied those principles for application in a theoretical wave energy design project in Sitka, Alaska. I discuss how our results show that while there are challenges in application, community-driven design can be suitable for renewable energy systems and with considerate adoption, the process stands to contribute to broader, significant changes in both communities and design toward justice and sustainability.

Student: Jennifer Waldo
Title: Using message framing to inspire collective urgen-sea in response to ocean change
Poster #:33

Co-Authors: Dr. Megan Jones
School: Oregon State University
Degree:Fisheries Science

Keywords: Climate change, ocean acidification, climate action, science communication, message framing, behavior change

Abstract:
Climate change is a major threat to the world's oceans and those who depend on them. Individual human behaviors and actions impact ocean environments; directly, through personal interaction with oceans and coasts, or indirectly, through ocean resource use and lifestyle choice. In the same respect, human behavior and action can contribute to a sustainable ocean future. Effectively mitigating and adapting to ocean change requires widespread engagement, behavior change, and action. However, engaging people in the topic of ocean change and motivating action is a challenging endeavor. In addition to knowledge and awareness, engagement includes caring, motivation, willingness to act, and action itself. Therefore, communication about climate change topics that seek to encourage climate action and behavior change should consider these factors of engagement. More attention is being brought to the use of message framing as a way of evoking the psychological factors of engagement and enabling more appropriate cognitive processing of complex issues. The present study aims to use message framing to explore psychologically grounded communication strategies about ocean change, specifically focusing on ocean acidification, a major emerging threat to Oregon marine ecosystems and coastal communities. We created targeted messages about ocean change and experimentally tested them in person through intercept surveys of visitors to the Oregon coast. We received a total of 2,451 surveys and will analyze responses to identify which message works best, for whom, and why. These results could facilitate effective communication about ocean acidification and ocean change that engages the public and motivates climate action.

Student: Savannah Clax
Title: The Impacts of the Pacific Marine Heatwave on Recruitment of Fish Species
Poster #:9

Co-Authors: N/A
School: Oregon State University
Degree:Marine Resource Management

Keywords: fisheries, climate change, marine heatwave, recruitment

Abstract:
The effects of climate change are becoming increasingly apparent, especially as it relates to sea surface temperatures. This has led to the increasing frequency of marine heatwaves (MHWs) both globally and particularly in the Pacific Ocean. The most familiar case of this occurring is the Pacific Marine Heatwave that occurred off the U.S. west coast. Nicknamed the "Blob", it appeared in 2014 and lasted through June 2016. This and the following heatwave events raised major concerns about its impacts on fisheries and wildlife due to the drastic increase in temperature. This research utilized existing recruitment data from the Pacific Fisheries Management Council and the RREAS to study recruitment patterns across 40+ Pacific Ocean species. It aimed to assess the impact of environmental factors, particularly the 2014-2016 heatwave, on recruitment. Results revealed varying responses among species, with some experiencing decreased recruitment while certain rockfish species showed resilience. Future research should delve into the mechanisms behind these differences, exploring genetic adaptations and oceanographic variables. Identifying resilient species can inform sustainable fisheries management and conservation, especially during increasing heatwave events due to climate change. This study highlights the importance of real-time monitoring and proactive responses to changing environmental conditions. Ultimately, it provides valuable insights into recruitment dynamics among Pacific Ocean species, offering guidance for the region's marine resource management and conservation policies.

Student: Lara Breitkreutz
Title: Characterizing Eelgrass (Zostera marina) recovery potential in South Slough, OR
Poster #:7

Co-Authors: Fiona Tomas Nash, Ryan Mueller, Alicia Helms
School: Oregon State of the Coast
Degree:Marine Resource Management

Keywords: seagrass, reproduction, environmental gradient, marine heatwave, restoration

Abstract:
Seagrasses are foundation species that define and support coastal ecosystems globally, creating meadows that provide valuable ecosystem functions and services. Seagrasses are well-adapted to survive in systems characterized by strong gradients and dynamic changes. Yet, notable declines have been observed worldwide due to an increase in human disturbances and global climate change, with consequent loss of associated ecosystem services. Although vegetative reproduction is the main mechanism for seagrass bed maintenance and expansion, sexual reproduction is critical to bed recovery after large declines. Key attributes of sexual reproduction (bed investment, seed output, and timing of flowering) that contribute to recovery potential can vary greatly along an estuarine gradient. We characterized these attributes throughout five Zostera marina (Eelgrass) beds in South Slough National Estuarine Research Reserve (SSNERR) in Oregon, which has historically suffered extensive losses of critical eelgrass habitat, in response to a marine heatwave (MHW). Our analysis shows variation in sexual reproduction between and within sites. We plan to explore environmental conditions as potential drivers of this variation using environmental data from SSNERR's four water quality stations located throughout the estuary. Second, we considered the potential consequences of MHWs on seedling growth and development (and thus, recovery potential) through a germination experiment. Results from this experiment will help define how future predicted warming scenarios affect the vulnerable early life stages of eelgrass. Altogether, we hope to provide field and experimental data that will assist coastal resource managers in estimating seed-based eelgrass recovery potential and developing restoration plans to counteract environmental disturbances.

Student: Greg Stelmach
Title: Human Dimensions of Marine Energy in Oregon
Poster #:25

Co-Authors: Hilary Boudet, Hossain Taufiq
School: Oregon State University
Degree:Public Policy

Keywords: offshore wind, wave energy, community benefits, energy siting

Abstract:
Policymakers have set ambitious goals for renewable energy deployment, such as the Biden Administration's national goal of 30 GW of offshore wind by 2030 and the Oregon legislature's planning goal of 3 GW floating offshore wind by 2030. Oregon has high potential for marine energy development, including offshore wind, wave, and tidal energy; however, proposed large-scale energy infrastructure projects often stumble due to ineffective engagement with host communities, even for renewable energy technologies. My research, funded by the Department of Energy's Water Power Technologies Office, uses a mixed methods approach to better understand public perceptions of marine energy development on the Oregon coast.
While research efforts are still ongoing, to date I have conducted 13 interviews with a variety of fishers, marine energy developers, labor unions, advocacy groups, regulators, and others. Through these interviews, I have found a high degree of concern over the Bureau of Ocean Energy Management's top-down siting process, with interviewees frequently comparing it to the more bottom-up approach used in siting the PacWave South wave energy test area off the coast of Newport. Interviewees have also expressed concerns about how benefits and risks of development are being considered, with many desiring more clarity about project details before it is allowed to proceed. My poster will elaborate on my preliminary interview findings, as well as present information about other research efforts of the project, such as an ongoing survey of California, Oregon, and Washington residents about perceptions of marine energy development.

Student: Joshua Blockstein
Title: Preferred Community Assets and Latinx Social Capital: A Tale of Trust, Resilience, and Vulnerability
Poster #:4

Co-Authors: Jenna Tilt
School: Oregon State University
Degree:PhD

Keywords: Community resilience, social capital, disasters, coastal hazards, Latinx

Abstract:
This study explores how valued locations and social support networks for marginalized populations living in high disaster risk areas are utilized to adapt to day-to-day challenges and are critical to preparing for and recovering from disasters. We hypothesize that the locations most valued for their associated resources, or community assets, also hold the most social capital and could be a source for building adaptive capacity to recover from disasters. By employing focus group discussions and a novel conceptual mapping activity, we identified preferred community assets that Latinx residents may utilize after a disaster and found that preferred community assets of community-based organizations, churches, and schools held strong social capital, particularly bonding social capital (connections among individuals with similar backgrounds or socioeconomic characteristics). Other assets held strong linking social capital (relationships across power or authority gradients in society) that have served a critical role for Latinx community members in past disasters by connecting them with outside resources. However, bridging social capital (connections among individuals who differ in backgrounds or socioeconomic characteristics) was found to be largely absent in this research. We provide policy recommendations that can leverage existing connections between community assets and social capital to support disaster resilience for marginalized populations.

Student: Izzy Mize
Title: An analysis of offshore wind on the Oregon Coast
Poster #:18

Co-Authors: Trajan Bitner, Dawson Davis, Caroline Kovacs, Lydia Lyall
School: Portland State University
Degree:Masters of Environmental Science and Management

Keywords: Offshore wind, renewable energy, Invasive species, Ecosystem disruption, fossil fuels

Abstract:
Utilizing offshore wind (OSW) as an alternative to fossil fuel-based energy generation requires a careful look at long-term sustainability and site impact minimization. We are exploring the impact of OSW in partnership with the Coastal Committee of the Western Region Panel on Aquatic Nuisance Species. Our analysis provides an overview of both the infrastructure needed and the potential environmental impacts that could result from developing OSW on the West Coast, with a focus on Oregon. Although Federal and state mandates require reduced reliance on fossil fuels, OSW presents some challenges that will have to be mitigated, including potential spread of invasive species. Marine invasive species disrupt ecosystems, displacing and outcompeting native species. Invasive species also pose an economic, cultural, and human health threat. The presence of biological invasive species is increasing due to changes in shipping activities and climate change. A shift in physical environmental and coastal environmental conditions resulting from OSW developments may compound the frequency and effects. Our literature-based research investigates changes in invasion risk to our coasts, the sea floor, and the structures themselves due to the building and maintenance of OSW facilities. We look at how construction and upkeep of OSW turbine structures could affect the offshore ecosystem. With proper mitigation measures, such as antifouling systems, use of local vessels, and well-defined policies, the impacts of OSW turbines could be reduced. We identify the key risks to local ecosystems with OSW and highlight the importance of implementing OSW in a manner that minimizes unintended consequences.

Student: Michael Weingartner
Title: Invasive Green Crab (*Carcinus maenas*) Management in Oregon
Poster #:34

Co-Authors: Angee Doerr
School: Oregon State University
Degree:Marine Resource Management

Keywords: green crab, aquatic invasive species, management, policy

Abstract:
Invasive species have significant adverse impacts on ecosystems worldwide, including loss of biodiversity, ecosystem function, and associated ecosystem services. The European green crab (*Carcinus maenas*) is an invasive species with a history of extreme environmental and economic impacts on coastal ecosystems around the world. Green crab have been observed in Oregon waters since 1998, and a number of recent strong recruitment events linked to climate processes are cause for concern. As oceans warm, it is likely green crab will continue to increase in numbers in the Pacific Northwest and may spread northward to establish populations in Canada and Alaska. Further studies on green crab impacts are needed in order to inform management practices, and there is concern from policymakers, researchers, managers, and other stakeholders about the potential for serious adverse impacts in the near future. Using a combination of internet surveys and semi-structured interviews, this research will evaluate the management practices employed across multiple US coastal states and Canada. Additionally, it will assess the current level of understanding, needs, and priorities for coastal stakeholders within Oregon and across other regions. Stakeholders will include coastal managers, policymakers, aquaculture producers, commercial fishermen, and other members of coastal communities. This knowledge will be useful for predicting future impacts, designing and promoting an Oregon green crab management plan, and planning resource allocation for effective management strategies.

Student: Morgan Johnston
Title: Predictive Species Distribution Modeling of Yelloweye Rockfish (*Sebastes ruberrimus*) in Oregon's Rocky Reefs for Improved Stock Management
Poster #:14

Co-Authors: Susan Piacenza, Leif Rasmuson, Scott Heppell
School: Oregon State University
Degree:Master's of Fisheries Science

Keywords: Rockfish, Species Distribution Model, Video Lander, Stock Assessment

Abstract:
Rockfish are critical mesopredators that play key roles in both marine ecosystem dynamics and recreational and commercial fisheries. However, since Oregon's rockfish fishery collapsed in 2002, one species' ecological and economic functions have remained severely depressed: Yelloweye Rockfish (*Sebastes ruberrimus*). This fish's true population size has remained elusive due to the complexity of their preferred habitat and survey accessibility. Without accurate abundance estimates, resource managers cannot effectively regulate fishing industries or support functioning ecosystems. We propose to address this knowledge gap by mapping the distribution and abundance of Yelloweye Rockfish across Oregon's territorial seas with associated environmental data, using novel remote camera sensing technology that can survey rocky reefs without disturbing the habitat or removing sensitive species. This effort could then be used to inform future stock assessments of this species. To do this, we will create a predictive species distribution model by coupling video camera derived abundance data with oceanographic data. While methods to conduct species distribution models are well established, applying in situ video lander data is an emerging application in marine ecosystems. The extension of remote camera surveys represents an important step forward in improving our knowledge of spatial ecology and resource abundance for marine species. The results of this research may be used to better manage Yelloweye Rockfish rebuilding efforts, guide fishers in better managing their quota in the mixed stock groundfish fishery, and to guide future monitoring efforts in rocky reefs off Oregon's coast.

Student: Katherine Berreman
Title: Sublethal Toxicity Testing of Commonly Used Pesticides at Varying Salinities in Menidia beryllina
Poster #:3

Co-Authors: Sara Hutton, Susanne Brander
School: Oregon State University
Degree:MS Student
Expected graduation: 2023

Presented at SOTC before: No

Keywords: toxicity testing, pesticides, sublethal, salinity

Abstract:
Various stressors due to climate change including sea-level rise and drought impact estuarine ecosystems and contribute to fluctuations in salinity levels. When there is a high salt concentration in an ecosystem, the salting out effect may occur and decrease solubility of compounds present. This is due to an increase in competition between salt ions and other compounds for interactions with water molecules, which reduces the amount of a compound dissolved in water and causes an increase in lipophilicity, or the ability for a compound to dissolve in fats and lipids. As a compound becomes more lipophilic, coastal organisms may be more sensitive to chemical exposure as uptake into the body can increase. Pesticides are chemical compounds commonly used for agricultural and household purposes, and they can enter estuarine ecosystems through runoff. To determine if there is a difference of pesticide toxicity at varying salinities, Menidia beryllina embryos at six days post fertilization (approximately 1-day pre-hatch) were exposed to sublethal levels of six pesticides (bifenthrin, chlorpyrifos, dicloran, myclobutanil, penconazole, triadimefon) at two salinities (5 PSU and 25 PSU) for 96 hours. Menidia beryllina (Inland silverside) are a euryhaline model species, which allows for the ability to observe stressor effects over a broad range of salinities. Behavior, growth, and gene expression are endpoints that will be analyzed for effects at sublethal exposure levels as impacts observed at early life stages of fish could have potential population effects due to organism fitness contributing to overall survival.

Student: Arthur Veremchuk
Title: Carbon dioxide uptake of red macroalgae *agarophyton vermiculophyllum* in an engineered system
Poster #:31

Co-Authors: N/A
School: Oregon State University
Degree:Chemical Engineering, PhD

Keywords: Macroalgae, Algae, Seaweed, Carbon dioxide

Abstract:
Marine algae globally provide a large sink for reducing carbon dioxide (CO2) Concentrations in the atmosphere. Capturing anthropogenic CO2 before it is released into the atmosphere to grow red macroalgae can provide both an environmental and commercial benefit. The ability to scale and intensify growth of the red macro algae *Agarophyton vermiculophyllum* in raceway tanks can lead to land-based systems that allow for on-demand CO2 capture. A Fundamental understanding of CO2 uptake kinetics is needed in order to (enhance) inform process design. Investigation of uptake rate of CO2 by *A. vermiculophyllum* and its response to varying bulk fluid velocities was done. Clonal cultures of *A. vermiculophyllum* were immobilized on mesh panels and cultivated in a raceway tank with varying bulk fluid velocities. The sealed raceway tank allowed for real time tracking of CO2 concentration entering and exiting the tank and provided a platform to maintain replete nutrient conditions. Preliminary data suggests high densities of *A. vermiculophyllum* experience little change of CO2 uptake with changing fluid velocity. Further research into the fundamental understanding of CO2 uptake by *A. vermiculophyllum* can provide information on reducing instantaneous release of CO2 by large CO2 producing facilities and processes in addition to furthering understanding growth of macroalgae in engineered environments used for other applications.

Student: Hamzah Alzanbaki
Title: Toward developing super seaweed
Poster #:2

Co-Authors: Gregory Rorrer
School: Oregon State University
Degree:PhD

Keywords: seaweed, aquaculture

Abstract:
Climate change, marine habitat destruction, and unsustainable agricultural activities are major challenges to humanity that have yet to be addressed. Red seaweeds have been studied as a potential sustainable source of food, energy, and pharmaceuticals in addition to carbon sequestration. We aim to develop an axenic superior red seaweed cultivar that is recognized for its highly branched morphology without any genetic modification. Red seaweed with high degree of branching will have more surface area available for photosynthesis and nutrient uptake from media. Therefore, with the enhanced degree of branching we should expect to produce seaweed tissue with higher nutrient accumulation per mass of the seaweed due to an enhanced rate of nutrient uptake and efficiency of photosynthesis. This will make what we call a “super seaweed” than can be cultivated in a land-based system with rigorously controlled conditions for a wide range of purposes including the production of protein rich food. Our preliminary data indicates that utilizing tumble culture and prescribed periods of nitrogen starvation might lead to the development of highly branched morphology of the red seaweed *Gracilaria parvispora*. Further experiments will be conducted to validate our current understanding and complete a life cycle analysis of using the developed super seaweed in an integrated multi-trophic aquaculture where fish effluent can be used to fertilize the seaweed and recycle nitrogen and carbon to offset the possible environmental impact of such aquaculture. Such important development is still needed to make fish farming a fully sustainable and eco-efficient food source.

Student: Hossain Taufiq
Title: Community Benefit Agreements for Offshore Wind: US, Europe, and the Asia Pacific
Poster #:29

Co-Authors: Hilary Boudet, Greg Stelmach
School: Public Policy
Degree:PhD

Keywords: Offshore Wind, Community, Benefit, Job Creation, Education, Environment, Infrastructure

Abstract:
The Bureau of Ocean Energy Management (BOEM) recently designated two draft call areas off the Oregon coast (Coos bay and Brookings). However, BOEM is facing local opposition due to concerns about impacts to fisheries, tourism, marine ecosystems, and aesthetics. In the UK, Denmark, Germany, South Korea, and Japan, renewable energy developers offer community benefits to garner local public support for their offshore projects. In Massachusetts, and California lease sales, BOEM included community benefit agreement (CBA) credits for bidders. BOEM is likely to consider including CBA stipulations, if they decide to move forward with the final lease sale in Oregon. However, publicly available information on CBAs for offshore wind is limited, especially in the US. Yet, CBAs are widely used in extractive industries in Australia, Canada, Africa, South America, and Central Asia. For my TotalEnergies SBE summer internship, our team has conducted a comprehensive, comparative analysis of CBAs across the US, Europe, and the Asia Pacific region. We collected and analyzed documents pertaining to community benefits in US offshore wind siting, including BOEM meeting minutes, hearing transcripts, media coverage, preliminary and final sale notices, etc. We categorized benefits into 12 themes from a review of 32 projects (27 wind; 5 mining) in the US and abroad, BOEM final sale notices, and CBA definitions and guidelines from US agencies and think tanks. The poster presentation will demonstrate how these themes can aid developers negotiating fair CBAs with the local stakeholders, featuring three CBA case examples from U.S. offshore wind projects.

Student: Hailey Bond
Title: Dynamic Revetments for Erosion Control in the Pacific Northwest
Poster #:5

Co-Authors: Meagan Wengrove, George Kaminsky, Jonathan Allan, Chris Blenkinsopp
School: Oregon State University
Degree:PhD

Keywords: coastal erosion, coastal engineering, dynamic revetment, cobble berm

Abstract:
Coastal erosion is a common problem in the Pacific Northwest (PNW), threatening both the built environment and the continued existence of public beaches. While traditional structural solutions may halt shoreline retreat, there is growing interest in natural and nature-based features (NNBFs) that dissipate wave energy and reduce toe scour and end effects often associated with hard structures. One of the most applicable NNBFs for the open coast of the PNW is a dynamic revetment, also called a cobble berm. Dynamic revetments are growing in popularity as a solution for chronic coastal erosion in the PNW. However, there are no guidelines for their design and construction, and their performance is difficult to predict on both short and long time scales. In this study, we surveyed coastal engineers, geologists, regulators, ecologists, and community members to better understand the biggest barriers to implementation of dynamic revetments in the PNW. Based on the results of the survey in combination with case studies of 5 engineered dynamic revetments in the PNW, we suggest design guidance and tools directly based on the needs and current practices of engineers. We also summarize the research needs of other professionals who work with the design and construction of dynamic revetments and identify future research paths. Overall, this study brings together the needs and expertise of professionals from different backgrounds who work on dynamic revetments in an effort to collaboratively advance the field of dynamic revetment research and engineering.

Student: Gregory Christie
Title: Avoiding Yelloweye Rockfish in the Halibut Longline Fishery and Smaller-Sized Sablefish in the Sablefish Trawl Fishery
Poster #:8

Co-Authors: Mark Lomeli
School: Oregon State
Degree:Master's in Marine Resource Management

Keywords: Bycatch prevention, sablefish, yelloweye rockfish, Pacific halibut

Abstract:
In Oregon's commercial fisheries, the bycatch of non-targeted species results in a loss of income for commercial fishers, a loss of diversity, and negatively affects both the sustainability of the fishery and the ecosystem as a whole. The bycatch of yelloweye rockfish (*Sebastes ruberrimus*)—a species rebuilding from being overfished—can constrain the allowable catch in the Pacific halibut (*Hippoglossus stenolepis*) longline fishery. Using floats to elevate the hooks off the bottom, we created a semi-demersal longline with the idea that yelloweye rockfish would exhibit lower catch rates due to a strong benthic association. Ideally, the catch rate of Pacific halibut would not be appreciably affected. In Oregon's bottom trawl fishery, sablefish (*Anoplopoma fimbria*) are a major source of income. However, the price that shoreside facilities offer for smaller-sized sablefish (<50 cm) is negligible compared to larger adult sablefish. Allowing the escapement of juvenile and smaller-sized sablefish maximizes the economic value of sablefish for fishermen and promotes the future propagation of the stock. We tested the efficacy of a flexible sorting grid with 9.5 cm squares inserted anterior of the codend in lowering the catch rate of juvenile sablefish without significantly impacting the catch rate of the larger sablefish.

Student: Kaeden Fletcher-Vogel
Title: Five-round battles: Tracking aggressive repetitive interactions in the sea anemone *Anthopleura elegantissima*
Poster #:10

Co-Authors: Jacob Bourquein, Elise Tysdal, Nathan Kirk
School: Oregon State University
Degree:Master's in Marine Resource Management

Keywords: Animal behavior, aggression, rocky intertidal, stress, *Anthopleura elegantissima*

Abstract:
The aggregating anemone, *Anthopleura elegantissima*, inhabits the rocky intertidal and forms colonies of genetically identical clones. Intraspecific competition for space on intertidal rocks results in agonistic behaviors between non-clonemate anemones of the same species using specialized structures called Acrorhagi. Aggression in *A. elegantissima* has been previously researched, but little is known about how aggression changes over a temporal scale. Here we hypothesized that repeated exposure to a non-clonemate would lead to increased aggressive interactions, because of the elevated stress levels resulting in readily having acrorhagi inflated. Aggression was induced by initiating contact among twenty-four pairs of non-clonemates for one hour over four consecutive days. After the fourth day, the anemones were kept separate for five days. After five days without exposure, contact between anemone pairs was initiated again to answer the question of how aggression changes over time. Comparison of acrorhagi status, number of contacts, number of acrorhagi sweeps, time spent in a retracted state, and time to first run were recorded. In preliminary results, there were significant relationships observed between acrorhagi status and repeated interaction. There was, however, no significant relationship between time to first run or time spent retracted. Additionally, the fights proceeded predictably, with the same individuals reliably “winning” the interaction each time. Finally, repetitive stressful interaction with a competitor induced a state of sustained acrorhagi presence even after a period of rest in both “warrior” and “reproductive” polyps, which suggests the possibility of role shift caused by stress.

Student: Ericka Rosen
Title: Five-round battles: Sex and Aggression in *Anthopleura elegantissima*
Poster #:23

Co-Authors: Emily Dye, Nathan Kirk
School: Oregon State University
Degree:Master's in Marine Resource Management

Keywords: Intraspecific competition, aggression, Sea anemone

Abstract:
The aggregating anemone, *Anthopleura elegantissima*, is abundant on the Oregon Coast and forms colonies of clones that compete with conspecifics for space. Past studies have observed increasingly aggressive behavior of the aggregating anemone *Anthopleura elegantissim*a towards non-clonemates. This behavior is displayed through the inflation of acrorhagi appendages that strike opponents in aggressive contact. In addition to cloning, these colonies also produced either eggs or sperm that they use for sexual reproduction. Therefore, these combatants are potentially attacking their sexual partners. In this study we examined how the sex of the anemone affects the aggression level of the fight. *A. elegantissima* were collected from the Oregon coast and acclimated in a laboratory setting. We then paired and observed several fights of individuals from different colonies that were: male vs male, female vs female and male vs female. Fights were scored on acrorhagi status before and after the fight, contact during the fight, number of acrorhagi sweeps, and total time spent retracted. These parameters were compared across categories to analyze which sex tended to be the more aggressive. We found that female vs. female fights had a much higher average number of total acrorhagi strikes in a fight than the other pairings, which could indicate that females are the more aggressive sex. There is still more research to be done to see if this intriguing trend will continue in a larger sample size.

Student Art Exhibitions

Student: Kate Larson
Title: Oceans of Inspiration
Poster #:E
Media: Photography
Created: 2022 /2023

Narrative:
I have been exploring wildlife and conservation photography throughout the last two years, but this summer has really given me a chance to let this passion shine through. I spent a week camping at Cape Perpetua with OSU's Creative Coast 2023 student cohort, and it is there that I was able to fully immerse myself in this beloved coastal ecosystem as a respectful observer and more so, as a storyteller. The photo collage reflects my exciting intertidal discoveries from the trip, while the blue heron and harbor seal are photos that show some of my greatest inspirations and favorite subjects.

Artist Statement:
I fell in love with wildlife & conservation photography when I was given the opportunity to photograph a colony of harbor seals for research with the Marine Mammal Institute's Dr. Renee Albertson. Ever since, I have gained this immense appreciation for the marine environment through the lens of a storyteller. I view photography as a meaningful and powerful means of connection: each and every photo is a unique story waiting to be told. It is an opportunity for the viewer to experience the rugged beauty of a penguin colony in the Antarctic or to stand in awe of the vibrant colors, textures, and patterns of the ocean and its inhabitants. All by admiring a Photograph. Photography allows us to step back and feel. We can be moved and inspired by the miraculous grandeur of a moment, and in an instant we can also be saddened and begin to understand the complexity and severity of a given issue. This, in my eyes, makes photography one of the greatest storytellers in life. So, I look to photography to let my passion shine through in a way that inspires people to see the ocean as I do: as a sea of inspiration, to maintain my hope for a brighter future, and to keep my heart full. Because in the end, that is all we can do. Be in the moment; appreciate the raw, natural beauty of the Earth; and never lose our innate sense of wonder.

Capturing a Creative Coast

Photography / June 2023

Blue
Photography / September 2023

A Seal’s Smile
Photography / July 2022

Student: Olivia Burleigh
Title: Fragile existence
Poster #:A
Media: Ceramics
Created: 2023

Narrative:
The brown sea cucumber, Isostichopus fuscus, is a species that has been exploited in the Galapagos Islands to meet the demands of the luxury seafood market. Failed management of the fishery in the early 2000s led to overfishing and the ultimate collapse of the species' population to the point where the species is now endangered. During the five months that I was living in the Galapagos, I only saw this species three times. This sea cucumber represents the fragility and balance needed for fisheries and conservation to coincide.

Artist Statement:
Olivia is a current second-year PhD student in the Department of Integrative Biology at Oregon State University. She is also a PRAx Interdisciplinary Student Fellow and an NSF Graduate Research Fellow. Art and science have always been interconnected in her eyes, as she spent her undergraduate career studying both biology and studio art. Her research focuses on how the innate immune system is involved in symbiosis regulation and coral bleaching responses due to climate change.

Student: Rose Pond
Title: Halaqaik (Cape Perpetua)
Poster #:I
Media: Acrylic and Ink on canvas
Created: 2023

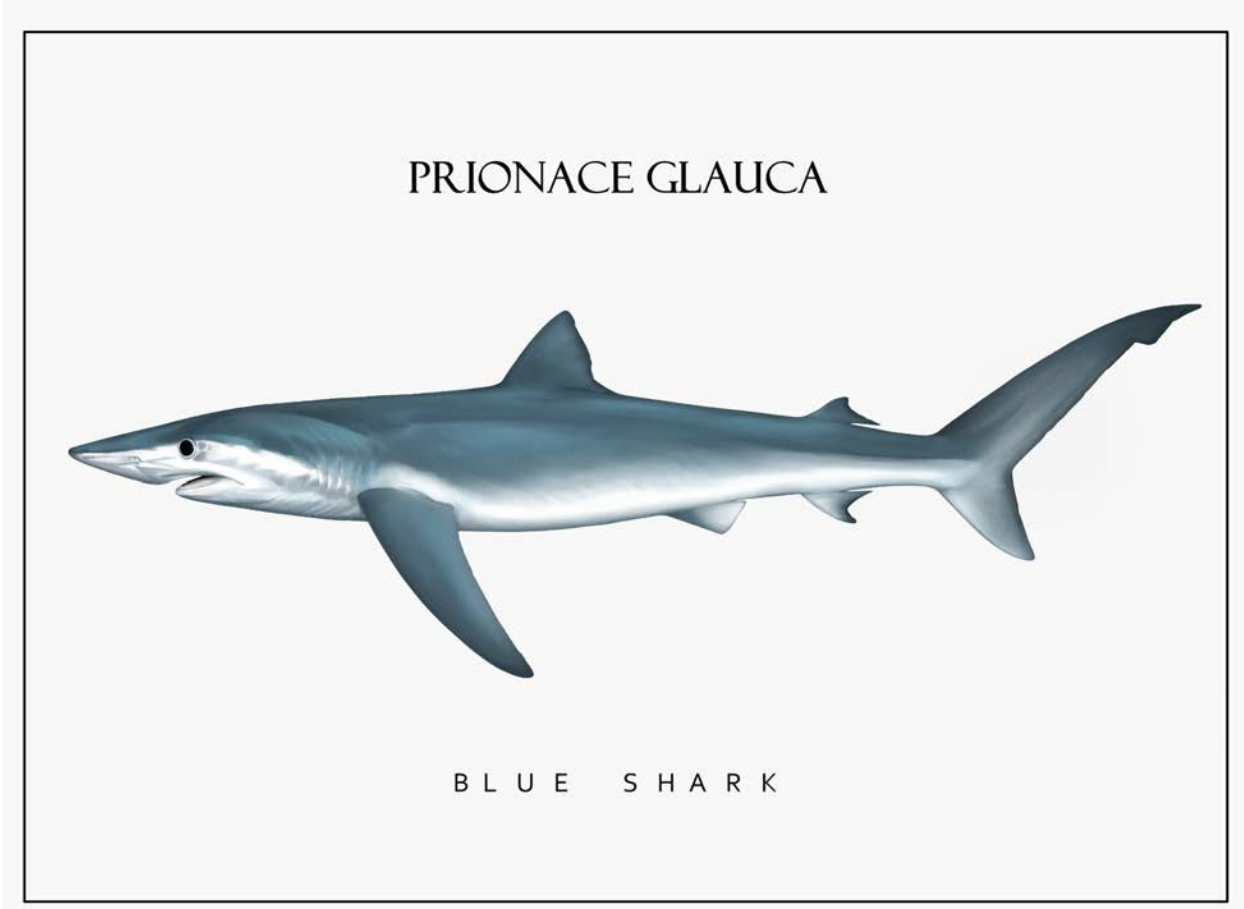
Narrative:
This artwork called Halaqaik was inspired by taking the Creative Coast class this last summer in Cape Perpetua. This piece represents the forgotten and overlooked history of Indigenous people on the Oregon coast. Halaqaik was the original name given to Cape Perpetua by the Alsea people who lived and had a village there. The Alsea were forcibly removed along with the Coos and lower Umpqua to the Sub-Agency in 1859. The Sub-Agency at Yachats was reported to have prison like conditions. This piece depicts two perspectives the peacefulness of the landscape and the contrasting history that took place there.

Artist statement:
Rose is an undergraduate student majoring in psychology, with minors in Indigenous studies and studio art. Rose is a member of the Samish Indian NaCon and is working to incorporate traditional coast Salish symbols in their art. Rose mainly uses paint on canvas to capture emoCons and the natural world in a way that they hope people can connect to. Rose is also exploring new mediums such as ceramics.

Student: Natalie Donato
Title: Simple Intricacies
Poster #:B
Media: Digital illustration printed on paper
Created: 2023

Narrative:
While working with the Big Fish Lab here at Hatfield Marine Science Center, I sought to better understand a species they frequently study, the blue shark (*Prionace glauca*), by creating an illustration for science communication purposes. Through that process, I made a digital painting to showcase the shark's complex beauty in a reflection of their natural form. By framing the shark in a context that lacks the influence of the stereotypical fearful narrative I hope that people can look beyond fear to admire and appreciate the intricacies of the shark itself like I did while creating this piece.

Artist statement:
My artwork is often inspired by my lifelong passion for marine science and conservation, and has allowed me to connect with my interests on a deeper level. From my time spent on the Oregon coast, I have been inspired by the local species I work with, and I hope to share a sense of pride and stewardship towards those local species like the blue shark through my art. The process of creating art allows me to delve into the intricacies of the animals, getting to know every curve, line and shape from the sketch to the finished piece. Through my process, my goal is to bring different aspects of images and imagery together to tell a story, to build a narrative within the finished product. However, creating *Simple Intricacies* posed a challenge–what happens when your subject already has its story written–a falsified, sensationalized story, for that matter? When there are so many images and associations tied to that narrative that reframing them all seems like an impossible task? Over and over, sharks have been portrayed as these monstrous killers. Instead of recontextualizing that narrative, I decided to let these misunderstood animals stand alone on a blank slate. *Simple Intricacies* is my attempt to remove the layers of sensationalization and fear surrounding sharks and to showcase the details obscured underneath. Seeing a shark like the blue shark in its simplest form allows for a new narrative to begin; one of awe, appreciation, and respect for such fascinating animals. I hope to spark curiosity, to help people learn, and to help people understand what lies beneath the age-old narratives that prey on the fears of consumers for publicity. It's time to help reframe the misunderstood narrative of sharks; and I'm here to further that work, one step at a time.


PRIONACE GLAUCA
BLUE SHARK

Student: Claire Schlagenhaft
Title: Fish-ish
Poster #:J
Media: Mixed Media (Wood, paper, acrylic, plastic, rubber, glue)
Created: 2023

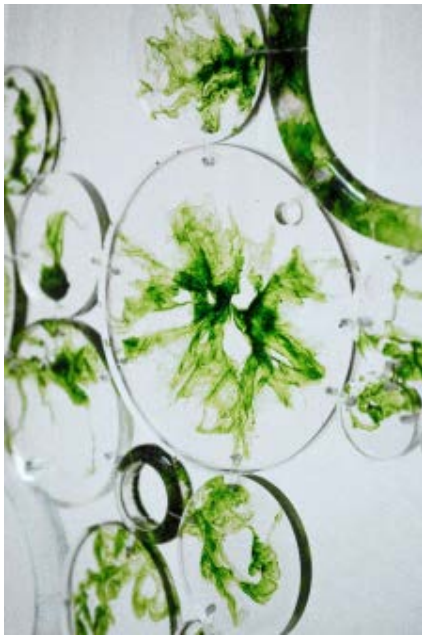
Narrative:
Fish-ish is a representation of the gap between consumers and what they're consuming. The wood board frames the image of what we think of when we hear the word "fish." It's a snapshot of our often limited perceptions and tendency to focus on only what is beautiful. The bodies are the unseen reality, constructed out of various trash items, from rubber bands to chip bags. When all is served on a pristine plate, "fish" the food and "fish" the animal nearly become two separate things. However, if we want to keep eating them, they must be seen as one.

Artist statement:
I am currently trying to find balance in my own life. As a senior, my own reality has become increasingly apparent to me, both the hardships and the joys that come with it. Sometimes, a small part of me is scared I made the wrong decision. Being in a college that is majority STEM students doesn't dissuade my passion really, but it often makes me look around and see how many more "meaningful" things they are achieving. Does my work have meaning? Not always, and that's okay. More often than not, I think it's only realized when looking back. In the end, I hope people can experience my work in a way they themselves find meaningful, in whatever shape or form that may take.

Student: Aliya Jamil
Title: Of little significance
Poster #:D
Media: Resin and ink
Created: 2023

Narrative:
"It is more important to live for the possibilities that lie ahead than to die in despair over what has been lost." – Barry Lopez, from Embrace Fearlessly the Burning World
As we brace ourselves against the looming wave of climate change, it is all too easy to succumb to panic. We are seeing unprecedented shifts across ecosystems – especially those in the ocean. Warming temperatures and changes in water circulation are causing dramatic changes across the marine food web. Despite being some of the smallest lifeforms in the ocean, phytoplankton are perhaps one of the most important in that they facilitate ocean carbon sequestration and serve as the base of the marine food web. Shifts away from large phytoplankton species (represented here with green ink) towards smaller species (blue ink) can ultimately lead to devastating impacts on fish, seabirds, whales, and even us. As humans move through the world, it is difficult to grasp that our very existence is in part dependent on photosynthetic organisms living at such small scales.

Artist Statement:
This piece invites the viewer to contemplate the significance of this in microscopic ocean life and its cascading nature. More importantly, it also encourages you to find beauty within error of the unknown. While physical, chemical, and ecological systems move towards some new equilibrium that may be unrecognizable to us, life will insist.




Student: Clara Isabel Oliverson
Title: Tufted Puffins & People
Poster #:G
Media: Photographs
Created: 2023

Narrative:
Along the Oregon Coast, the population of Tufted Puffins has plummeted in the last few decades. Haystack Rock, located in Cannon Beach, holds one of the largest remaining populations of Tufted Puffins in Oregon and is one of the last places they are easily visible to the public. Because of this, the town of Cannon Beach takes pride in its puffins and many tourists visit just to see them. But despite the love surrounding these charismatic birds, populations continue to decline. Before long, there may not be any puffins left on Haystack at all. These images aim to document the story of the Haystack Rock puffins and the community around them.

Artist Statement:
Clara is a second-year student at Oregon State University studying Fisheries, Wildlife, and Conservation Sciences with a specialization in ornithology. She has been a wildlife photographer for about 6 years and is currently focused on telling conservation stories through her images. This summer, she was an intern with OSU's Seabird Oceanography Lab photographing the Tufted Puffins and Common Murres on Haystack Rock to support research on the chick diets of these species. During this internship, she also had the opportunity to create a photo essay (under the mentorship of photographer Morgan Heim) documenting the conservation of Tufted Puffins in Oregon. The submitted images are a selection from that photo essay.

The first image depicts a common scene at the rock as a puffin soars along the top plateau. This bird was coming in from the ocean (empty-handed) and returning to its burrow along the grassy west slope of Haystack. Moments like this were often accompanied by Haystack Rock volunteers yelling "Puffin!!" and beachgoers excitedly watching the bird return to the colony.

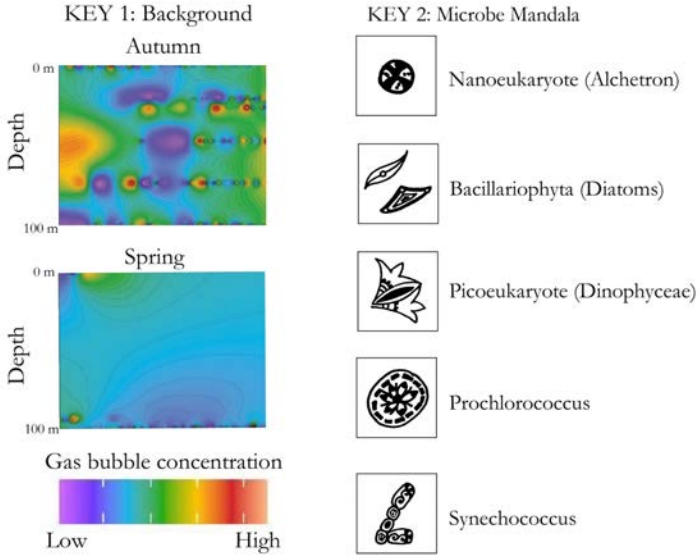
The second is of Tim Halloran, a USFWS volunteer who has spent 12 summers tirelessly counting the puffins on the rock. He has watched the steady decline of the population year by year, and in 2023, observed the largest decrease in birds so far. Despite these discouraging numbers, he is excited to return each year and watch what happens next with these funny little birds.

The final image shows the puffin statue in downtown Cannon Beach. Some tourists stop to read the plaque and observe the statue, while many walk by without giving it a second glance. This image aims to depict the contrast in the conservation story of these birds: there are a few very passionate people who are doing everything they can to protect and appreciate them, while most people pass them by without a second thought.

Student: Vaishnavi Padaki
Title of the artwork: Composing clouds in the ocean
Poster #:H
Media: Glass
Year: 2023

Narrative:
'Composing clouds in the ocean' art piece consists of waves that symbolize the ocean's essence. It is structured in a wave to take you on an exploration of the minute processes causing climate change. The mandala design emphasizes the small gaseous bubbles produced by the ocean's producers. The background conveys seasonal differences in the concentration and composition of these bubbles. These gasses leave the ocean to form clouds and regulate climatic processes. Together, the piece evokes the seasons that ocean systems experience.

Artist statement:
Vaishnavi Padaki is enrolled in her third-year doctoral program in the Department of Microbiology at Oregon State University. She focuses on the interaction between marine algae and bacteria. She is also a scientist-artist. Vaishnavi's passion for artistic expression and background in scientific research led her to create this captivating glass sculpture that captures the ocean ecosystem's beauty, complexity, and wonder. The art form Vaishnavi creates is called Zentangles, which she often translates into diverse art mediums, including embroidery, crochet, stippling, quilling paper, and ceramics. For the first time, she has boldly experimented with glass as her medium of art communication. As an experimenter, Vaishnavi embraces the new medium and explores its possibilities and challenges. The result is a glass sculpture that illustrates Vaishnavi's artistic courage and unwavering dedication to artistic exploration. As a scientist-artist, Vaishnavi holds a deep-seated belief in the power of art to inspire and educate, thus bridging the gap between science and art. Her distinct perspective combines analytical thinking with creative expression, creating artwork that is both intellectually stimulating as well as visually compelling. Explore Vaishnavi's art, where science and art meet, and embark on a journey of discovery and wonder.



Student: Aspen McCallum
Title: Creative Coast 2023: Cape Perpetua
Poster #:F
Media: Mixed Media
Created: 2023

Narrative:
This is a small sketchbook chronicling my time and adventures at Cape Perpetua this past summer, 2023. Roughly organized by day, I spent five days exploring the coast and documented what I found. My main theme was to bring out my inner child and simply explore, rather than focusing on mass producing content. My driving theme was the playground of the natural world, something adults easily forget. Throughout the book I also write short summaries of what I did each day, what I noticed, and reflections.

Artist Statement:
Aspen McCallum is a junior at Oregon State University studying for a Bachelors of Fine Arts with a concentration in printmaking, drawing, and painting. This is their second year attending the Creative Coast class offered by Andy Myers and Michael Boonstra, which takes place at Cape Perpetua. Their depth of work ranges in media including printmaking, drawing, painting but also is expansive into sculptural work including ceramics, stained glass and more.
Creative Coast is a week-long class held on-site at Cape Perpetua allowing students to work in the field rather than the classroom creating site specific work. Ranging from artists to marine science majors, this hands-on class is the perfect opportunity to really explore a place and translate it into visual means. This specific sketchbook served as the main form of documentation for the trip. The sketchbook itself was handmade before the class and was filled on-site. Some additions were added after the trip, as was further documentation. Building off my previous zine from last year's trip to the coast, I wanted to dive deeper into the location and reimagine it through a new lens: that of childlike curiosity. As a college student and young adult, my perspective feels as though it is in flux between adulthood and adolescence. To recapture the ways I used to see the world as a child, I aimed my practice and composition toward storytelling with elements of on-site collection (seen in the page with real leaves) as many young kids are often prompted. Overall, this book serves as a guide of my experience at Cape Perpetua over the summer of 2023. Also, I have made some linocut bookmarks as takeaways during my showing based on scenes from this trip at the coast.


Cape
Perpetua

Student: Jason St Clair
Title: Ethereal Edge
Poster #:K
Media: Infrared Digital Photograph
Year: 2022

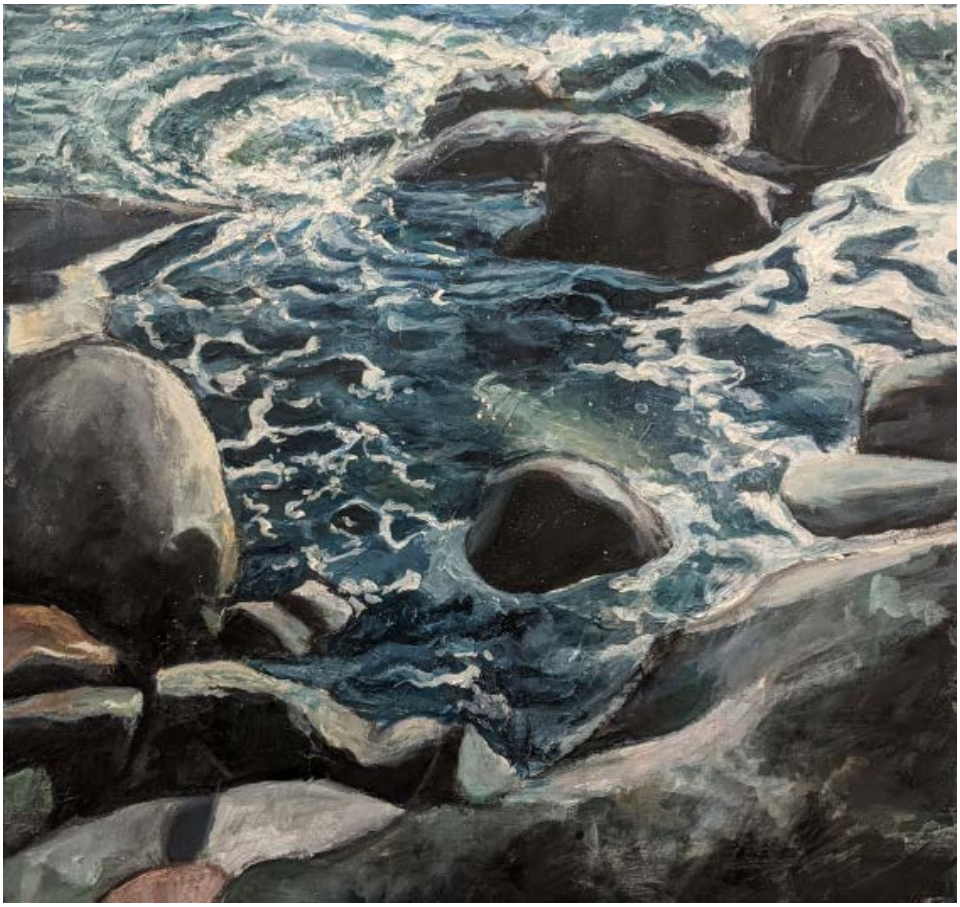
Narrative:
Ethereal Edge captures the Oregon coast's timeless allure through the lens of infrared photography. This enchanting artwork invites viewers to witness the coastline's ethereal beauty and feel its palpable connection to the vast Pacific Ocean. With its otherworldly tones and surreal textures, the photograph serves as a visual plea for ocean conservation. The red tones that infrared bring identify the health of the plant life and microorganisms that call the coast their home. It whispers the untold stories of the sea, urging us to protect this fragile ecosystem. Ethereal Edge isn't just a photograph; it's a call to action, a reminder of the delicate balance we must preserve for the Oregon coast and the Earth's oceans.

Artist's Statement:
Through two transformative hikes along the Oregon Coast Trail, Jason St Clair forged a deep connection with the coastline's fragile yet breathtaking beauty. Ethereal Edge emerged from his desire to shed light on the often unseen life that calls this interface between land and sea home. Armed with a modified camera and an infrared filter, he unveiled a hidden world that remains invisible to the naked eye. Many of these lifeforms, essential to the coastal ecosystem, seamlessly blend into rocks and soil, evading the visual spectrum. Infrared photography, however, forces viewers to acknowledge their existence, sparking awe, wonder, and a compelling urge to protect even the tiniest organisms. Ethereal Edge serves as a reminder that the ocean's vitality extends far beyond the charming marine creatures readily encountered. It unveils the deeper layers of life that often go overlooked but are equally crucial to the coastal ecosystem's health. Jason's motivation goes beyond art; it's a call to recognize the importance of conserving every aspect of this delicate balance. As a species, humanity stands on the unseen precipice of environmental catastrophe, and the path is unsustainable. Jason's experiences as both an avid hiker along the Oregon coast and a fisherman and sailor have revealed a harsh truth for him: destruction often remains hidden from the more touristy areas. His aspiration is to foster a harmonious relationship between humanity and the sea, emphasizing our responsibility to protect and cherish it. Yet, his infrared work like Ethereal Edge also reflects a personal journey. There's a learning curve in revealing the unseen through technology, just as there is in understanding the intricacies of our interconnected world. As he explores this uncharted territory, Jason hopes this artwork encourages viewers to embark on their own path towards a more profound connection with nature and a commitment to safeguarding our fragile planet.

Student: Ian Hermanson
Title: Newport Jetty
Poster #:C
Media: Acrylic on paper
Created: 2023

Narrative:
My painting captures the ocean swelling among the rocks of Newport Jetty. I hope the image calls attention to the elegance of the cold Oregon Coast ocean. Beyond scientific complexity, the ocean embodies a grace of movement, strength, and presence. I believe this grace is important. Zooming my frame until I capture a tight composition of water flowing between only a few rocks, I embellish the motion, color, and light of the stone and sea. With a few artistic suggestions, the viewer proceeds with their interpretation.

Artist Statement:
Ian Hermanson is an Oregon State student majoring in Mechanical Engineering and minoring in Studio Art. He believes that art doesn't merely "make his brain feel good," but that expressive creativity is essential to design and technical thought.



Highschool Researchers

Student: Grace Stephens
Title: The effects of manure on plant growth: grass fed vs grain fed
Co-Authors: NA
School: North Bend High School

Abstract:
Plants need both micro-nutrients and macro-nutrients to survive. With this in mind, I devised an experiment where I would test the effects of grass fed manure (micro-nutrient packed) in comparison to grain fed manure (macro-nutrient packed). The experiment consisted of six pots in which I mixed my base manures with cleaned sand. There were two pots with store bought soil, two pots with grass fed manure, and two pots with grain fed manure. After watering equally and keeping measurements (mm) of the growth within the plants for eleven days, I tested the results. With the grain fed manure plants only being an average of 0.95mm shorter than the grass fed manure plants, my Chi-square test was 0.7971606683, showing no significance within my experiment. So, the difference in cow manure had no significant effect on the growth of the plants, as the plants remained the same height.

Student: Garrett Vetter
Title: How wildfires affect algae population
Co-Authors: NA
School: North Bend High School

Abstract:
The effect of wildfire on algae population is a concerning research idea. Wildfire runoff can pose dangers to ecosystems and human by virtue of large algae blooms. In this experiment, I was to test water at different locations to see if wildfire affected algae population. I found that wildfire does indeed increase the amount of algae in a freshwater pond. The absorbance values at the burned location trended higher than those at unburnt locations, suggesting more algae was in the pond.