Seining in Huntington Beach Wetlands in Huntington Beach, CA

California Estuarine Research Society 2018 Meeting Program

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Long Beach Convention Center
Meeting Room 103A
Long Beach, California

Sunday, 09 December 2018

2018 CAERS Meeting - AGENDA - Long Beach, CA

8:00	**Registration and refreshments**	
8:30 - 9:00 am	**Welcome and Keynote**	
	Welcome to CAERS 2018	Theresa Sinicrope Talley*; CAERS, California Sea Grant at Scripps Institution of Oceanography, UCSD; tstalley@ucsd.edu
Keynote	A new approach to integrating spatiotemporal variation in demographic processes for understanding population dynamics and human impacts on Olympia oysters	Edwin Grosholz*[1], David Kimbro[2], Will White[3]; 1 Dept of Environmental Science and Policy, UC Davis. 2 Northeastern University, 3 Oregon State University; tedgrosholz@ucdavis.edu
9:00 - 10:10 am	**Climate Change Effects & Ocean Acidification**	
Ignite!	Conserving California's coastal habitats in the face of sea level rise	Walter Heady*, Brian Cohen, Mary Gleason, Joshua Morris, Sarah Newkirk; The Nature Conservancy; wheady@tnc.org
	Changing sea level and changing views of estuary restoration in California – Can we get out of the way?	David Jacobs*; Ecology and Evolutionary Biology, University of California Los Angeles; djacobs@ucla.edu
	Projecting wetland evolution in intermittently open lagoons with sea-level rise	Karen Thorne*[1], Scott Jones[1], Kevin Buffington[1], John Largier[2]; 1 USGS, 2 UC Davis; kthorne@usgs.gov
	Species range shifts, long term variability of temperature on coastal lagoons in Southern California	Julio Lorda*[1], Rodrigo Beas[1], Jeff Crooks[2]; 1 Universidad Autónoma de Baja California, 2 Tijuana River National Estuarine Research Reserve; jlorda@uabc.edu.mx
	Scale and extreme climate events: understanding a drought induced die-back of an invasive plant ecosystem engineer in tidal wetlands	Rachel Wigginton*, Megan Kelson, Edwin Grosholz; UC Davis; rdwigginton@ucdavis.edu
	A Synthesis of carbon services in California seagrass beds	Melissa Ward*[1,2], Tessa Hill[1], Brady O'Donnell[1], Brian Gaylord[1], Walter Oechel[2]; 1 UC Davis; 2 SDSU; maward@ucdavis.edu
	Coastal hypoxia in the central California Current System	Kate Hewett*, John Largier; UC Davis; kmhewett@ucdavis.edu
10:10 - 10:40 am	**Networking Break**	
10:40 am - 12:00 pm	**Community Ecology and Natural History**	
Ignite!	Spatial subsidies and mortality of an estuarine copepod revealed using a box model	Wim Kimmerer*[1], Edward Gross[2], Anne Slaughter[1] 1 Estuary and Ocean Science Center, SFSU; 2 RMA, Inc.; kimmerer@sfsu.edu
	Crab identity and density drive site-specific effects of burrowing crabs on plant community composition	Janet Walker*[1,2], Jeremy Long[2]; 1 UC Davis; 2 SDSU; janwalker@ucdavis.edu
	Comparisons of Tide Pool Fish Assemblages at Isla Natividad, BCS: Effects of tidal height, geomorphology, and other tide pool characteristics	Hali Rederer*[1], Scott Hamilton[2], Ivano Aiello[2], Ronald Coleman[1], Laurel Lam[2]; 1 CSU Sacramento, 2 Moss Landing Marine Laboratory; halirederer@csus.edu
	An analysis of the benthic macrofauna of the Southern California continental slope: Unique habitats and (possibly) neutrally organized assemblages	David Gillett*, Southern California Coastal Water Research Project; davidg@sccwrp.org
Ignite!	The cascading effect of temporal variability in risk	Jason Sadowski*, Edwin Grosholz; UC Davis; jsadowski@ucdavis.edu
	Food quantity and quality, or female mortality: What controls copepod egg production rates?	Austin Gearty*, Toni Ignoffo, Anne Slaughter, Wim Kimmerer; Estuary & Ocean Science Center, San Francisco State University; agearty@mail.sfsu.edu
	Threespine stickleback evolve seasonally in intermittent estuaries	Ben Wasserman*, Simone Des Roches, Travis Apgar, Eric Palkovacs; Ecology and Evolutionary Biology, UC Santa Cruz; bawasser@ucsc.edu
	Metabolic responses to thermal changes of a common coastal stingray, the round stingray (*Urobatis halleri*)	Diana Silva Garay*, Chris Lowe; CSU Long Beach; dlore.silvag@gmail.com
12:00-1:30	**Lunch, posters, and networking**	
1:30 - 2:20	**Spatial and Temporal Variability**	
Ignite!	Customized, web-based exploration of a long-term fisheries monitoring program	Marcus Beck*[1], Kristen Kittleson[2], Kevin O'Connor[3]; 1 Southern California Coastal Water Research Project, 2 County of Santa Cruz, 3 Moss Landing Marine Lab; marcusb@sccwrp.org
	Mapping vegetation community change in the Tijuana River National Estuarine Research Reserve from 1986 – 2016	Kellie Uyeda*[1], Monica Almeida[1], Justin McCullough[1], John Boland[2], Jeff Crooks[1]; 1 Tijuana River National Estuarine Research Reserve, 2 Boland Ecological Services; kuyeda@trnerr.org
	Interannual Variability of the Hydrodynamics of Los Peñasquitos Lagoon	Madeleine Harvey*[1], Sarah Giddings[1], Geno Pawlak[2]; 1 Scripps Institution of Oceanography, UCSD, 2 Jacobs School of Engineering, UCSD; meharvey@ucsd.edu
	Circulation of San Diego Bay, a low-inflow, seasonally hypersaline estuary	Angelica Rodriguez*[1], Sarah Giddings[1], Jessica Bredvik[2], Suzane Graham[2]; 1 Scripps Institution of Oceanography, UCSD, 2 SPAWAR- SSC Pacific; arodriguez@ucsd.edu
	Edge effects in estuarine habitat mosaics: an experimental test using restored eelgrass beds	Kaylee Griffith*, Kevin Hovel; Coastal and Marine Institute, San Diego State University; kleeroseg@gmail.com
2:20 - 2:50 pm	**Networking break**	
2:50 - 3:30 pm	**Restoration**	
	Facilitating ecological recovery of a San Francisco Bay salt marsh restoration site through active revegetation	Margot Buchbinder*, Kathy Boyer; Estuary & Ocean Science Center; San Francisco State University; mbuchbin@mail.sfsu.edu
	Recovering ecosystem functions by leveraging positive effects of biodiversity in a restored salt marsh	Bengt Allen*[1], Megan Fitzgerald[1], Karla Gonzalez[1], Jennifer Funk[2], Christine Whitcraft[1]; 1 CSU Long Beach, 2 Chapman University; bengt.allen@csulb.edu
	Kaelepulu: Efforts to restore a highly urbanized estuary in Hawaii	Bob Bourke*; Enchanted Lake Residents Association; rebourke2003@yahoo.com
	Diet of an important wetland resident, the California Killifish, *Fundulus parvipinnis*, in a natural and created marsh habitat located in Mission Bay, California	Katie Robinson-Filipp*, Drew Talley; Environmental and Ocean Sciences, University of San Diego; kblaharobinson@sandiego.edu
3:30-4:00 pm	**Networking break**	
4:00-5:00 pm	**Business Meeting**	

CAERS 2018 -- Poster Presentation Overview -- Long Beach, CA

#	Climate Change Effects and Ocean Acidification	
1	Comparing Carbon Storage in California Seagrass Beds and Salt Marshes	Chelsey Souza*, Melissa Ward, Tessa Hill, Brady O'Donnell; UC Davis; csouza@ucdavis.edu
2	Contribution of eelgrass (Zostera marina) community metabolism to the carbon flux of San Diego Bay	Abigail Ryder*[1], Walter Oechel[2], Matt Edwards[2], Melissa Ward[1]; 1 UC Davis, 2 SDSU; aryder@sdsu.edu
3	Epifaunal community recovery in San Francisco Estuary eelgrass (Zostera marina) beds after low salinity period	Geana Ayala*, Kathy Boyer; Estuary and Ocean Science Center, SFSU; gsayala@sfsu.edu
4	Investigating coastal wetland biomass dynamics with UAVs	Cheryl Doughty*, Kyla Cavanaugh; UC Los Angeles; cdoughty@ucla.edu
5	Synthesis of Thresholds of Ocean Acidification Effects on Echinoderms	Miranda Roethler*[1], Nina Bednarsek[1], Martha Sutula[1], Steve Weisberg[1], Rich Ambrose[2]; 1 Southern California Coastal Water Research Project, 2 UC Los Angeles;
6	Reproduction of endangered Suaeda californica and its use in sea level rise adaptation in SF Estuary	Kelly Santos*, Melissa Patten, Kathy Boyer; Estuary and Ocean Science Center, SFSU; ksantos7@mail.sfsu.edu
7	The Effect of Sediment Placement for Sea Level Rise Adaptation on Suspended Sediment Concentrations in a Southern Californian Salt Marsh	Amanda Wagner*, Rich Ambrose; UC Los Angeles; a.wagner@ucla.edu
	Community Ecology and Natural History	
8	Both species interactions and nutrients may reduce the negative effects of density on growth of a dominant macroalga on a human-impacted fringing coral reef in the South Pacific	Shalanda Grier*, Peggy Fong; UC Los Angeles; sgrier@g.ucla.edu
9	Prey availability for and diet of California Least Tern in southern California	Amanda Martinez*, Cynthia Coria, Christine Whitcraft; CSU Long Beach; amandatmartinez12@gmail.com
10	Otolith Increment Validation of the California Killifish	Raechel Hill*, Drew Talley; Environmental and Ocean Sciences, University of San Diego; raechelhill@sandiego.edu
11	Detangling the ecological roles of Fundulus parvipinnis in wetland ecosystems	Drew Talley*, Environmental and Ocean Sciences, University of San Diego; dtalley@sandiego.edu
	Living Shorelines and Restoration	
12	A New Living Shorelines Project at Giant Marsh: Integrating Restoration Features Across an Elevational Gradient for Sea Level Rise Adaptation	Melissa Patten*[1], Kathy Boyer[1], Marilyn Latta[2], Joel Darnell[3], Chela Zabin[4]; 1 Estuary and Ocean Science Center, SFSU, 2 California State Coastal Conservancy, 3 Environmental Science Associates, 4 Smithsonian Environmental Research Center;
13	Impacts of living shorelines restoration on fish and infaunal communities in Newport Bay, California	Marjorie Howard*, Christine Whitcraft; CSU Long Beach; marjorieehoward@gmail.com
14	The Effect of Sedimentation on Oysters Adjacent to Eelgrass Meadows	Victoria Wood*[1], Christine Whitcraft[2], Joseph Carlin[1], Katie Nichols[3], Danielle Zacherl[1]; 1 CSU Fullerton, 2 CSU Long Beach, 3 Orange County Coastkeeper; victoria.wood@csu.fullerton.edu
15	Impact of Submerged Aquatic Vegetation (Zostera marina and Ruppia maritima) on Habitat Parameters and Macroinvertebrate Community Composition within an Urbanized Coastal Lagoon	Nicholas Da Silva*, Christine Whitcraft; CSU Long Beach; nicholas.dasilva@student.csulb.edu
	Spatial and Temporal Variability	
16	Biogeochemical observations and baseline CO2 conditions in the Agua Hedionda Lagoon	Kenisha Shipley*, Todd Martz; Scripps Institution of Oceanography, UCSD; kmshiple@ucsd.edu
17	Habitat use and connectivity of native and nonnative gobies in a fragmented wetland habitat in southern California	Chloe Van Grootheest*, Christine Whitcraft; CSU Long Beach; chloevangrootheest@gmail.com
18	Spatial and Temporal Variation in the Diet Composition of Zooplankton in Mission Bay	Bryanna Paulson*, University of San Diego; bpaulson@sandiego.edu
19	Developing Monitoring and Assessment Protocols for Southern California Eelgrass	Kenny McCune*; CSU Long Beach; kennym@sccwrp.org
20	Invasions as Consequence of Change: Examples from the Californias	Jeff Crooks*[1], Julio Lorda[2], Kellie Uyeda[1], Justin McCullough[1], Monica Almeida[1]; 1 Tijuana River National Estuarine Research Reserve, 2 Universidad Autónoma de Baja California; jcrooks@trnerr.org
	Health Hazards: Contaminants and HABS	
21	Dinophysis abundance and Diarrhetic Shellfish Toxin concentration in California mussel tissue at Santa Cruz Municipal Wharf	Dana Shultz*[1], Raphael Kudela[2] ; 1 Southern California Coastal Water Research Project, 2 UC Santa Cruz; danas@sccwrp.org
22	Understanding sediment dynamics and assessing potential health hazards in the Tijuana River Estuary	Darbi Berry*, Suzanne Walther; Environmental and Ocean Sciences, University of San Diego; darbiberry@sandiego.edu
23	What coastal watershed trash monitoring reveals about urban sources	Nina Venuti*, Theresa S Talley; California Sea Grant, Scripps Institution of Oceanography, UCSD; nvenuti@ucsd.edu

ABSTRACTS (in alphabetical order of presenter's last name)

Recovering ecosystem functions by leveraging positive effects of biodiversity in a restored salt marsh

Bengt Allen*1, Megan Fitzgerald1, Karla Gonzalez1, Jennifer Funk2, Christine Whitcraft1; 1 CSU Long Beach, 2 Chapman University; bengt.allen@csulb.edu ORAL PRESENTATION

Natural and managed ecosystems provide a variety of ecological, economic, and cultural benefits, yet most have been altered by human activity such that they exhibit deficits in biodiversity and functionality. Identifying factors accelerating the recovery of key species and associated functions in degraded systems is therefore a high global priority. We manipulated salt marsh plant species richness across an elevation gradient as part of a coastal wetland restoration, quantifying species-specific changes in plant cover after one and three years, the relative contribution of selection versus complementarity to overall diversity effects, and patterns of variation in environmental conditions and species-specific plant traits associated with primary productivity. Overall, biodiversity enhanced biomass accumulation in experimental plots, with the magnitude of the effect strengthening over time due to decreases at low and increases at high species richness. Diversity effects were initially due to selection, with the identity of the highest performing species varying across tidal elevations; however, complementarity effects eventually contributed as much, or more. Our results suggest that incorporating biodiversity into restoration designs is effective, and that shorter experiments not encompassing the full range of environmental and species trait variability may both underestimate the strength of and misidentify the mechanisms underlying diversity effects.

Epifaunal community recovery in San Francisco Estuary eelgrass (*Zostera marina*) beds after low salinity period

Geana Ayala*, Kathy Boyer; Estuary and Ocean Science Center, SFSU; gsayala@sfsu.edu POSTER #3

Severe weather events are predicted to increase in intensity and frequency in the future, and their effects on community composition and functioning in estuaries is poorly understood. The San Francisco Estuary (SFE) experienced a historically wet winter in 2017 when heavy rainfall reduced surface salinities drastically for several months, but the impact of this extended period of low salinity on organisms in the shallow subtidal region of the central bay is unknown. Eelgrass (*Zostera marina*) is an important habitat-forming species worldwide, hosting a diverse community of epifaunal invertebrates. We conducted quarterly surveys in six SFE eelgrass beds beginning in July 2017 to quantify shoot density, epiphyte biomass, invertebrate community composition, sediment characteristics, and other factors. Following the low-salinity period, we observed large changes in the invertebrate community compared to pre-2017 data, including the disappearance of two key native species, Taylor's sea hare (*Phylapllysia taylori*) and the isopod *Pentidotea resecata*. These ecologically important species feed on eelgrass epiphytes, increasing light availability to eelgrass and linking primary production to higher trophic levels. At the same time multiple invasive invertebrates became abundant. These findings reinforce a need to understand weather-related shifts in epifaunal community composition and distribution, as these may critically affect the conservation of critical foundational habitats, especially as climate changes intensify.

Customized, web-based exploration of a long-term fisheries monitoring program

Marcus Beck*1, Kristen Kittleson2, Kevin O'Connor3; 1 Southern California Coastal Water Research Project, 2 County of Santa Cruz, 3 Moss Landing Marine Lab; marcusb@sccwrp.org ORAL PRESENTATION

Long-term monitoring programs provide critical information that informs management actions to protect, enhance, or restore natural resources. Because these programs are resource-intensive, monitoring data are routinely evaluated to assess environmental condition and ability of the monitoring design to address management questions. A critical challenge is the need to quickly assess status and trends from aggregated information, while preserving the ability to explore patterns in the raw data. A twenty-year dataset of over 15000 fish density (steelhead salmon, *Oncorynchus mykiss*) and habitat measurements across four watersheds in Santa Cruz County, California was evaluated to assess resource condition and identify monitoring recommendations. A customized, web-based analysis platform was developed using open-source software to allow managers to 1) explore status and trends, 2) evaluate spatial patterns, and 3) understand relationships between habitat and salmonid density. The analyses were customized to address the primary management questions, while maintaining flexibility that facilitated understanding of relationships at individual sampling sites and across watershed aggregations. This approach

allowed managers to independently evaluate the datasets in a way that was not possible with conventional modes of delivering research products, such as technical reports or other hard-copy deliverables. We suggest that interactive approaches that allow exploration of complex datasets are effective tools to evaluate long-term monitoring datasets without compromising resolution of the raw data. We provide our approach as a proof of concept that could be used in other contexts.

Understanding sediment dynamics and assessing potential health hazards in the Tijuana River Estuary

Darbi Berry*, Suzanne Walther; Environmental and Ocean Sciences, University of San Diego; darbiberry@sandiego.edu POSTER #22

Coastal wetlands and salt marshes are among the ecosystems most impacted by anthropogenic activity. and have long been subject to degradation of viable ecosystem services such as water quality, habitat feasibility and pollution. Estuarine sediments serve as an important sink and source for both nutrients and heavy metals. Wetlands host and filter sediments transported between both land sources and the sea. Many of these heavy metals, if made bioavailable by the system can be hazardous to both environmental and human health. This study gained a better understanding of potential human health hazards that may be associated with the proposed and active restoration projects in the study site. We quantified the relationships between the sediment grain size and the geospatial distribution of heavy metals in the Tijuana River Estuary, in San Diego County. We collected 113 samples analyzed them using a Laser Particle Sorter (LPS) and an X-Ray Florescence (XRF). The Screening Quick Reference Tables (SQiRTs) developed by NOAA are widely used to help evaluate potential risks associated with inorganics and organics in sediments across San Diego County and we used them as a generous baseline for further analysis in this project. We used the Nemerow Index, widely employed in estuarine and coastal research, to assess the geospatial distribution of toxicity and health risks associated with the chosen heavy metals.

Kaelepulu: Efforts to restore a highly urbanized estuary in Hawaii

Bob Bourke*; Enchanted Lake Residents Association; rebourke2003@yahoo.com ORAL PRESENTATION

The 135-acre Kaelepulu Estuary on Windward Oahu has undergone extensive modification since 1965 as a result of flood control water diversion and urbanization. The estuary supports wetland ESA waterbird habitats, fisheries, and recreation, but has been challenged by eutrophication. Research on a number of fronts has identified 6 steps to restore ecosystem functions and services: 1) Flow restoration around a USACE flood control levee 2) Eradication of invasive mangroves, 3) Selective dredging to improve salt wedge penetration, 4) Manual tide-coordinated monthly openings of the stream mouth, 5) Tightened controls over construction runoff, and 6) Improvements to City storm drains to limit pollutant loads. Significant progress has been made on all fronts with the exception of City storm drain pollutant loads.

Facilitating ecological recovery of a San Francisco Bay salt marsh restoration site through active revegetation

Margot Buchbinder*, Kathy Boyer; Estuary & Ocean Science Center; San Francisco State University; mbuchbin@mail.sfsu.edu ORAL PRESENTATION

With the predicted acceleration of sea level rise in the mid-21st century, salt marsh restoration efforts are faced with the challenge of building and maintaining sufficient sediment to elevations that support vegetation. A novel technique has been used at the highly subsided Sears Point restoration site in north San Francisco Bay: the construction of 500 earthen mounds to buffer wave action and accrete sediment. However, the mounds rapidly eroded following construction, limiting their ability to achieve these functions. We planted mounds using native *Spartina foliosa* with or without coir erosion logs oriented to intercept either wind-waves or tidal currents. We hypothesized that *S. foliosa* would stabilize sediments, reducing erosion and leading to sediment accretion relative to unmanipulated controls, while coir erosion logs would enhance that effect. We also expected that changes to soil due to *S. foliosa* presence would foster development of soil invertebrate communities valuable to marsh functions including food web support. We found coir logs to be ineffective in this high wave-energy environment but that *S. foliosa* was able to stabilize sediments and reduce erosion compared to controls over time, with the highest-density plantings providing the most protection. Further, significant increases in macro-organic matter and trends in some invertebrate measures suggest our revegetation will facilitate marsh community development. As we successfully

planted *S. foliosa* to mounds at lower elevations than where natural recruitment is likely from seed, active planting may help to initiate a suite of valuable functions in restored marshes that could otherwise take decades to achieve.

Invasions as consequence of change: Examples from the Californias

Jeff Crooks*[1], Julio Lorda[2], Kellie Uyeda[1], Justin McCullough[1], Monica Almeida[1]; 1 Tijuana River National Estuarine Research Reserve, 2 Universidad Autónoma de Baja California; jcrooks@trnerr.org POSTER #20

While biological invasions are often considered as causes of alterations to invaded ecosystems, they also can be viewed as consequences of change. Within estuaries, salinity and temperature are major drivers of the distribution and abundance of organisms, and changes to these factors can promote new invasions and the ecological release of established populations. The estuaries of the Bight of the Californias, which includes Southern California, USA, and northern Baja California, Mexico, provide examples of how changing salinity and temperature regimes can lead to both shifting distributions of native species ("native invasions") as well as facilitation of non-natives. This highlights various ways in which invasions can be viewed through the lens of environmental change, and also offers opportunities to preview potential

Impact of submerged aquatic vegetation (*Zostera marina* and *Ruppia maritima*) on habitat parameters and macroinvertebrate community composition within an urbanized coastal lagoon

Nicholas Da Silva*, Christine Whitcraft; CSU Long Beach; nicholas.dasilva@student.csulb.edu POSTER #15

Seagrass ecosystems enhance coastal regions and provide a range of important environmental services. Unfortunately, acreage of these ecologically valuable habitats has been dramatically reduced worldwide by anthropogenic disturbances including coastal dredging, development, and urbanization. To combat this loss, local resource managers often promote restoration or mitigation programs which aim to reestablish degraded or destroyed habitat. This study investigates bed characteristics and macroinvertebrate community structure associated with several seagrass meadows within a highly urbanized but freshly restored coastal lagoon in Southern California. The Colorado Lagoon, located in the city of Long Beach, recently underwent a multi-year renovation which involved site-wide dredging, bathymetric modifications, and the transplanting of four beds of the eelgrass *Zostera marina* (the historically dominant seagrass in the region). Additionally, a secondary native seagrass, *Ruppia maritima*, colonized several regions of the lagoon through natural dispersal following the completion of restoration activities. We aim to compare abiotic conditions, vegetation characteristics, and macroinvertebrate community composition in the three unique subtidal habitats present within the newly restored lagoon: *R. maritima, Z. marina*, and unvegetated bare ground benthos. Preliminary results suggest that the morphology of each seagrass species may influence local macroinvertebrates compared to bare ground, and that differences in each species' growing season, reproductive strategies, and ability to tolerate stress may cause the communities they support to vary both locally and temporally. Understanding how benthic and blade-associated macroinvertebrate communities change in response to the presence and species of local seagrasses will allow for better management and stewardship of California's coastal estuaries.

Investigating coastal wetland biomass dynamics with UAVs

Cheryl Doughty*, Kyla Cavanaugh; UC Los Angeles; cdoughty@ucla.edu POSTER #4

Climate change poses a significant threat to coastal ecosystems worldwide. How salt marshes will respond depends on their ability to actively build elevation, which is determined by plant productivity and biomass. Yet, salt marsh productivity and biomass are not well-characterized across broad spatial scales or continuously in time. We combined seasonal field surveys and high-resolution unmanned aerial vehicle (UAV) multispectral imagery from the Carpinteria Salt Marsh Reserve to investigate the patterns and drivers of salt marsh biomass in the southern California region. We validated the UAV imagery using canopy reflectance captured in situ and found that UAV reflectance correlated highly (r2>0.86) to field measurements. UAV imagery was then used to test a suite of vegetation indices in their ability to predict aboveground biomass. NDVI provided the strongest correlation to aboveground biomass for each season, and when seasonal data were pooled (r2=0.44; rmse=451 g/m2). The NDVI aboveground biomass estimation model (AGB=2657.3*NDVI–59.1) was then used to create maps of biomass for each season. We found that spring exhibited higher average aboveground biomass (1150 g/m2) and total site-wide

aboveground biomass in spring was estimated to be 192 Mg, approximately 50 Mg higher than all other seasons. Aboveground biomass peaks highest in spring at elevations ranging from 1.6 – 2.0 m NAVD88, and exhibits sharp declines at higher elevations, especially during summer. Our approach utilizes UAVs to characterize the relationship between salt marsh biomass and remotely-sensed indices, which can aid the investigation of long-term biomass dynamics in wetlands across broad spatial scales.

Food quantity and quality, or female mortality: What controls copepod egg production rates?

Austin Gearty*, Toni Ignoffo, Anne Slaughter, Wim Kimmerer; Estuary & Ocean Science Center, San Francisco State University; agearty@mail.sfsu.edu ORAL PRESENTATION

Quantifying egg production rates (EPR) in copepods is a central focus in zooplankton ecology because it measures both female growth and reproductive output. We measured EPR for the egg-carrying calanoid copepod *Pseudodiaptomus forbesi* in the northern San Francisco Estuary between 2006 and 2017. Egg production is low in large estuarine channels, consistent with year-round low chlorophyll a concentration, a proxy for phytoplankton biomass. In freshwater tidal sloughs and wetlands chlorophyll concentrations are generally higher, but egg production rates for *P. forbesi* respond unpredictably to chlorophyll. Two factors likely contribute to this apparent disparity. First, high mortality of females (i.e., predation) elevates the proportion of pre-reproductive females, resulting in low EPR even with plentiful food. Mortality is especially difficult to measure in an estuarine environment where tidal exchange is strong, and requires corrections for gains and losses via transport. Second, copepods are selective feeders and many of their prey lack pigment, requiring more specific measures of food availability and quality. We employed a wide range of methods, including microscopic counts, lipid analysis, stable isotope analysis, high performance liquid chromatography, and flow cytometry to better describe *P. forbesi* diets. Improving measurements of food, combined with estimates of female mortality rates, will refine our understanding of the relationship between copepod diets and reproduction.

An analysis of the benthic macrofauna of the Southern California continental slope: Unique habitats and (possibly) neutrally organized assemblages

David Gillett*, Southern California Coastal Water Research Project; davidg@sccwrp.org ORAL PRESENTATION

Benthic infauna are a key ecological component of nearly all marine ecosystems that provide a multitude of ecological services. The last comprehensive study of the benthic infauna of Southern California's continental slope ecosystem – an area the comprises >60% of the Southern California Bight – was in the 1950's. Given the advances in benthic ecology, the lack of a modern synthesis of the fauna of the continental slope represents a distinct gap in our understanding of the region's coastal ocean. The goal of this study was to characterize the natural, baseline structure of the benthic infauna of the Southern California Bight continental slope. To this end, infauna, sediment composition, and sediment chemistry data collected from 1972 – 2016 were aggregated from across the region. These data were used to define reference conditions, determine if there were distinct habitats within the continental slope, and characterize the resident fauna of any distinct habitats. Our analyses identified three naturally occurring habitats: 1 Upper Slope – the shallow (200-400m) shelf/slope transition habitat along the length of the coastline; 2. Northwestern Slope – the area between Santa Barbara, CA and Point Conception, CA that covers a range of depths; 3. Lower Slope - the deep-water (400-1000m) slope habitat along the length of the coastline. The beta-diversity within habitat was quite large, with large Bray-Curtis dissimilarity values (>0.5) between any two samples within a habitat. This potentially stochastic (i.e., neutral) organization of continental slope fauna challenges traditional (i.e., niche) approaches to community ecology in the shallower waters of the region.

Both species interactions and nutrients may reduce the negative effects of density on growth of a dominant macroalga on a human-impacted fringing coral reef in the South Pacific

Shalanda Grier*, Peggy Fong; UC Los Angeles; sgrier@g.ucla.edu POSTER #8

As coral reefs worldwide shift to domination by macroalgae, it has become vital to understand how macroalgal species respond to alterations in species interactions and environmental drivers. We conducted 3 experiments examining the effects of algal density, nutrients, and algal-algal interactions on the growth of *Padina boryana*, a common brown macroalga that often dominates human-impacted coral reefs. We explored whether density or

species interactions affected the growth rate of *Padina* and found a two-fold increase in growth at low densities. Further, *Padina* benefited from the presence of another brown alga, *Sargassum*, at high but not low densities, possibly due to enhanced nutrients supplied by the other species. To test this hypothesis, we evaluated if added nutrients had the same effect as *Sargassum* on growth of *Padina*. Although, there was no significant effect of nutrients, there was a trend for nutrient addition to ameliorate the negative effect of density on *Padina*, which mirrored it's response to *Sargassum*. We then established that shape of the density/growth relationship was an exponential decline, but only when *Padina* was grown alone; when *Sargassum* was present the benefit to *Padina* of growing at low densities was eliminated by interaction with *Sargassum*. Overall, we found that growth of this dominant coral reef macroalga was density-dependent but that both the presence of other species and nutrients benefited growth at high densities, suggesting that human-impacted reefs may become increasingly macroalgal dominated as transitions to macroalgae intensify.

Edge effects in estuarine habitat mosaics: an experimental test using restored eelgrass beds

Kaylee Griffith*, Kevin Hovel; Coastal and Marine Institute, San Diego State University; kleeroseg@gmail.com ORAL PRESENTATION

Seagrass is often one of several habitat types in estuarine mosaics, but seagrass edge effect studies have rarely considered that neighboring habitat identity might create multiple 'edge types' each with unique effects on fauna. We used an eelgrass (*Zostera marina*) and Olympia oyster (*Ostrea lurida*) living shoreline restoration experiment in southern California to test if eelgrass epifaunal community structure and predation risk vary between edge types (eelgrass-oyster and eelgrass-unvegetated sediment) and edge proximity (edge or interior). Multivariate community analysis suggested that edge type and edge proximity altered epifaunal assemblages at only one of three sites, and that site accounted for most of the variability in community structure. Similarly, we found that effects of edge type and edge proximity on epifaunal density, richness, and diversity responses were site-specific, with oysters elevating richness in eelgrass at one site but not at others. Using tethering experiments, we found that predation risk for grass shrimp varied with edge type and distance from edge, with interactive effects of edge type and edge proximity at two sites. However, predation risk was higher in the interior of eelgrass patches planted adjacent to oysters than those planted adjacent to unvegetated sediment. Our results suggest that after one year, oyster restoration has had moderate and variable effects on eelgrass epifaunal communities and predation risk. Our living shorelines project is one of the first in southern California, and we recommend that more studies utilize restoration to experimentally test ecological theory.

A new approach to integrating spatiotemporal variation in demographic processes for understanding population dynamics and human impacts on Olympia oysters

Edwin Grosholz*[1], David Kimbro[2], Will White[3]; 1 Dept of Environmental Science and Policy, UC Davis. 2 Northeastern University, 3 Oregon State University; tedgrosholz@ucdavis.edu ORAL PRESENTATION

Foundation species are key components of estuarine ecosystems and support other species through the provision of physical structure and/or trophic support. Disentangling the relative effects of top–down, bottom–up and supply–side (i.e. juvenile recruitment) forces on foundation species is essential to predicting future effects of climate change and other human stressors. We took a novel approach to this problem by coupling long-term field observations and short-term experiments involving Olympia oysters *Ostrea lurida*, a key foundation species in California estuaries, with a state–space integral projection model. Our results showed the best model of oyster population dynamics involved spatial variation in growth and adult mortality – but not juvenile mortality – as well as spatiotemporal variation in recruitment. These patterns matched short-term estimates of each of those processes from field data. Larval recruitment had an interannual 'boom and bust' pattern, and during good recruitment years most larvae settled in the inner bay where water residence time was highest. Adult oyster mortality was also highest in the inner bay, where several predators were abundant and lowest in the mid-bay, where oyster growth was greatest, creating a size refuge from predators. Surprisingly, juvenile mortality was constant across the bay, possibly because of a lack of size refuge from predators. This approach represents a significant advance in disentangling the relative contributions of spatiotemporal variation in demographic processes, which can allow for more accurate estimates of the impacts of climate change and other human stressors on foundation species like Olympia oysters.

Interannual Variability of the Hydrodynamics of Los Peñasquitos Lagoon

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Many estuaries in California and other locations around the world with steep coasts and Mediterranean climates are classified as intermittently open estuaries (IOEs)—systems where a sandbar sill forms near the mouth that can periodically limit or block the ocean-estuary exchange. In these systems, inflowing currents and waves propagate into and dissipate in the inlet driving sediment transport from the adjacent beach into the estuary mouth. Measurements were conducted in Los Peñasquitos Lagoon (LPL) a small, shallow IOE in San Diego, CA from December 2014 to November 2018 during several unique periods of Southern California climatology; the 2014-2015 Blob with anomalously warm and drought conditions, the 2015-2016 El Nino with above average offshore waves and elevated sea levels, and the winter of 2016-2017 with above average precipitation. Observations indicate that interannual variability in atmospheric and oceanic forcing can affect sill height, current velocities, wave energy, stratification, and dissolved oxygen content within the lagoon.

Conserving California's coastal habitats in the face of sea level rise

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Sea level rise presents a challenge to conserving coastal habitats already impacted by human populations focused along the coast. We developed a comprehensive spatial assessment of the vulnerability of coastal habitats, sensitive species, and conservation lands to sea level rise and applied this to the entire California coast, where high biodiversity, high endemism, and 26.5 million people coincide. By characterizing the potential impact of projected subtidal and intertidal exposures independently we mapped and quantified vulnerability for 22 wetland and 18 upland habitats to 1.5m of sea level rise. We found 59% of coastal habitat area vulnerable to sea level rise, vulnerability of species found nowhere else, and that 25% of conservation lands will be drowned by subtidal waters. We developed a wall-to-wall conservation blueprint comprised of five strategies to maintain coastal habitat area in the face of sea level rise. Our "Hope for the Coast" campaign engaged key state, local, and federal agencies to coalesce around a vision: "Guided by science in collective action we will maintain and enhance California's coastal habitats in the face of sea level rise and other stressors, ensuring that our children and their grandchildren will enjoy the ecological, recreational, and economic values that California's coastal habitats provide to us today," with actionable commitments. Our vulnerability results and conservation strategy maps provide blueprints for coastal decision makers to take collective action today and into the future to conserve California's iconic coastal habitats. Our parsimonious and modular approach may be applied to coastal settings around the world.

Coastal hypoxia in the central California Current System

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Coastal upwelling supports productive ecosystems in eastern boundary currents that provide ecologically and economically important habitats, e.g., off the west coast of North America. However, the upwelling of nutrient-rich deep waters poses ecosystem risks as well as benefits, as cold upwelled waters are increasingly enriched in CO2 and depleted in oxygen. Because the mechanisms responsible for changing oxygen levels within the California Current System (CCS) are not fully understood, our ability to characterize the duration and extent of exposure to hypoxia is limited. This prevents proper assessment of habitat vulnerability, and how management tools can be applied to address local impacts of globally driven changes. Oxygen levels in coastal upwelling regions vary owing to influx of oxygen-poor undercurrent waters, local drawdown of oxygen through net respiration, local oxygen replenishment through net production and/or vertical mixing of oxygenated surface waters. There has been comparatively limited research on hypoxia in the central CCS, despite being the location of maximum upwelling wind stress over the CCS, and despite the well-recognized productivity of the greater Gulf of Farallones (from Monterey Bay to Bodega Bay) – a "hot spot" for its biological resources, as recognized by three National Marine Sanctuaries. Here we present new information acquired from near-bottom moored sensors, deployed at a few different locations over the shelf from 2013 to 2018. These time-series measurements of temperature, salinity and oxygen provide new insight and allow us to describe the seasonal dissolved oxygen cycle and short-term events.

Otolith Increment Validation of the California Killifish

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POSTER #10

California's wetlands are greatly endangered as 95% of marsh area has been destroyed or developed. Understanding the health of southern and northern Baja California wetlands requires clear knowledge of the natural history of organisms in these marshes. This study therefore focused on *Fundulus parvipinnis*, a key mesopredator in the Mission Bay wetland of San Diego, CA, in an effort to better understand its life history. This work validated otolith increment formation for *F. parvipinnis*, which will help to determine growth patterns and population dynamics of this species. Weekly samples of a continuously growing population of *F. parvipinnis* were dissected and the otoliths analyzed to determine the increment formation of one ring in the otolith. A second method of using a biological dye to stain live fish and the currently forming otolith ring was used to corroborate the results of the first method. The expected validation time of formation of a single ring is approximately one day. This finding allows for accurate age determination of any *F. parvipinnis* caught, which can be used for future population and ecosystem dynamics study.

Impacts of living shorelines restoration on fish and infaunal communities in Newport Bay, California

Marjorie Howard*, Christine Whitcraft; CSU Long Beach; marjorieehoward@gmail.com POSTER #13

Efforts to restore the Olympia oyster (*Ostrea lurida*) are of high importance due to the oyster's substantial decline as well as its ecological and economic value. The construction of *O. lurida* beds may provide complex habitat for many wetland species while enhancing water clarity via filtration. However, previous studies have observed significant declines in abundance and diversity of infaunal invertebrates immediately beneath restored beds due to an altered sediment-water interface. This loss may potentially be counterbalanced by planting seagrass beds adjacent to oyster beds, as the additional complex habitat provided by seagrass root systems is expected to increase infaunal abundance and diversity. Pairing oyster and seagrass beds in a living shorelines restoration may also create more diverse habitats for fish, enhancing their abundance and diversity. Olympia oyster and eelgrass (*Zostera marina*) restoration were conducted, both paired and separately, at four sites within Newport Bay, California. Each treatment plot was assessed both pre- and post-restoration for fish and infaunal community composition. Infauna were sampled by collecting sediment cores from both intertidal (oyster or control) and subtidal (eelgrass or control) plots of each treatment. Fish were monitored via a baited GoPro placed in subtidal plots of each treatment. Preliminary results show that the infaunal community exhibits site-specific changes in response to restoration, which will provide insight into the ideal conditions and locations for oyster and eelgrass restoration. The fish community was observed to utilize all restored habitat types, and patterns of community change will be useful in informing future restoration efforts.

Changing sea level and changing views of estuary restoration in California – Can we get out of the way?

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Larger estuaries form as a function of rising sea level that floods river and tectonic valleys generating estuary space that was "inherited" from rapidly rising late Pleistocene sea-level into the subsequent Holocene period. During the more constant Holocene sea-level of the last 10,000 years, coasts have matured and estuaries have evolved into lagoon systems. For most of the last several decades restoration has largely involved excavation of lagoons to form estuaries. In effect this was an effort to use the dredge and our considerable hydrocarbon powered earth-moving mastery to go back in time - an attempt to reverse or "rewild" estuaries to the early Holocene condition. More recently anthropogenic sea-level rise has become more manifest. One might imagine that those who had been eager to deepen our estuaries would embrace this process that is threatening to replicate our former restoration efforts. However, that does not appear to be the case. Now restoration focuses our considerable hydrocarbon powered earth-moving capacity on making sure that Marsh surfaces can keep up with sea-level rise and that the status quo is maintained in the face of change in these dynamic ever-changing systems. Before we take such actions we might want to investigate the origins of these marsh surfaces we would like to preserve, and what the dynamics of the system would likely produce if we simply get out of the way.

Spatial subsidies and mortality of an estuarine copepod revealed using a box model

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Estimating mortality of planktonic populations is challenging because assumptions of the methods are rarely met, more so in estuaries where tidal exchange ensures that the population is not closed. Estuarine plankton populations undergo losses through movement from productive regions, creating a corresponding subsidy to regions that are less productive. We estimated mortality rates of the copepod *Pseudodiaptomus forbesi* in the San Francisco Estuary using a vertical-life-table approach with a Bayesian estimation method. Using a spatial box model with salinity-based boundaries we estimated spatial subsidies to and losses from each box, and used them to correct mortality estimates for movement. Data came from a long-term monitoring program and from three sample sets for 1991–2007 and 2010–2012. A hydrodynamic model coupled with a particle-tracking model supplied exchange rates between boxes and from each box to several sinks. In-situ mortality, i.e., mortality corrected for movement, was highly variable. In-situ mortality of adults was high (means by box and sampling program 0.1–0.9 d-1) and appeared invariant with salinity or year. In-situ mortality of nauplii and copepodites increased from fresh (~0) to brackish water (means 0.4–0.8 d-1), partly because of consumption by clams. An increase in the spatial subsidy to brackish water after 1993 corresponded to the introduction of a predatory copepod to this region. Our results emphasize the importance of mortality and spatial subsidies in structuring populations. Mortality estimates of estuarine plankton are feasible with sufficient sampling to overcome high variability, provided adjustments are made to account for movement.

Species range shifts, long term variability of temperature on coastal lagoons in Southern California

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Recent climactic events have resulted in dramatic range shifts of many coastal species, which may allow us to envision potential future distributions of species and perhaps the movement of bio-geographical transition zones due to climate change. Following the 2014-2016 North Pacific warm anomaly (the Blob) and the 2015-2016 El Niño we observed the northward shift of several invertebrate and fish species' ranges in the Southern California Bight. Sub-tropical zones, such as the Southern California Bight, are likely to continue to gain tropical species, and monitoring programs will allow us to continue to record the tropicalization of the Californias. Coastal lagoons, estuaries, and bays are complex and variable, where spatially close systems can vary significantly in some important environmental characteristics such as temperature. We examined the long-term temperature variability in our study region to explain observed species range shifts and to predict future potential range expansions. The data suggest we should expect to see variability (timing and/or severity) in the effects from climate change even across similar ecosystems close in proximity.

Prey availability for and diet of California Least Tern in southern California

Amanda Martinez*, Cynthia Coria, Christine Whitcraft; CSU Long Beach; amandatmartinez12@gmail.com POSTER #9

The California Least Tern (CLT: *Sternula antillarium browni*) is a state and federally endangered bird as a result of habitat loss and degradation. An important factor that contributes to healthy population numbers is prey availability because it affects the CLT diet. This study focuses on prey availability at the CLT colony in Huntington Beach, California. We hypothesize that nesting success is directly influenced by having the appropriate prey species and size class of fish available during all stages of the breeding period (mating, post-hatching, and post-fledgling dispersal). The Huntington Beach colony has three foraging habitats near the colony: estuary, ocean, and river. All three habitats are topsmelt-dominated with no significant differences in species richness or community composition among the three habitats. However, fish were smaller during the post-hatching period as compared to mating and fledging periods. Guano samples and dropped fish were all dominated by topsmelt indicating a preference towards slender-bodied fish. Preliminary behavioral data suggest all three habitats were used with a preference for the river and estuary during post-hatching period, potentially due to availability of small size class fish in those two habitats.

Further understanding of the CLT diet and prey availability will aid in management decisions regarding successful breeding seasons each year.

Developing monitoring and assessment protocols for Southern California eelgrass

Kenny McCune*; CSU Long Beach; kennym@sccwrp.org POSTER #19

Seagrass provides a variety of important ecological functions for coastal marine habitats throughout much of the world, but little has been done to quantify seagrass ecological function despite international recognition of the ecological value of these unique systems. The seagrass *Zostera marina* (eelgrass) is prominent throughout Southern California embayments where regional managers have emphasized the need for a monitoring and assessment framework to help evaluate and manage the ecological resources associated with eelgrass habitat. In coordination with a panel of regional managers and seagrass experts, we are working to develop a set of protocols and endpoints that can be used in a Southern California regional monitoring program for eelgrass and other submerged aquatic vegetation. A framework emphasizing the measurement of indicators of seagrass ecological functions, in the form of structural metrics (e.g., shoot density, leaf area index, shoot height, biomass, ect.), can be used for assessing seagrass resources in an ecologically sound context and the feasibility of incorporating these protocols into a regional monitoring program is high.

A New Living Shorelines Project at Giant Marsh: Integrating Restoration Features Across an Elevational Gradient for Sea Level Rise Adaptation

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With concern about climate change-induced sea level rise and increased storm surge, the first living shorelines project in San Francisco Bay was installed in San Rafael in 2012, and evaluated habitat values of native oyster and eelgrass restoration at a scale large enough to also test shoreline protection potential. Building on lessons learned from that first project, the State Coastal Conservancy and project partners are developing a new living shorelines project at Giant Marsh near Point Pinole. This project includes numerous restoration elements from the deep intertidal to the eroding tidal marsh shoreline and up to the estuarine/terrestrial transition zone. Oyster reefs and eelgrass will again be included, as will oyster reefs close to shore in concert with plantings designed to enhance native cordgrass establishment and spread. This shoreline also has habitat appropriate for restoration of the federally endangered California sea-blite, which will be "arbored" to encourage these shrubs to grow tall to maximize high tide refuge for rare birds and mammals. Plantings at the estuarine/terrestrial transition zone will enhance native plant presence at the site. Monitoring of plants, birds, fish, and invertebrates will permit assessment of habitat values of the various treatments, and physical processes such as wave attenuation, erosion, and accretion will be tracked. The project is currently in the permitting phase, with construction planned for 2019. Project elements incorporate an experimental design that will permit rigorous evaluation of multiple treatments relative to controls and pre-project conditions, thus aiding in the design of future projects to enhance habitat while buffering shorelines against erosion.

Spatial and temporal variation in the diet composition of zooplankton in Mission Bay

Bryanna Paulson*, University of San Diego; bpaulson@sandiego.edu POSTER #18

Zooplankton play an integral role in aquatic systems, often serving as trophic intermediaries by transferring carbon between primary producers and higher trophic levels. This study used carbon and nitrogen stable isotopes to analyze variation in the diets of different size fractions of plankton in Mission Bay, San Diego, CA. From April 2017 to April 2018, plankton tows were conducted and environmental conditions measured monthly at three different sites in the bay. The three sites varied in distance from the mouth of the bay and degree of tidal influence. Significant differences in chlorophyll a were detected among sites, while significant differences in temperature, salinity, phosphate, and ammonia were detected temporally throughout the year. The results of this study showed spatial and temporal variation in the stable isotopic values of plankton species in Mission Bay, as well as variation with size class and correlation with environmental conditions. This study increases our understanding of Mission Bay's food

web structure and the importance of potential prey in the diets of zooplankton in the bay. It also provides baseline data for future food web studies in Mission Bay and similar regions.

Comparisons of tide pool fish assemblages at Isla Natividad, BCS: Effects of tidal height, geomorphology, and other tide pool characteristics

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Reported here is a study on rocky intertidal fishes at Isla Natividad, Baja California Sur (BCS) in one site, La Plana Cove, within a Marine Protected Area (MPA). Results are presented for two questions investigated:

1. What are the differences in abundance, richness, and diversity between fish found in higher versus lower tide pools?
2. What physical attributes of the tide pools themselves supports fish occupation?

A visual census survey was conducted of 30 tide pools, 15 in the higher and 15 in the lower intertidal. Results included: 573 total fish counted, 12 species of fish identified with the higher tidal tide pools having 58% of the fish, an abundance edge with 163 fish per unit volume compared to lower tide pools with 141 fish per unit volume. Community structure, species richness, and diversity were similar for both higher and lower tide pools. Fish per unit volume (L) between higher and lower tide pools was not significant ($p = 0.79$). Regression analysis of tide pool depth was significant ($p = 0.03$ $r^2 = 0.458$) for the most common fish species, *Girella nigricans*, (Opaleye; 53%) of total fish. This suggest Opaleye, in the La Plana, MPA cove, is distributing itself by the geomorphologic structure of deeper tide pools which supports water depth regardless of the tide pools tidal height. Most importantly, this data is a baseline for future studies of Isla Natividad, BCS rocky intertidal fishes.

Diet of an important wetland resident, the California Killifish, *Fundulus parvipinnis*, in a natural and created marsh habitat located in Mission Bay, California

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Southern California has experienced a significant loss in wetland habitat. This decline of Pacific coastal wetlands is concerning due to the vital roles these habitats serve for endangered and threatened species. Mitigation is used to create and restore degraded wetland habitats. However, these restored and created habitats may not provide equivalent ecosystem function as natural salt marsh habitat. This study assesses potential differences in food web dynamics of a natural and created marsh habitat through an examination of the diet of a ubiquitous and abundant species in southern California wetlands, the California Killifish (*Fundulus parvipinnis*). As a salt-marsh resident fish, *F. parvipinnis* transfers energy and nutrients off of the marsh surface, with direct and indirect impacts on their predators and prey. *Fundulus parvipinnis* individuals were collected on a weekly basis during their peak spawning period to provide an extensive examination of potential differences and shifts in diet. Gut content and stable isotope analyses were conducted to provide specific and broad insights into the diet of collected individuals. Differences in prey category composition were discovered between the natural and created marsh habitats. In addition, similar ontogenetic diet shifts were observed in both the created and natural marsh habitats. This information provides insight into the ecological function of both natural and created habitats and helps to address the need to understand both structural and system features that affect the subsequent food web dynamics of a system.

Circulation of San Diego Bay, a low-inflow, seasonally hypersaline estuary

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San Diego Bay is a highly urbanized low-inflow estuary. Freshwater input is limited to episodic precipitation events which primarily occur during the winter and spring months. As such, the bay exhibits both hyperthermal and hypersaline conditions during the summer to fall months, resulting in complex longitudinal density gradients. Longitudinal variation in temperature and salinity delineate zones of circulation and ecoregions identified in ecological monitoring efforts. Close to the mouth, thermally driven exchange occurs in the classical sense (outflow at the surface, inflow at depth). Conversely, near the head of the bay the observed density structure is dominated

by salinity and supports inverse subtidal circulation. In the summer months, hypersalinity extends from the southern portion of the basin to the mid-bay. Consequently, the entire southern half of the bay may exhibit inverse subtidal circulation (outflow at depth, inflow at the surface) near the end of the dry season. This study concentrates on the transition region of the bay where density profiles in the main channel frequently exhibit nearly well mixed conditions. An experiment was conducted during the seasonal evolution of longitudinal dynamics (summer to fall months of 2017) to examine lateral structure of density and currents in the mid-bay where broad shoals flank the channel creating a bathymetric slope that drops from 4 to 14 meters depth over a lateral distance of 500 meters. Results will be discussed in the context of frontal dynamics with implications for biological activity within the bay.

Synthesis of thresholds of ocean acidification effects on echinoderms

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Interpreting the vulnerability of pelagic calcifiers to ocean acidification (OA) is enhanced by understanding of their critical thresholds. In California, echinoderms serve both as an economically important fishery species and an ecologically important ecosystem engineer, hence their vulnerability to climate change is of primary interest. To address this need, we undertook a comprehensive data synthesis for echinoderms, primarily those living in the California Current Ecosystem. Meta-analysis determined the extent to which responses among studies conducted on differing taxa and life stages could be integrated into a common analysis. Breakpoint analyses identified OA thresholds for several endpoints. Finally, expert judgment was used to verify results and assign confidence scores for eight endpoints with sufficient signal:noise ratio to develop thresholds specific to life stage, taxa, duration, and depth. These endpoints fell into the general categories of physiology, behavior, growth and development, and mortality. The range of pH from 7.74 to 7.20 provides a risk range from early warning to population tipping points, thus providing rigorous basis for vulnerability assessments to guide climate change response and evaluate the efficacy of local pollution management.

Contribution of eelgrass (*Zostera marina*) community metabolism to the carbon flux of San Diego Bay

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Atmospheric CO2 is higher than it has been in the last 800,000 years and is expected to continue to rise due to anthropogenic emissions. Urban areas are responsible for up to 70% of current greenhouse gas emissions and therefore there is a need to seek local solutions to combat a global challenge. Because coastal margins play a disproportionate role in oceanic carbon absorption due to marine production from vegetation such as seagrasses, port cities such as San Diego may have a unique opportunity for climate mitigation by conserving and restoring this habitat. However, there is a knowledge gap in the extent that seagrasses contribute to carbon services, particularly along the West Coast. This study aims to quantify carbon fluxes in the San Diego Bay by measuring gross community production, community respiration, and the resulting net community production in eelgrass beds and bare sediment plots via benthic incubation chambers containing dissolved oxygen sensors and carbonate chemistry bottle sampling. Here we present preliminary data from August and September* deployments at a site in the Southern San Diego Bay, where most eelgrass habitat in the bay is located. Our data indicate that bay beds act as carbon sources during these months, with an average flux of -113 mg O2/g eelgrass-hr in August and -179 mg O2/g eelgrass-hr in September. We believe these 'source' values are indicative of bed senescence and anomalously warm temperatures during the times of deployment. These deployments will continue to be conducted on a monthly basis throughout the year to determine the role of seasonal variation. Further research should be undertaken to determine the influence of site, water temperature, hydrodynamics, and anthropogenic impact, among other variables, on seagrass carbon metabolism. *Oct data in process

The cascading effect of temporal variability in risk

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Predators are known to have strong effects on their prey through both direct consumption of prey and through non-consumptive processes. When exposed to risk, prey often reduce their foraging rates. However, predators are often mobile and create periods of relative safety and risk. When risky periods are long, they may be more impactful than

multiple short periods of risk even if the total amount of time is equivalent. We developed a model of prey decision-making under temporal variability and tested the model using a tritrophic system. We measured how the foraging rate of *Nucella ostrina* on barnacles (*Balanus glandula/Cthamalus dalli*) changes in response to crab predators (*Cancer productus*). Over 8 weeks, snails were exposed to crabs for 100% of the time, 50% of the time or 0% of the time. We used two 50% treatments and exposed snails to crabs either every other week, or for 4 weeks in a row. We also measured how snail tissue mass and shell mass changed. Our model indicated that snails would reduce growth and foraging rates during longer periods of risk relative to shorter periods of risk. We found some differences between the model and our experimental results. All crab treatments suppressed snail growth and barnacle consumption. We found that shorter periods of risk had a smaller effect than longer periods of risk. Therefore, the distribution of predation risk through time has a greater impact on prey foraging than we would expect.

Reproduction of endangered *Suaeda californica* and its use in sea level rise adaptation in San Francisco Estuary

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POSTER #6

Over 90% of the salt marshes in the San Francisco Estuary (SFE) have been damaged or destroyed and in general, the diversity of salt marsh vegetation in the SFE has decreased over the past 50 years. Some salt marsh plant species are now quite rare, and will require active revegetation to insure both their presence and their functions. This includes the endangered *Suaeda californica*, a salt-tolerant, succulent coastal wetland shrub that occurs in a narrow high tide zone along sandy salt marsh edges or estuarine beaches. The original native SFE population became completely extirpated around 1960. Plant material from Morro Bay was used to propagate and reintroduce juvenile *S. californica* to San Francisco Bay in 1999, and roughly 30 total plants have survived until now in three locations. As these low numbers hardly represent a restored population of *S. californica*, and the plants have not successfully self-recruited from seed, research is needed to understand the best methods to restore *S. californica* populations. The objectives of this project were to 1) better understand the phenology of flowering, and the patterns in fruit and seed production of S. californica planted in the SFE in the 1990s; 2) determine the effects of abiotic conditions, including freshwater availability and organic matter, on the germination and growth of *S. californica*; and 3) evaluate the efficacy of "arbors" (various configurations of wooden branches as support) to enhance height growth of *S. californica*, which might further encourage sediment accumulation and high tide refuge. Understanding factors that promote *S. californica* reproduction, germination, and growth will inform the maintenance of SF Bay salt marshes and the habitat they provide, while also assisting in the recovery of an endangered species. In doing so, this project will help preserve California's diminishing wetland habitats and help adapt to climate change and sea level rise.

Biogeochemical observations and baseline CO_2 conditions in the Agua Hedionda Lagoon

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Estuarine environments are uniquely diverse coastal subsystems located at the land-river-ocean interface. Across different systems, carbon dioxide (CO_2) parameters and anthropogenic inputs can vary greatly given the heterogeneity between individual estuarine systems, which makes it difficult to characterize coastal ocean systems as a whole. The Agua Hedionda Lagoon (AHL) is a local estuary located in Carlsbad, CA comprising three interconnected basins, which make up a total of about 400 acres off the Pacific coast. This lagoon is highly impacted by the surrounding urbanization, land use, and densely populated community, making it susceptible to anthropogenic impacts. One of the primary features operating at the lagoon is the Carlsbad Aquafarm (CAF), which raises over one million pounds of Mediterranean blue mussels (*Mytilus edulis*) and Pacific oysters (*Crassostrea gigas*) every year. Understanding the baseline chemical distribution and variability will provide critical information needed by the stakeholders to manage the CAF and lagoon ecosystem. To assess the variable conditions in the AHL, an autonomous shore station system is employed at the CAF to collect continuous measurements for total dissolved CO_2 (TCO_2) every hour, and the partial pressure of CO_2 (pCO_2), pH, temperature, and salinity are all taken every 15 seconds. Additional sensor deployments in the adjacent lagoon basins are also collecting in situ data for salinity, temperature, dissolved oxygen, pH, and pressure, every 30 minutes. We will focus on a recent dataset from October 2018, which captured two rain events in the first and second week of October to highlight the variable lagoon conditions.

Dinophysis abundance and Diarrhetic Shellfish Toxin concentration in California mussel tissue at Santa Cruz Municipal Wharf

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Diarrhetic Shellfish Toxins (DSTs) are a suite of algal toxins produced by marine dinoflagellates of the genus Dinophysis. Human consumption of seafood with a high level of DSTs can lead to gastrointestinal illness with symptoms analogous to food poisoning, known as Diarrhetic Shellfish Poisoning (DSP). The first reported case of DSP in the U.S. occurred in Washington State in 2011, following the consumption of contaminated shellfish. While the presence of DSTs is well documented along the coast of Washington State, there has been little research into the presence and levels of DSTs in California. This study describes a weekly time series (2013-2016) of Dinophysis abundance and DST level in California mussels (*Mytilus californianus*) at Santa Cruz Municipal Wharf (SCMW), Santa Cruz, CA. Dinophysis was found to be present in low levels throughout the year at SCMW, with the highest abundances occurring May-July. The toxin profile of DST in mussel tissue at SCMW was dominated by dinophysistoxin 2, with frequent low levels of okadaic acid and the occasional presence of dinophysistoxin 1. DSTs were found to exceed the recommended FDA action level of 160 ng/g 19 out of 192 weeks sampled in this study. Dinophysis concentration in the water column was a positive, but weak predictor of DST concentration in mussel tissue. This study demonstrates that Dinophysis is present as a member of the background phytoplankton community and is producing toxin that accumulates in mussel tissue at SCMW throughout the year, with toxin levels occasionally reaching levels of concern.

Metabolic responses to thermal changes of a common coastal stingray, the round stingray (*Urobatis halleri*)

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Coastal and estuarine ecosystems are considered highly vulnerable to the effects of climate change as diel and seasonal thermal fluctuations intensify. Since most fishes are ectotherms, shifts in temperature patterns may severely affect their metabolic demands, behavior, and survival. In this context, quantifying fish species' ability to adapt to temperature changes remains a research challenge for coastal areas. The round stingray, *Urobatis halleri,* is an abundant benthic mesopredator of estuaries and coastal habitats of Southern California, understanding their bioenergetics is relevant in terms of improving local management and conservation strategies. Using respirometry technique, standard metabolic rate (SMR) and thermal sensitivity (Q10SMR) were estimated for the round stingray (n=5, weight range= 0.3 – 0.6 kg). Oxygen uptake (mgO2/min/kg) was quantified as a proxy of the aerobic metabolism of acclimated individuals at three temperature treatments (15°, 23°, 27°C). SMR were estimated by using the mean lowest normal distribution as a more suitable approximation of their minimum oxygen uptake. As predicted, SMRMLND increased as temperature raised and decreased with body-mass. The acclimated thermal sensitivity (Q10SMR) in the five tested individuals was of 2.47 ± 1.29 (15° - 23°C), 2.42 ± 0.48 (15° - 27°C), and 3.59 ± 2.79 (23° - 27°C); indicating a higher thermal sensitivity at higher temperatures. Our results, although preliminary, suggest that drastic temperature changes in estuarine and coastal habitats likely play a significant role on the energetic demands and the ecology of the round stingray.

Comparing carbon storage in California seagrass beds and salt marshes

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There is strong interest in quantifying the world's ecosystems that are capable of carbon storage as a means to mitigate human-induced climate change. 'Blue carbon' environments in California include seagrass meadows and salt marshes, which are capable of carbon storage and sequestration. Along the east coast, these environments have been extensively studied, however there is a strong need to collect data along the west coast to fill a large spatial data gap. Specifically, we collected 35, 30-cm push cores in seagrass meadows and salt marshes across a latitudinal gradient in California. We found that California salt marshes store significantly more organic material than seagrasses, with seagrasses sediments containing 3.21 ± 0.25% total organic material (TOM), while salt marshes contain 12.01 ± 1.27% TOM (mean ± SE). We also found strong significant correlation between sediment grain size and TOM in both habitats (r^2=0.82). After determining the percent carbon via elemental analyzer, this translates to 13.982 ± 1.26 kg C/m^3 stored on average for both habitats (mean ± SE). We attribute the difference in carbon

storage largely to hydrology between the two environments, but plan for future sampling to be conducted monthly in both types of environments to further identify this difference. The data indicates important trends for salt marshes and seagrass beds in the West Coast of the United States. It is essential to quantify carbon storage in these environments in order to preserve and incorporate them in future mitigation strategies.

Detangling the ecological roles of *Fundulus parvipinnis* in wetland ecosystems

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The Talley Lab broadly examines issues of habitat connectivity and spatial subsidy in coastal ecosystems, with particular attention to insular habitats and issues related to the California killifish, *Fundulus parvipinnis*. Despite its abundance and critical role in southern and Baja California marshes, *F. parvipinnis* has received relatively little scholarly attention in comparison to its well-studied congener, *F. heteroclitus* on the Atlantic coast (e.g., 39 vs 2,285 citations in Web of Science database, respectively). In recent years, the Talley lab has increased efforts to better describe the life-history and roles of *F. parvipinnis* in these systems, and here we present brief vignettes of ongoing and recent research, including studies of connectivity, trophic roles, tissue turnover, otolith analyses, and reproductive patterns.

Projecting wetland evolution in intermittently open lagoons with sea-level rise

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One important knowledge gap is how the dynamic intermittently-open and closed lagoons of Southern California, will be affected by sea-level rise. We will present a summary of tidal marsh processes that influence the structure and functions of these estuaries and how they may respond to sea-level rise. A case study for Los Penasquitos Lagoon and other southern California estuaries will be presented to illustrate wetland vulnerabilities with sea-level rise.

Mapping vegetation community change in the Tijuana River National Estuarine Research Reserve from 1986 – 2016

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Highly detailed vegetation mapping can provide valuable information to guide management of natural resources at large spatial extents. We had the opportunity to compare vegetation maps of the Tijuana River National Estuarine Research Reserve from 1986 and 2016, each produced through a combination of field-based observation and aerial imagery interpretation. Although the comparison of the two maps was not completely straightforward due to differences in mapping categories, missing metadata, and the difficulty of placing a hard boundary at what is often a gradual transition between adjacent community types, the comparison provides an important record of vegetation communities during a time of dramatic change. Some changes are already known to managers, such as the conversion of upland communities to salt marsh through restoration, the dramatic increase in willows in the river valley, and southern movement of the river mouth. However, more subtle changes have escaped notice, such as the gradual narrowing of channels throughout the estuary, conversion of mudflat to vegetated marsh, and loss of vegetated marsh associated with the change in the river mouth position. Both maps provide a valuable resource for documenting future change in vegetation communities, and careful documentation and archiving can ensure the maximum utility for future analysis.

Habitat use and connectivity of native and nonnative gobies in a fragmented wetland habitat in southern California

Chloe Van Grootheest*, Christine Whitcraft; CSU Long Beach; chloevangrootheest@gmail.com POSTER #17

Habitat fragmentation in wetland ecosystems can negatively impact flora and fauna by reducing connectivity and increasing vulnerability to invasive species. This study aims to evaluate how fragmentation is influencing the ecology, interactions and connectivity of and between native longjaw mudsucker (*Gillichthys mirabilis*) and nonnative yellowfin goby (*Acanthogobius flavimanus*). These are explored by 1) assessing species distribution and habitat use,

2) evaluating diet overlap as well as species' isotopic niche space between habitat types and 3) comparing physiological tolerances such as temperature sensitivity (Q10) to aid in understanding differential habitat use between species. Habitat types consist of altered, natural, and marsh creek sites. Species' habitat use and distribution are determined by beach seining all habitat types. Species' diet and isotopic overlap are determined through stomach content analyses and stable isotope analyses respectfully. Finally, species' temperature sensitivity is quantified through a metabolic rate experiment at different temperatures using a respirometer. Our preliminary data show that the nonnative goby inhabits the altered habitat while the native goby inhabits the natural and creek habitats. In addition, preliminary stable isotope signatures show similar food signatures among habitats but different signatures of fish among sampling locations and between habitat types. This potentially supports the idea of differential habitat use between the native and nonnative gobies. These results could inform future restoration of the fragmented wetland habitat at the Seal Beach National Wildlife Refuge by suggesting that removal of culverts and conversion of the altered ponds to tidal creeks might reduce the population of the nonnative goby.

What coastal watershed trash monitoring reveals about urban sources

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POSTER #23

Community cleanups are an important trash control strategy in many areas, but constant inputs of the same suite of items make cleanups Sisyphean efforts that may not sufficiently address the problem. A two-year trash removal tracking effort in mid-city San Diego revealed that 138 cu meters (13 mt) of trash accumulated along an only 1 km-long reach of urban creek. Longer-term monitoring in this and nearby creeks revealed that most of the meso-trash (2-25 cm length) was dominated by plastics (53±9% of total volume), in particular food-related wrappers and packaging (67±7% of total plastic volume). Tiny plastics (0.5-20 mm) line these seasonal creek beds (100% of sites, up to 45,787±31,380 pieces m-2 in the top 5 cm of soil) likely due to the deterioration of larger plastic items (65-100% non-pellet plastics). Downstream, 12-25% of wetland and bay fishes consumed plastics, posing potential health risks to the fishes and their consumers. Data on the types, locations and amounts of trash suggested most trash enters the watershed through illegal dumping, homeless encampments and storm drain flows. Lasting solutions to these challenges are complex, and will require collaborations with industry, local government, sociologists, economists and the public.

The effect of sediment placement for sea level rise adaptation on suspended sediment concentrations in a Southern Californian salt marsh

Amanda Wagner*, Rich Ambrose; UC Los Angeles; a.wagner@ucla.edu POSTER #7

Coastal wetlands provide valuable ecosystem services, including sequestering carbon, reducing storm impacts, improving water quality, and providing habitat for endangered species. Yet due to sea level rise the future of coastal wetlands is in question. Sediment placement is a promising new technique that aims to help coastal wetlands accommodate sea level rise by maintaining the vegetated marsh at appropriate elevations. However, adding sediment to a marsh could increase the amount of sediment suspended in the water column, altering natural patterns of sediment flux. This is the first study to evaluate suspended sediment concentrations (SSC) associated with sediment placement. We measured SSC at the marsh surface of experimental and control sites in Seal Beach, California, one week, one month, three months, six months, and one year after sediment addition. The experimental site had approximately 25cm of dredged sediment added over 8.5 acres, and the control site was located 259 meters from the edge of the experimental site across a channel. SSC on the experimental and control sites was initially high, but within one month it decreased and remained low. The increased SSC on the control site was surprising as the added sediment moved farther away from the experimental site than expected. SSC at the control site decreased faster than the experimental site. The increase in SSC throughout the salt marsh indicates there could be potential ecological effects from this technique beyond the augmentation site.

Crab identity and density drive site-specific effects of burrowing crabs on plant community composition

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Although habitat-modifying animals influence primary production, little is known about their influence on plant species composition. This is surprising given that diverse plant assemblages may consist of plants that respond differently to habitat modifiers. We manipulated burrowing crabs in mixed assemblages dominated by two plant species (*Spartina foliosa, Sarcocornia pacifica*) at three sites in southern California (KF1, KF2, SDL). At each site, we stocked crab inclusion cages with locally occurring crabs at their ambient densities. Every other month during the growing season from 2016-2018, we measured plant morphology (plant height), stem density, plant community structure (percent cover), and reproductive investment (number of flowers), as well as edaphic conditions (salinity, nitrate, ammonium, and dissolved organic carbon). The main effect of crabs on plant communities were site-specific, with crab effects larger at SDL. At this site, crab treatments became dominated by pickleweed, while crab absent treatments were dominated by cordgrass. Additionally, at SDL, salinity and DOC were lower in crab treatments, however there were no treatment differences in nitrogen and ammonium concentrations. This site-specific effect of crabs may have been related to differences in burrow number and size. Burrow density was ~3x higher at SDL (dominated by *Uca crenulata*) than the other two sites, and burrow diameter was smaller at SDL (likely because of the absence of *Pachygrapsus crassipes* from this site). Together, these data suggest that the identity and density of the burrowing crab species may determine the impact of these habitat modifiers on plant community composition.

A Synthesis of carbon services in California seagrass beds

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As oceanic and atmospheric CO2 increase, conservation and restoration of submerged aquatic vegetation has been proposed as a tactic for combatting climate change and ocean acidification (OA). Seagrass beds can act as carbon sinks by absorbing CO2 for burial in underlying sediments. However, the significance of these services in the context of climate change and OA remains unclear. Moreover, there are no published data regarding the carbon services of California's dominant seagrass, *Zostera marina*. Here we present a preliminary quantification of three distinct components of seagrass carbon fluxes in a Northern California estuary from 2015 to present. We find seagrass-to-sediment fluxes indicate that seagrasses bury a significant amount of carbon (8.04 to 12.82 gC m-2yr-1), although these values can be lower than carbon stocks in Mediterranean and tropical seagrass beds. Our data on seagrasses' ability to alter water chemistry (water to seagrass flux) indicate that seagrasses may serve to ameliorate OA in some contexts (raising pH up to 0.1 units inside beds) and will increase temporal chemical variability. Third, our measurements of atmospheric CO2 exchange (atmosphere to seagrass flux) show that meadows serve as net annual sinks for atmospheric CO2 (-383 ± 144 gC m-2yr-1), with high temporal variability. In sum, these carbon services merit continued support for conservation of California seagrass beds. Further research should compare these values to those of other coastal habitats such as kelp forests, salt marshes and soft-bottom systems.

Threespine stickleback evolve seasonally in intermittent estuaries

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Seasonally variable environments have the potential to cause fluctuations in natural selection. Predictions of how fluctuations in natural selection will influence the genetic diversity of populations range from increasing to eroding diversity. We examined how variation in the climate-driven selection regimes of replicate fluctuating environments affects the maintenance of a genetic polymorphism. To do so, we collected threespine stickleback living in twenty intermittently-open estuaries in central California. In other populations, low-armored morphs are found in freshwater populations while heavily-armored morphs are found in anadromous populations. In our estuaries all populations are polymorphic. Semiannual samples from twenty lagoons reveal little seasonal differences within sites, but large differences amongst sites. Lagoons with predatory fishes were more likely to have more heavily armored stickleback, however, presence of predator fishes was strongly correlated with watershed size. Larger watersheds display longer winter openings and potentially more opportunity for selection for marine phenotypes. At Younger Lagoon, a small predator-free lagoon, monthly sampling reveals summer increases and winter decreases in

the abundance of the low-armored, freshwater morph. This supports the hypothesis that fluctuations in the seasonality of natural selection maintain diversity of armor morphs in these populations and that both biotic and abiotic factors contribute to the equilibrium morph frequencies in intermittent estuaries.

Scale and extreme climate events: understanding a drought induced die-back of an invasive plant ecosystem engineer in tidal wetlands

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Extreme climate events, such as persistent drought, could alter the ability of invasive species to persist. Droughts act on multiple scales, both temporal and spatial, making understanding the effects of these events complicated. Within the salt marshes of the San Francisco Bay, *Lepidium latifolium*, or white top, is an aggressive invasive plant ecosystem engineer, but during California's historic drought (2014-2016), we observed a die-back of *Lepidium* populations across the Bay. We established a precipitation manipulative in winter 2016 within the salt marsh of the Palo Alto Baylands Nature Reserve (south San Francisco Bay). We applied four precipitation treatments: rain exclusion, rain exclusion control, rain addition (2" of additional water), and unmanipulated control. We found rain exclosures did not significantly decrease *Lepidium* stem numbers in our plots. This pattern persisted in 2017, indicating it is unlikely there is a lag in *Lepidium* response to decreased local precipitation. We also examined connections between salinity changes at the Bay scale and *Lepidium* die-back by pairing data from three Lepidium invaded sites with Bay water salinity data spanning a geographic range from the south to the central Bay. We found bay water salinity three years prior to the growing season of interest had a strong impact on *Lepidium* stem density across the all three of our sites. This suggests, in tidal marshes, longer temporal scales (multi-year) and larger geographic scales (Bay as opposed to plot level salinity) could be key to understanding the impact of extreme drought on invasive plants.

The effect of sedimentation on oysters adjacent to eelgrass meadows

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Oyster and eelgrass beds both provide ecosystem services that may include offering complex three-dimensional habitats, providing refuge from predation, and providing shoreline resiliency by buffering erosion. California's native oyster, *Ostrea lurida*, and our native eelgrass, *Zostera marina*, have declined over the past two centuries on the west coast of the United States. As part of a Living Shorelines initiative, this study sought to restore oysters and eelgrass alone and adjacent to one another. Specifically, this study aimed to assess if oyster response is affected by eelgrass due to eelgrass-induced sediment deposition. From June 2016—April 2017, four treatments were established with restored eelgrass, oyster, oyster/eelgrass, and control plots at each of four locations in Newport Bay, California. Sediment deposition onto oyster shell was measured using point-contact techniques. Oyster response was measured by assessing adult oyster density. Six months after oyster bed construction, there was increased mud deposition on shell on oyster beds restored alone compared to beds restored adjacent to eelgrass, suggesting that eelgrass may filter sediments from the water column, reducing the sediment load delivered to adjacent oyster beds. However, after one year this "filtering effect" was detected at only one site. After one year, adult oyster density was either unaffected by the presence of eelgrass or greater when oysters were restored alone compared to adjacent to eelgrass (one site). Conclusions about whether to restore oysters alone versus adjacent to eelgrass meadows may be premature given the temporal and spatial context dependency observed within the first year following restoration.