2024 EEMB Undergraduate Research Symposium

Saturday, April 20th, 2024

9:00 AM **Welcome/Introduction to Symposium Format**
9:10 AM **Session 1**
Please note: "10 minute talks" are 8 minute talks with time for 2 questions

- 10 min talk- Ronja Keeley (She/her)-*Ectos, Oaks, and Drought: A Greenhouse Experiment on the Effects of Fungal Communities from Arid and Mesic Sites on Drought Stressed Quercus lobata Seedlings*
    - Authors: Ronja Keeley (UCSB), Laura Bogar (UC Davis), Holly Moeller (UCSB)

      Oak trees rely heavily on microbes, including ectomycorrhizal fungi, to access nutrients and water in the soil in exchange for sugars produced through photosynthesis. Sites along an aridity gradient at Tejon Ranch were found to have significantly different fungal communities, and fungal communities associated with arid sites are thought to confer more drought tolerance to plant hosts than fungal communities associated with mesic sites due to differing ecological traits in the fungi. We tested this by conducting a greenhouse experiment in which we planted Quercus lobata (Valley Oak) seedlings into soil inocula from three arid sites, three mesic sites, and a sterile potting mix. After symbiosis was established, we conducted a 20 week drought and measured physiological responses of the seedlings before destructively harvesting them. We found that drought stress negatively impacted the seedlings, and that seedlings in the arid soils had significantly higher shoot biomass under non-drought conditions than under drought conditions. Additionally, presence of fungi and percent colonization increased leaf counts and shoot mass of the seedlings. This has implications for understanding how Q. lobata responds to drought stress in soils with differing climatic histories and highlights the importance of inoculating oak trees with ectomycorrhizal fungi in restoration.
- 10 min talk- Max Laubstein (He/him)-*Whole genome sequences corroborate deep split and cryptic variation in Steller's Jays (Cyanocitta stelleri)*
    - Authors: Max Laubstein (UCSB), Carla Cicero (UC Berkeley Museum of Vertebrate Zoology), Phred Benham (UC Berkeley Museum of Vertebrate Zoology), Lydia Smith (UC Berkeley Museum of Vertebrate Zoology), Michelle Davila (UC Berkeley Museum of Vertebrate Zoology), Erik Enbody (UCSC), Rauri Bowie (UC Berkeley Museum of Vertebrate Zoology)

      The global range of the Steller's Jay (Cyanocitta stelleri) stretches from southern Alaska through western North America to northern Nicaragua. Across its wide distribution, this species exhibits considerable morphological diversity and occupies a variety of forest and woodland habitat types. Combined, these factors render the Steller's Jay an exemplary system for analyzing the genomics underlying ecological and morphological divergence, and the role of landscapes in driving biotic diversification. Prior study of 1,080 individuals using mtDNA and microsatellites revealed deep

divergence and cryptic genetic variation among populations from the Pacific Ocean to the Rocky Mountains. Genetic variation was largely congruent with three morphotypes and ecological niche models. Here we expand on that work by sequencing whole genomes for 310 individuals representing the same populations and morphotypes, with particularly dense sampling at the contact zone between the subspecies annectens and macrolopha in the Utah-Wyoming-Idaho border region. A high quality reference genome and 150 of the sequences were generated as part of the California Conservation Genomes Project. Whole genome sequences corroborate the deep split and narrow contact zone between Coastal/NW Interior and Rocky Mountain clades, as well as divergence of Middle American Steller's Jays. Further, both whole genomes and microsatellites reveal cryptic genomic variation in central coastal California that provides evidence for past isolation. Using this genomic dataset, we characterize current and historical states of introgression and hybridization across the contact zone and seek to identify genomic regions underlying plumage, morphological, and ecological variation.

- 10 min talk- Roman Garzelloni (He/him)-*The relationship between seed mass and lifetime fecundity in Nemophila menziesii*
    - Authors: Roman Garzelloni, UCSB; Dr. Susan Mazer, UCSB

      An evolutionary trade-off is the process through which an increase in a trait's contribution to fitness comes at the expense of a decrease in another trait's contribution to fitness. Phenotypic trade-offs are due to both environmental and genetic factors while genetic trade-offs are due only to genetic factors. The trade-off between number of offspring per individual and parental resource investment per offspring is especially important to examine because it applies to all organisms and has a large effect on reproductive strategies. In the Smith and Fretwell (1974) theoretical model, a genetically based trade-off between number of offspring and resource investment per offspring is predicted within species due to limited parental resources. To test the Smith and Fretwell model in seed-bearing plants, I measured the relationship between lifetime fecundity and mean seed mass in two successive generations of the annual herb Nemophila menziesii. The data for this study were collected from four field populations of pedigreed N. menziesii planted by the Mazer lab in two successive growing seasons. Variation in plant size masked the trade-offs, so plant size was controlled for in all analyses. All four populations displayed strong phenotypic tradeoffs between seed mass and lifetime fecundity, but only two of the populations displayed a genetically-based trade-off consistent with the Smith and Fretwell model. These results suggest that environmental factors play a bigger role than genetic factors in the examined trade-off, but limitations imposed by the nature of the analyses may have made the detection of genetic trade-offs harder than that of phenotypic trade-offs.
- 10 min talk- Albert Li (He/him)- *The impact of thinning on non-native grass dominance in degraded chaparral communities*
    - Authors: Albert Li, Stephanie Ma, Carla D'Antonio, UCSB

      With the continuous degradation of the chaparrals in California, restoration is increasingly needed to protect the ecosystem, preserving the biodiversity and the vital ecosystem services it brings. However, reestablishing chaparral on invaded land is challenging and has yet to see large-scale success. Invasive non-native grasses, such as

Bromus spp. and Avena spp. post as a great threat to the native chaparral communities, as they have consistently outcompeted chaparral species with their various competitive advantages. Therefore, in many cases, chaparral restoration efforts must be coupled with invasive species control mechanisms like manual removal to achieve the desired level of success. My research evaluates the impacts of thinning non-native grasses, either fully or partially, on the eventual growth and reproductive success of the remaining non-native grass individuals with the ultimate goal of understanding how far removal must go in order to truly reduce seed set and productivity of this productive, flammable, non-native species. My research aims to apply the theory of Constant Final Yield – the theory that at some threshold of plant density, the eventual total plant biomass will be the same – to the practice of habitat restoration. In February, We thinned grass in 50X50 centimeter plots to 5 different densities by head weeding, with three repetition to each treatment. The project is currently ongoing, as I plan to collect and analyze data in June this year, finishing the project then.

- 10 min talk- Colin Gregory (He/him)- *Big Shrimpin': Individual behavioral variation within a marine cleaning mutualism*
    - Authors: Colin Gregory, Bryce Barbee, Eleanor Caves, UCSB

      Marine cleaning mutualisms are interactions in which small fish and shrimp remove material from larger 'client' fish species. Small groups of the cleaner shrimp, Ancylomenes pedersoni, live at cleaning stations and interact with a large variety of client reef fish species. Given the benefits entailed in these interactions for cleaners (who receive a meal), extending cleaning services should theoretically be advantageous for all cleaners. However, in the field there is substantial variation in how individual shrimp behave during cleaning interactions, with some individuals cleaning much more often than others. Here, we explore behavioral variation among individual cleaners in both the lab and the field. In the lab, we developed assays to test an individual's boldness, exploration, and activity level. We then used footage from the field to see how these same individuals interact in groups with client fish that visit their stations. We want to see if the variation within cleaning interactions can be predicted by the individual personality types comprising a group. Cleaning mutualisms play an important role in the health and diversity of coral reef communities. Exploring the role that individual behavioral variation has on a group's cleaning service will shed light on the mechanisms that shape the outcomes of these interactions.
- 10 min talk- Andie McNeil (She/her)- *Nutrient Rescuing Macroalgae For Aquaculture*
    - Authors: Andie McNeil, Sarah Hoyer, Lucas Manocherian, Dr. Lauren Smith and Dr. Halley Foehlich at UCSB

      Anthropogenic stressors are encouraging alternate food sources through marine aquaculture. Currently, seaweed is the fastest growing aquaculture sector. However, seaweed aquaculture faces challenges due to climate change. In particular, marine heatwaves can result in decline of seaweed at high temperatures. We explore a potential remedy to heat related mortality. The nutrient rescue hypothesis posits that supplemental nutrients will allow seaweeds to withstand higher temperatures. We tested this hypothesis on three species grown at the local farm – Ulva sp., Gracilaria pacifica, and Palmaria palmata. We grew each at six temperatures, under high and low nutrient conditions for

five days. We found no difference in mean percent growth at any temperature between nutrient treatments. We hypothesize two reasons for this lack of difference: (1) the low nutrient treatment was too high, or (2) the seaweed were nutrient replete upon collection. To determine the cause, we collected new seaweed and placed it all in an environment with no nutrient supplementation, depleting the nutrients before running additional experiments at adjusted high and low nutrient conditions. We conducted trials starting day one, five, seven, and eleven. During the day eleven trial we began to notice a nutrient signal. Growth differences were not statistically significant, however, likely would have been after more days without nutrients or with additional replicates. This indicates that seaweed at the farm is nutrient replete and suggests that if the nutrient rescue hypothesis holds true, this farm has already implemented a climate adaptation that will improve their growth outcomes under climate change.

- 10 min talk- Conor Crowley (He/him)- *Estimating Trait Heritability in Nemophila Menziesii Using Parent-Offspring Regressions*
    - Authors: Conor Crowley, Dr. Suzan Mazer, UCSB

      Heritability is a statistical measure used to quantify the level of predictability of the passage of a trait from parent to offspring. It is an extremely important metric for determining the effectiveness of plant breeding and can tell us about a trait's capacity to evolve. One of the most widely used methods of calculating heritability is to perform what's called parent-offspring regression. This involves plotting the trait values of a parental generation on one axis and the trait values of an offspring generation on the other. My research aims to explore heritability in four populations of Nemophila menziesii, commonly known as baby blue eyes, using this method. More specifically I am interested in how maternal genes and paternal genes compare in how they contribute to heritability for certain traits. I am also concerned with whether performing parent-offspring regressions using data from different years vs. data from the same year produces significantly different results. These findings should allow us to have a greater understanding of the methods we use to estimate heritability. Furthermore, it will provide us with a breakdown of the various factors contributing to heritability for several traits in Nemophila menziesii.
- 10 min talk- Benny Behar (He/him)- *Bryozoan Dynamics in the Benthic Community of Santa Cruz Island*
    - Authors: Benny Behar, UCSB

      The spatial distribution, settlement, and growth of marine invertebrates are largely affected by shifting climate conditions. In marine systems, changes in climate can alter predator-prey relationships, food availability, growth, survival rates, and settlement success, which can lead to dramatic fluctuations in population. In 2013, the Santa Barbara Channel saw many invertebrate populations plummet, coinciding with a record-breaking marine heatwave. Among these invertebrates were bryozoans, a filter-feeding marine invertebrate that are largely understudied throughout the world. With this research, I used a 20 year time series of benthic marine invertebrates and algae to explore how changes in the benthic community relate to the loss and dramatic recovery of bryozoans in the system. Additionally, I looked at how oceanographic conditions 1-2 years prior related to bryozoan population dynamics in order to understand the

mechanisms that lead to their loss and recovery. This study aims to provide insight into the oceanographic and biological factors that contribute to their settlement patterns, spanning the two decades surrounding this climate anomaly.

10:30 AM **Break**

10:50 AM **Session 2**

Please note: "10 minute talks" are 8 minute talks with time for 2 questions

- 10 min talk- Bowen Brock (He/him)- *Vectors for Invasion: Is the native snail Megastraea undosa engendering the continued proliferation of the invasive algae Sargassum horneri*
    - Authors: Bowen Brock, UCSB

      Invasive species in marine systems have been shown to alter predator-prey relationships, decrease biodiversity, and outcompete native foundational species. In 2013, the Northern Channel Islands experienced an explosion of the invasive algae, Sargassum horneri. S. horneri has been shown to outcompete native algae, limiting the growth of native, structure-forming kelps and severely impacting local marine invertebrates. I explored whether a native marine snail, Megastraea undosa, is potentially facilitating the recruitment and survival of S. horneri by providing open substrate for settlement and fostering growth by increasing access to sunlight. I collected observational data from Anacapa Island and Santa Cruz Island during the summer of 2023, quantifying the amount of invasive algae growing on both snails and on natural substrate. I found that the density of S. horneri was ~ 3500 times greater on snails than it is on natural substrate. These increased densities are correlated to increased shading at sites, suggesting that the snail's mobility potentially increases the overall access to sunlight compared to a stationary algae on natural substrate. This study will aid in future research about S. horneri dispersal and potential eradication strategies for mitigating the effects of invasive algae.
- 10 min talk- Cayenne Gularte (She/her)- *Temporal and genotypic variation in corolla size and fecundity within and among wild populations of Nemophila menziesii*
    - Authors: Cayenne Gularte, Dr. Susan Mazer, UCSB

      Studying the phenotypic plasticity of the common wildflower Nemophila menziesii gives insight into the range of variation for its traits of flower size and reproductive fitness. Using data from two groups of pedigreed plants that descended from the same groups of paternal and maternal genes across two field years with contrasting environmental conditions, creates the opportunity to see how genotype and environment work individually and together to make the variance in phenotype. In the face of climate change, it is essential to understand how plants will react in various environmental conditions as climate conditions are altered.
- 5 min talk- April Zhang (She/her)-*Flammability of Wildland Fuel Types and Its Relevance to Fire Spread and Ignition*
    - Authors: April Zhang, Dr. Carla D'Antonio, UCSB

      The project aims to better understand fire behavior in southern California with regards to vegetation types and moisture content. Through in-lab experiments and treatments on collected field samples and regression analyses with experimental results, I examine the flammability of wildland fuel types—combustible biomass of live and dead

vegetation—specifically the oak and conifer species. With litter samples of Gray Pine (Pinus sabiniana) and Coast Live Oak (Quercus agrifolia), representative sample species of the two species tested, respectively, water with a weight that is a percentage of the dry sample weight is added as treatment on 10% increments; variables including but not limited to flame height, maximum temperature, time to ignition and time to glow are measured. The results indicate that oak species are much more fire-resilient and less ignitable compared to its coniferous counterparts. This knowledge can be contributed to the recently observed phenomenon of oaks' expansion into conifer forests and the wildfire mitigation plans of Santa Barbara County.

- 5 min talk- Rosie Manner (She/her)-*Integrating Scat Collection and Hair Snares to Explore Marine-Terrestrial Connectivity along the Gaviota Coast in California*
    - Authors: Rosie Manner, Grace Lewin, Dr. Hillary Young, UCSB

      Noninvasive survey methods are becoming increasingly crucial in field studies, as they allow for larger sample sizes, cover wider areas of research, and are beneficial in the long-term studying of elusive and rare species. They also prioritize ethical treatment of animals, overall minimizing stress and harm for both the animals and the researchers. This research project investigates the marine influence on the diets of large terrestrial mammals at the Jack and Laura Dangermond Preserve in California, aiming to understand their potential role as ecological connectors between the coastal and terrestrial environments. This study includes a comprehensive analysis of marine-trophic interactions by surveying scat samples collected from the six target species– coyotes (Canis latrans), bobcats (Lynx rufus), mountain lions (Puma concolor), American black bears (Ursus americanus), wild pigs (Sus scrofa), and mule deer (Odocoileus hemionus). Additionally, this study also includes an independent project to design and test different hair snare designs, with the goal of evaluating the effectiveness and capabilities of these hair snares for noninvasively capturing hair samples from the same target species. Three distinct hair snare designs were researched and constructed, and a 4-week deployment and collection plan was implemented to evaluate their performance. Isotope analysis of the hair samples will provide valuable insights into the feeding habits and trophic ecology of these mammal species. The integration of scat collection and hair snares provides a noninvasive approach to studying diet distribution, offering significant insights for wildlife management and conservation along the California Gaviota coast.
- 10 min talk- Emma Holm-Olsen (She/her)- *"The effect of nutrient enrichment and macro symbionts on coral endosymbiont communities in Moorea, French Polynesia"*
    - Authors: Emma Holm-Olsen (UCSB), Julianna J Renzi (UCSB), Deron E Burkepile (UCSB), Alexander Primo (Odum School of Ecology, University of Georgia), Joseph S Curtis (UCSB/University of Otago), Craig W Osenberg (Odum School of Ecology, University of Georgia), Adrian C Stier (UCSB)

      Corals are important habitat formers that rely on a network of species interactions to thrive. Microscopically, corals acquire most of their energy from a mutualism with dinoflagellate algae that live in their tissues (i.e., endosymbionts) and provide carbon to corals in exchange for nutrients. Macroscopically, corals in the genus Pocillopora rely on animal symbionts–particularly crabs in the genus Trapezia–to defend

them from predation, sedimentation, and parasites. Existing literature suggests that high temperatures can break down these mutualisms, with devastating consequences for coral health. However, we do not yet understand how other stressors, such as nutrient runoff from coastal development, may impact these species interactions. To examine how both excess nutrients and macro symbionts influence coral endosymbiont communities we ran a yearlong experiment in Moorea, French Polynesia where we cleared Pocillopora corals of their symbiotic fishes and invertebrates, and exposed them to one of four treatments: (1) control, (2) the addition of a pair of mutualistic crabs, (3) nutrient enrichment, (4) nutrient enrichment + a pair of mutualistic crabs (n = 10 colonies/treatment). We observed how symbiont communities developed in each treatment and sampled corals to quantify their endosymbiont densities before treatment application, one month into the experiment, and after one year. We found that corals exposed to nutrient enrichment had overall higher endosymbiont densities, but that higher endosymbiont densities were not correlated with the corals' carbohydrate or protein content. There were no obvious relationships between coral macro symbiotic species and endosymbiont densities, with the possible exception of snapping shrimp (family: Alpheidae), which appeared negatively correlated with endosymbiont densities. This work improves our understanding of how nutrient enrichment affects coral reefs and may help inform future action regarding coastal development.

- 10 min talk- Fern CapittiFenton (They/them)-*Artificial Light at Night (ALAN) on sandy beaches decreases kelp wrack consumption rates of nocturnal intertidal amphipods (Megalorchestia spp.,Talitridae)*
    - Authors: Fern CapittiFenton, Jenifer E. Dugan. UCSB

      Light generated by human infrastructure, known as Artificial Light at Night (ALAN), can impact the behaviors and health of local animals through changes in orientation and attraction or repulsion from the altered light environment [1]. Despite the ubiquity of ALAN along sandy beaches, its impacts on many sandy beach species remain poorly understood. Talitrid amphipods or beach hoppers (family Talitridae) are nocturnal intertidal crustaceans that play an important role as primary consumers of wave cast kelp wrack on temperate sandy beaches. We investigated the effects of exposure to ALAN on rates of kelp wrack consumption of juveniles and adults, of an important talitrid amphipod species, Megalorchestia corniculata. We used two light exposure regimes in laboratory mesocosms to assess effects of ALAN on kelp consumption. The experimental treatment regime was 24 hours of light consisting of 12 hours daylight and 12 hours artificial light. The control regime was 12 hours daylight and 12 hours darkness. For adults, kelp consumption was lower when exposed to the treatment light regime compared to the control light regime. For juveniles, there was no significant difference in kelp consumption between those exposed to the different light regimes. My results indicate a negative influence of ALAN on kelp consumption and suggest that beach hoppers will be less effective as the primary processors of kelp wrack subsidies where artificial light illuminates beaches. The crucial role of nocturnal intertidal animals like beach hoppers in the function of kelp processing and nutrient cycling is at risk because of exposure to ALAN along temperate coasts, posing unknown consequences for sandy beach ecosystems.

- 10 min talk- Francesca Fee (She/her)-*Fish friends and foes: Assessing the relative effects of herbivores and corallivores on Pocillopora growth in Moorea, French Polynesia*
    - Authors: Francesca Fee, Deron Burkepile, Thomas Adam, Kelly Speare (UCSB)

      Declines in coral coverage are threatening the biological and structural diversity of coral reef ecosystems. As more reefs are undergoing phase shifts from coral to macroalgal dominance, it is valuable to assess how anthropogenic pressures, such as overfishing, are influencing coral growth. Over a three year time period, this study tracked the growth of individual Pocillopora colonies in Moorea, French Polynesia, from a factorial field experiment that crossed treatments of herbivory and nutrient enrichment. Additionally, the relative role of heterotrophic feeding on Pocillopora growth was investigated by analyzing the percentage of polyp extension within individual coral colonies. A positive correlation was found between polyp extension and coral growth, suggesting that higher rates of heterotrophic feeding increased Pocillopora growth. For all Pocillopora colonies that exhibited positive growth, both polyp extension and total growth differed significantly throughout herbivory treatments. The corals in the lowest herbivory treatment had the highest rates of polyp extension, which was expected due to the decreased threat of predation by corallivores. However, the highest amount of positive growth was observed in the highest herbivory treatment, suggesting a strong effect of the top-down control of macroalgae by marine herbivores. These results reinforced the value of sustainable fishing practices and long term monitoring on coral reef ecosystems.
- Kyle Chua (He/him)- *Examining intraspecific differences in seed viability in native California wetland species.*
    - Authors: Kyle Chua, University of California Santa Barbara

      Many native California wetland plant species are threatened by invasive species. California's vernal pool wetlands exist within a grassland matrix, making them especially vulnerable to invasion by exotic annual grasses. One method to restore invaded habitat is to reseed lost natives, restoring native community interactions and improving system stability. However, restoration is often challenged by both native seed viability and its availability. Here, we perform a tetrazolium assay to examine intraspecific differences between native seed viability. Acquiring viability data is vital in informing restoration practitioners how to best prioritize species to restore based on seed viability, availability, and available germination cues in the field. If one population's seed has a higher viability rate than others, then that population may be used in local restoration projects to optimize restoration because seed is more likely to germinate. We determined that intraspecific differences in viability exist for the species Deinandra fasciculata. These results highlight the importance of considering intraspecific variability in plant functional traits to confer restoration success.
- 10 min talk- Kylie Newcomer (She/her)-*Identifying Herbivore Impacts on Coral Reef Recovery*
    - Authors: Kylie Newcomer, Casselle Lab, UCSB

      On tropical reefs, coral and algae compete for light, nutrients, and space. Herbivores have been shown to consume algae, fostering the settlement and growth of corals. However, the influence of herbivore size and feeding mode on algal coverage and

diversity is less understood. The role of large herbivores is potentially more important due to their distinct feeding mode and disproportionate impact, but studying these species is becoming difficult due to removal by fishing and habitat loss. The Caselle lab began an exclusion cage project in 2018 at Palmyra Atoll National Wildlife Refuge to determine how herbivore size and feeding mode influence benthic composition. Exclusion cages were designed to test the effects of large (>30cm TL) and small herbivores on coral-algal competition on a recovering reef. I used video feeding data and 3D orthomosaic imagery from each experimental treatment to test how bite rate and feeding mode influence coral-algal competition across four years of recovery. I found that cages with higher levels of access had increased coverage of short productive algal turf and crustose coralline algae, which are associated with a healthy coral reef. Cages with lower access had higher coverage of macroalgae and turf and sediment, which are associated with degraded reefs. Within the lowest access treatment, territorial damselfish (genus Stegastes) dominated, which drastically changed the benthic composition and herbivory rates. This study will work to inform coral reef managers on how the presence of large herbivores can influence coral-algal competition and foster recovery in the system.

12:10 PM **Lunch Break – LSB Courtyard**

1:10 PM **Poster Session 1**

- Alexis Sittenfeld-Parkhurst (Pronouns)-*The affect of parasitic flatworms on the health of Acropora pulchra corals*
    - Authors: Alexis Sittenfeld-Parkhurst, Ninah Munk, and Adrian Stier

      Coral reefs are facing the consequences of carbon emissions being absorbed by the ocean, inducing ocean warming and acidification. Ecologists around the world are conducting research to help slow or stop the degradation of our coral reefs, research that tends to take place in controlled environments like tanks. A coral of interest is Acropora pulchra, but they are vulnerable to Acropora Eating Flatworm infestations while in captivity. Therefore this study's aim is to investigate the effect of Acropora Eating Flatworms (Prosthiostomum acroporae) on their host corals. Results indicate a significant effect of worm treatment on change in photosynthetic efficiency(fvfm), with corals in the low worm treatment showing the highest positive change. However, growth rate differences among treatments were not statistically significant. Correlation analysis revealed a slight negative correlation between change in photosynthetic efficiency and growth rate, suggesting a potential trade-off between photosynthetic efficiency and growth. Further studies investigating the nutritional dynamics of coral-endosymbiont-parasite relationships could be beneficial to prospective restorative and conservation efforts of Acropora pulchra corals.
- Bianca Paganelli, Carys Goldsmith, Madelyn Schaffer, Angela Ji (She/her; She/her; She/her; She/her) -*Investigating the development and effect of nicothoid egg predators on cancer crabs*
    - Authors: Armand Kuris, Zoe Zilz, Jaden Orli, Bianca Paganelli, Carys Goldsmith, Madelyn Schaffer, Angela Ji, UCSB

      Nicothoid copepods are novel predators on the eggs of three species of Cancer crabs along Gaviota coast. This copepod was discovered in early 2021. Prior to that, this

type of egg predator had only been observed sporadically in the Atlantic ocean. These copepods are best observed under a microscope and bear a close resemblance to the crab's eggs, so that the crab egg mass is intermingled with the copepod eggs. These copepods engage in partial feeding of the crab's eggs. Despite only siphoning some of the contents, those crab eggs become unviable. Free living adult copepods cease to molt, but we have evidence that, in this species, adults may molt at least once. We are now looking at the quantitative effects of the nicothoids on crab egg mortality, and quantifying the developmental stages of the nicothoids in the crab egg masses.

- Annabel Long (She/her)- *Do California overwintering sites with more tree species host more western monarchs?*
    - Authors: Annabel Long, UCSB

      As ecologists and conservationists strive to save western migratory monarch butterflies (Danaus plexippus ssp. plexippus) from extinction, we need to understand what abiotic and biotic factors in California overwintering sites are most conducive to the butterflies' survival. Although nonnative eucalyptus trees make up most overwintering groves, research indicates that western monarchs may be more likely to cluster in native trees if possible. Less is known about how tree species diversity in overwintering sites may affect western monarchs. The intention of this study is to investigate whether California overwintering sites with more tree species support larger populations of western monarch butterflies. For each site in a sample of 24 overwintering sites prioritized by the Xerces Society for Invertebrate Conservation and in a random sample of 24 sites, I counted the number of tree species, and I calculated the average population of western monarchs from Western Monarch Thanksgiving Count data. After graphing my data and including linear trendlines, I found a weak positive correlation for the priority sample (r=0.103), but I found a weak negative correlation for the random sample of all California sites (r=-0.230). I observed that sites in the priority sample had higher average populations than sites in the random sample. While this study was inconclusive, more research on abiotic and biotic factors in overwintering sites may reveal why the sites prioritized by the Xerces Society tend to host more western monarchs, and this could inform conservation efforts.
- Calen Campos (He/him)-*Assessing seed predation to inform the conservation and recovery of the critically endangered Nipomo Mesa Lupine, Lupinus nipomensis.*
    - Authors: Lisa Stratton, Wayne Chapman, An Bui, Mary Cadogan UCSB

      Seed predation by granivores limits plant survival and recruitment of new germinates, especially of rare species limited by small populations and increasing pressure from nonnative invasives. The relationship between granivores and native flora at the Dune Protected Area in Callandar, CA is currently shifting away from historic patterns; Nipomo mesa lupine (L. nipomensis) and other dune stabilizing plant species have been impacted by the habitat-wide colonization by the invasive perennial veldt grass (Ehrharta calycina). Current veldt management practices prevent the use of herbicide to control the grass within a 15-foot buffer of extant lupine populations. Understanding how dense stands of veldt grass may support increased populations of L. nipomensis seed predators can inform the

management of veldt grass and the recovery of the endangered lupine. This study assessed seed predation through low profile boxes baited with L. nipomensis seeds and camera traps capturing both video and still images to compare seed predation rates relative to dense stands of veldt grass. Conservation implications were further assessed by considering the role of cages (fencing) in reducing seed predation. We found that increased proximity to veldt grass modestly increased seed predation, and that uncaged bait stations lost the most seeds (~70% loss rates compared to ~15% in caged plots). The most common seed predators captured on camera were Heermann's kangaroo rats, Dipodomys heermanni (found outside of cages and away from veldt grass), Deer mice, Peromyscus maniculatus (found outside of cages and adjacent to veldt grass), and California towhees (found within cages and away from veldt grass). Our results establish patterns of seed predation consistent with predicted results and emphasize potential vulnerability to seed predation in areas near veldt or areas unprotected by caging.

- Cameron Penn (She/her)-*Effects of ocean acidification and ocean warming on the behavior and physiology of the sea star, Evasterias troschelii*
    - Authors: Cameron Penn (UCSB), W. Christopher Long (NMFS NOAA), Emily Ryznar (NMFS NOAA)

      The mottled sea star, Evasterias troschelii, is an ecologically-important, abundant predator in coastal systems from Alaska to California; however, its physiological response to increased temperatures (ocean warming) and decreased pH (ocean acidification) is currently unknown. In this study, the behavioral and physiological response of E. troschelii was explored in a 25-day experiment which fully crossed pH (ambient and pH 7.5) with temperature (8°C and 14°C). Growth, feeding rate, condition index, and righting time were measured. The 50% lethal temperature (LT50) was measured before and after exposure. Growth and feeding both increased with temperature and were not affected by pH. Condition index was unaffected by both temperature and pH. Righting time increased at low pH and decreased at increased temperature. The LT50 increased by about 2°C every 30 minutes from the beginning to the end of the experiment but was unaffected by either temperature or pH treatments. Simulating the effects of climate change on E. troschelii suggests they are well-adapted to a wide range of temperature and pH as they survived temperatures well within future projections and pH had a limited effect on physiological and behavioral responses.
- Chiara Cimarusti (She/her)- *Olfactory neurons responsible for chemotaxis in Drosophila melanogaster larva*
    - Authors: Chiara Cimarusti, Thuc To, Matthieu Louis

      Olfaction is an essential part of survival and the way organisms comprehend their surroundings efficiently. This project aims to evaluate how different olfactory sensory neurons in the Drosophila melanogaster larva respond to different odor concentrations to control chemotaxis. Tracking the larvae's movements in their enclosed environment will be done through software called PiVR. By studying the behavioral

response of the larvae to an odor gradient, we can understand the underlying neural processing of the olfactory sensory neurons.

- Delaney O'Donnell (She/her)-*Analysis of algae and aquatic vegetation abundance at the Devereux Slough*
    - Authors: Delaney O'Donnell (CCBER at UCSB), Sophia Cabral (CCBER at UCSB), Alison Rickard (CCBER at UCSB)

      This project investigates how water quality metrics correlate with seasonal changes in algal and aquatic vegetation abundance via close-range and satellite imagery analysis at the Devereux Slough. The Devereux Slough, part of UCSB's North Campus Open Space (NCOS), is a temporary open/closed estuary undergoing restoration efforts following its previous use as a golf course. The Devereux Slough provides buffer area for storm surges and sea level rise, and it functions as a wildlife corridor linking protected lands.

      The Aquatic Invertebrate Lab at the NCOS evaluates wetland function in terms of nutrient filtering and support for wildlife. We analyze the effects of restoration on the ecosystem, abiotic factors on aquatic food webs, and the relationship between nutrient pulses and algal blooms.

      We deployed camera stands at bridges across NCOS to research algal growth through photography where Coastsnap is used to catalog images taken by citizen scientists. We then use ENVI and Adobe Photoshop to divide photographs into quadrats and analyze the algal cover based on pixel cover. We have Solinst leveloggers deployed near each site which collect water level, temperature, and in some cases, conductivity.

      We also investigate how aquatic vegetation density shifts spatially and temporally at the Devereux Slough from 2022-2024. We isolate spectral bands from monthly PlanetLabs satellite imagery and apply the normalized difference aquatic vegetation index function in R. We are interested in how plant health varies between longer- and shorter-term restoration sites and with water quality metrics taken by Solinst leveloggers.
- Dylan Messineo (He/him)- *Stage-Dependent Wing Begging Reciprocity in California Condors*
    - Authors: Dylan Messineo – UCSB – Andrea Blackburn – Conservation and Science Department, Santa Barbara Zoo Arianna Punzalan – Hopper Mountain National Wildlife Refuge, US Fish and Wildlife Service Joseph Brandt - Ventura Fish and Wildlife Office, US Fish and Wildlife Service Nadya Seal-Faith - Conservation and Science Department, Santa Barbara Zoo David Meyer - Conservation and Science Department, Santa Barbara Zoo Amy List – Hopper Mountain National Wildlife Refuge, US Fish and Wildlife Service Nate Melling – Hopper Mountain National Wildlife Refuge, US Fish and Wildlife Service Estelle Sandhaus - Conservation and Science Department, Santa Barbara Zoo

      Objective: To determine the role of stage day, in relation to the reciprocation/unreciprocation of wing begging behavior by feeding in the California condor (Gymnogyps californianus) species. The purpose of this study was to find the effect of nest stage day on chick wing begging reciprocity and the responsiveness of male vs. female parents.

Background: The term stage day refers to the number of days that have past since the birth of the chick. Chicks will often perform wing begging, flapping of the wings, to the adults to ask for food. The reciprocation refers to whether the adult feeds the chick after this behavior occurs. Previous observation of California condor feeding behavior notes how feedings per week decline steeply in the first few weeks, then remain at a constant lower level for the latter half. Specifically, in the beginning weeks, chicks were fed once every two hours, yet this declined to an average of once every 10 hours in the later weeks. This indicates that feeding by the adults declines in the later stages of nesting. Additionally, male and females fed their chicks with roughly the same frequency, with no significant difference except in one nest.
Methods/Results: The results were derived from observation of 11 different nests in the Southern California area from 2007-2009. The data included the reciprocation and unreciprocation to wing begging behavior by the chick from either the male or female adult. The reciprocation rate by the adults was aligned to the stage day. After calculating correlation coefficients in R, it was found that there was weak negative correlation ($r=-0.2$, $p=0.026$, $n=1822$) between reciprocation rate and stage day. In the same way, there was weak positive correlation between unreciprocated rate and stage day ($r=0.2$, $p=0.026$, $n=1822$). These results are in accordance with our prior hypothesis that reciprocation rate would decrease as stage day increased. Differing from the literature and prior hypothesis that male and females have similar feeding behavior, the reciprocation rate of males decreased more as stage day increased, than for females.
Conclusions/Implications: The findings provide the conservation science community a better understanding of California condor behavior. This is essential, as California condors are critically endangered, so any additional understanding will improve the management of wild condors, thus improving species recovery. The fact that reciprocation to wing begging aligns with typical California condor feeding behavior indicates they are related and can be further studied. Although our study indicated a greater propensity for female adults to respond to wing begging, further research can determine the roles of males and females in the nest.

- Elena Neuburger (She/her)-*Exploring the Capacity of Biofilms to Support Batrachochytrium dendrobatidis Across Plants and Water Depth*
    - Authors: Elena Neuburger, Lourdes Velazquez, Cherie Briggs, UCSB

      Batrachochytrium dendrobatidis (Bd), a frog-killing pathogenic fungus, continues to decimate frog populations around the world. Biofilms formed on pond surfaces may support the persistence of Bd. To better understand the relationship between Bd and biofilms, we will examine Bd's presence in biofilms established on different sterile surface types and in already existing biofilms found on plants. The goal of the project is to determine the capacity of biofilms to support Bd and improve our ability to predict where Bd might be found in a pond. Understanding Bd-disease dynamics outside of the host-pathogen system could lead to better disease mitigation strategies.
- Emma Sayre (She/her)- *Relationships between Algae, Macroinvertebrates, and Water Quality in the North Campus Open Space*
    - Authors: Emma Sayre, Nick Liu, CCBER

Algae plays a crucial role in aquatic ecosystems, serving as both a primary producer through photosynthesis and a food source and habitat for macroinvertebrates, which in turn supports larger organisms. The abundance and composition of algae and macroinvertebrates are influenced by environmental factors such as salinity, temperature, pH, and dissolved oxygen.

This ongoing study investigates the dynamics of a temporary open-closed estuary in the North Campus Open Space Devereux Slough. Monthly water quality data and algae samples are collected from three sites to assess the types of algae present and variations in macroinvertebrate abundance. Preliminary findings reveal several genera of algae, including but not limited to Tribomena, Phormidium, Ulva, and Oscillatoria. Tribomena exhibits the highest abundance of macroinvertebrates and species diversity.

These findings have enabled a more targeted exploration into local microalgal salinity tolerance, primarily through measurements of algal cell wall density, extent of motion, and color in response to regularly increasing salt concentration. Algae samples were collected from Phelps Bridge and introduced to a controlled aquarium environment in which oxygen and temperature levels were kept relatively constant, while 0.25 ppt of salt was introduced to the system every three days over the course of seven weeks. After each addition, the cell structures and behavior of the algae were examined with microscopy. This yielded results aligning with expectations of algal health deterioration with higher salinity. This research highlights the complex interactions between algae, macroinvertebrates, and environmental factors in estuarine ecosystems.

- Evelyn Tsang & Sanjana Sujeet (She/her, She/her)- *An Evaluation of Plastics Found in California Eastern Sierra Lake Environments*
    - Authors: S. Sujeet, E. W. Tsang, A. Estrada, J. D. Chamorro, D. J. McCauley, R. M. Reynolds, UCSB.

Although it is acknowledged globally that plastic production must stall, plastic is increasingly prevalent in our daily lives from our food, water, and surroundings, resulting in increased plastic pollution. Previous research has examined the presence and effects of plastic in marine and terrestrial environments, which includes damage to soil health, contamination of groundwater, wildlife endangerment, and bioaccumulation and biomagnification across food webs. However, less is known about the presence of plastics in freshwater lakes. To fill this knowledge gap, this project aimed to understand critical factors influencing micro and macro plastic prevalence in the freshwater lake environments of the California Eastern Sierra mountain range. Here site popularity, fishing activity, and the relationship between macroplastic presence on microplastics were the main factors analyzed. The amount of micro and macro plastics were measured and analyzed in seven lakes in the Eastern Sierra with varying degrees of popularity based on Google reviews and fishing activity based on accessibility from the trailhead as well as recreational advertisement. Our results showed that as site popularity, fishing activity, and macroplastic presence increased, so did the amount of microplastics that were collected. While this trend was not statistically significant, this study warrants further research including additional sites which can provide insight into the factors influencing plastic prevalence in freshwater ecosystems.

- Hibah Ganie and Kaitlyn Briggs (She/her, She/her)- *Shedding Light on Campus: Improving Student Safety and Energy Efficiency through Light Pollution Analysis*
    - Authors: Kaitlyn Briggs, Hibah Ganie, Owen Crosby, Arianna Huang, Dr. Lisa Stratton, UCSB

      It has been well studied that light pollution significantly impacts humans and wildlife. When light is in excess, humans are negatively affected through reduced safety from light glare, disrupted circadian rhythms, and decreased exposure to the night sky. We studied UCSB's residential areas to determine if these were issues on campus. This research was conducted through community engagement surveys about problematic lights and field visits to measure light intensity and color. We found a consensus among respondents that particularly bright or cold colored lights regularly affect respondent's ability to sleep and thus their academic performance. Surveys were promoted through 10 versions of attention-grabbing info flyers posted around campus, displayed on digital screens in residential lobbies, and sent out through residential email list servers to make our resources available in numerous forms with 9 responses and the anticipation of more in the spring quarter. We evaluated whether there are problematic lights around 12 residential halls through field surveys. After identifying 40 problematic lights, we identified a number of possible solutions that included adding shields, decreasing light color temperature, or changing the lighting fixture and/or bulb. We also took readings of sky glow into the atmosphere across 4 residential zones and 2 campus adjacent natural area zones to assess whether the school is dark sky compliant. We hope to assess the benefits of reducing night lighting on the school's energy budget. Overall, we hope to improve campus lighting to benefit students' safety, reduce light pollution impact on the night sky, and improve the school's energy budget.
- Irina Roybal and Nell Thompson (She/her; She/her)- Estimating the Water Use of a Tropical Atoll Canopy Tree
    - Authors: Nell Thompson, Irina Roybal, UCSB

      The long-studied and complex plant transpiration process can be better understood with developments in heat-pulse velocity techniques. Sap flow sensors employing such methods directly measure sap flux velocity (Fv), defined as the velocity at which water is pulled upward through a tree's xylem. Fv measurements from a single point on a tree must be extrapolated to the sapwood area of the entire trunk–a step that introduces considerable uncertainty, especially in understudied tree species that transport water deep in their trunks. This study investigated how to upscale Fv data measured at multiple trunk depths (4-100 mm) from 18 Pisonia grandis trees on aPacific atoll. During the initial month of observation, Pisonia core samples were extracted to characterize variations in wood density, moisture content, and volumetric heat capacity by depth. Polynomial and power functions fitted to these data were used to correct Fv measurements, which were then plotted versus measurement depth (mm) and relative radial depth (%). Fv-depth trends indicate water transport occurs as deep as 100 mm within Pisonia trunks, but that Fv generally decreases with depth. Some small Pisonia featured detectable sap flow at the center of their trunks while others did not. These Fv-depth trends enable a robust extrapolation approach to convert Fv measurements to

whole-tree water use rates for Pisonia, allowing resource managers to better estimate groundwater depletion rates on atolls.

- Isabella Puchkova (She/her)- *Modeling Harmful Algal Blooms on the California Coast*
    - Authors: Isabella Puchkova, UCSB

      Harmful algal blooms (HABs) are a conglomeration of algal cells that can release toxins that kill marine life, worsen water quality, and ultimately endanger human health. Species of the diatom Pseudo-nitzschia are largely responsible for toxic blooms around the world and especially along the US West Coast, as many species produce the marine neurotoxin domoic acid. Ocean acidification, increased water temperatures, precipitation unpredictability, and water stratification all caused by global warming are each linked to increases in domoic acid production in species of Pseudo-nitzschia. In response to HABs, statewide agencies issue advisories against eating certain seafood and may formally close fisheries. These closures can last for months, prolonging the fishing season and costing millions of dollars in revenue. The goal of this research is to ease statewide fisheries management by synthesizing years of data on Pseudo-nitzschia and domoic acid concentrations and pinpointing hotspots along the coast.
- Isaiah Sailors (Pronouns)- *Host Specificity and Diversity of Pine-associated Fungal Endophytes of Japan*
    - Authors: Isaiah Sailors, Ryoko Oono, University of California - Santa Barbara

      This study investigates foliar fungal endophyte diversity within pine trees common to Japan. Endophytes are microorganisms that live asymptomatically within plant tissues. Previous research indicates recurring associations between the endophyte species belonging to the Lophodermium genus (Rhytismatales, Leotiomycetes) and various pine species (Pinus) worldwide. To better understand this relationship between pines and Lophodermium, more pine species from more geographical locations and environments need to be sampled and have their endophyte community structures investigated. To study this, pine needles were collected from P. thunbergii, P. parviflora, P. koraiensis across multiple locations within Japan. From each plant, 100 2 mm sections of leaves were cultured in slant agar tubes. Tubes showing growth were then further cultured for morphotyping and PCR amplification of the ITS-LSU fungal barcode region for Sanger sequencing, which was used for species identification and characterization of the fungal endophyte community structure within each tree sample. Based on current results from 354 out of 1252 samples, 88 unique isolates were identified, with Sordariomycetes (24.6% of isolates) and Lophodermium (21.2% of isolates) predominating, primarily in P. thunbergii. We identified seven different Lophodermium operational taxonomic units (OTUs) and 27 different Sordariomycetes OTUs from seven different pine trees, across three locations. We identified significantly more Lophodermium OTUs than expected but the community was dominated by a particular OTU that remains unnamed. This highlights the importance of studying these intricate systems since even easily isolated and common species remain unidentified among endophyte communities. Once finished with sequencing all 1252 samples, we will compare the endophyte communities among hosts and locations using these diversity metrics as well as community dissimilarity metrics, such as by calculating the Bray-Curtis dissimilarity index.

- Kinga Bihari (She/her)- *Identifying Potential Biosecurity Threats and Evaluating Detection Strategies for the Channel Islands*
    - Authors: Kinga Bihari (UCSB), Raymond Hunter (UCSB Bren), Lara Brenner (TNC)

      Due to their tendency to outcompete and prey upon native species, rodents are among the most harmful of all invasive species found on islands around the globe. Therefore, it is critical for island managers to develop effective, proactive methods of preventing and rapidly detecting rodent incursions on islands before populations become established and cause irreversible damage to ecosystems. The goal of this study is to strengthen biosecurity camera trap monitoring protocols on the California Channel Islands by identifying potential invasive rodents on the mainland and evaluating if their behavior changes in the presence of native predator odors, and thus influences their camera trap detectability if introduced to the Channel Islands. We deployed 24 camera traps at a mainland California site (Coal Oil Point Reserve, CA) to measure rodent detectability in the presence of a food lure (peanut butter) with and without the addition of a novel Santa Cruz Island fox (Urocyon littoralis santacruzae) scent. Woodrats showed no detectable response to either treatment, while black rat detection increased following both treatments, and mouse detection increased only after fox scent was added to the food lure. Our findings indicate that while the presence of native predators like the island fox is unlikely to deter rodents from detection devices, biosecurity efforts need to account for the various behaviors of invasive rodent taxa, including dietary and habitat preferences.
- Jonathan Hurtik and Dario Russo (He/him; He/him)- *The Rest Is Hysteresis: Developing A Model For Predicting The Tipping Points Of A Five Connected Reef System*
    - Authors: Jonathan Hurtik, UCSB, Dario Russo, UCSB

      Coral reefs exhibit alternative stable states, possibly existing as coral-dominated, macroalgae-dominated, or mixed with both coral and macroalgae coexisting on a reef. Individual reefs can affect the stable state of those adjacent when close proximity allows for the dispersion and settlement of coral and macroalgae recruits on alternate reefs (Greiner et al. 2022). Current population models of coral and macroalgae only explore the effects of dispersal and grazing rate on a two-reef system, but this does not yield valuable insight into larger biological systems. Here, we aim to construct a series of models to predict the effects of dispersal and grazing rate on the stable states of a five-connected reef system. Understanding the role of herbivory and dispersal in larger, interconnected reef systems can better inform conservation practices by identifying how fisheries management on one reef can influence the stable state of those within a connected system. Our model explores the effects of unique dispersal and grazing rates on the percent cover of coral, macroalgae, and turf algae on each reef.
- Victoria Isabel Aldrete (She/her)-*The Relationship Between Total DNA Content, Berry Size, and Cell Abundance in the Pink Berry Consortia*
    - Authors: Victoria I. Aldrete, Tori Avalon Jones, Elizabeth G. Wilbanks

      Pink berries are microbial aggregates from the Sippewissett Salt Marshes (Falmouth, MA). The pink berry consortia houses a diverse range of species and microbial processes. Different photosynthetic bacteria inside these compact, charismatic

consortia provide their characteristic pink or green colors. Pink berries vary widely in size, from an approximate range of 1mm to 1cm. We aim to relate berry size to total DNA content across ponds in two marshes, Little Sippewissett and Great Sippewissett. We seek to answer the following questions: (1) Is total DNA content directly related to berry size? (2) How can DNA content vs size analysis answer questions of cell abundance? To answer these questions, we collected berries across two ponds in two marsh sites. We extracted their DNA with powersoil extraction kits and then quantified the total DNA yield per berry with Qbit. Next, we conducted individual berry size analysis using ImageJ software to determine the individual berry volume from scanned images. In comparing DNA quantifications to ImageJ results, we found a positive correlation between total DNA yield and berry size. As such, we can use ImageJ as a baseline for asking questions about the abundance of certain organisms crucial to their function in the pink berry ecosystem, such as bacterial predators. By performing downstream analysis with digital droplet PCR we can determine the amount of predator DNA in each berry. Using the berry size/cell abundance baseline, we can make inferences about the individual cell abundance of these predators. This information can then aid our understanding of the scale of the impact they have on their consortia Because this project is ongoing, further laboratory and field research is required to fully construct the relationship between berry size, total DNA content, and individual cell abundance. Nevertheless, the results of this study are optimistic in providing an initial positive correlation between berry size and total DNA content, and in establishing a baseline for ImageJ image processing informing cell abundance measurements. This opens the door for future analyses of specific species cell abundance in the pink berries, and inference of their ecological impact.

- Megan Wagner and Luke Rutherford (She/her, He/him)-*Investegating Pollinator Phenology in California Wildflower N. menziesii*
    - Authors: Megan Wagner, Luke Rutherford, Helen Payne UCSB

        The majority of plant species are pollinated by insects, and many ecosystems rely on plant-animal interactions for pollination. Understanding plant-pollinator interactions is crucial for predicting ecosystem responses to climate change. Climate change may be driving plants and pollinators to adapt independently, creating the opportunity for potential phenological mismatch, such as flowering time and the emergence time of pollinators. We investigated the following floral visitors found on Nemophila menziesii (Baby Blue Eyes, Hydrophyllaceae), a native California wildflower: Toxomerus marginatus, Calypte anna, Bombus vosnesenskii, and Aphelocoma californica. We identified the diverse array of insects visiting N. menziesii flowers through field specimen collection across four field sites in northern California, and identified potential bird pollinators using observation records on iNaturalist. Utilizing publicly available specimen occurrence data from GBIF (gbif.org) and climate data using ClimateNA, we characterized the climate conditions associated with both Nemophila flowering and its associated pollinator emergences. These occurrences can help us determine how past climatic events influence the historic emergence time of specimens. Specifically, we predict changes in the timing of flowering and pollinator emergence, potentially disrupting the interactions between N. menziesii and its pollinators. These findings underscore the vulnerability of plant-pollinator interactions to climate change and

highlight the importance of considering both floral and pollinator responses when assessing ecosystem resilience. This research could aid in developing conservation strategies by focusing conservation efforts on species facing higher phenological risk in response to climate change and identifying how climate-induced mismatches affect plant-pollinator relationships in the future.

- Jorge De La Cruz (He/him)- *Applying geometric morphometrics to assess phenotypic variation in bees*
    - Authors: Jorge De La Cruz, University of California Santa Barbara

      Species-level identification of insects is often difficult and can limit ecological studies, particularly those assessing insect biodiversity. Wing venation characteristics are fundamental for defining and classifying insects. Bees (Hymenoptera: Apoidea) have relatively conserved wing characteristics at the family, genus, and species level, but the patterns between groups remain poorly understood. In this study, we employed geometric morphometrics to assess variation in wing venation across bees taxa. Geometric morphometrics allows for detailed shape analysis of wing structure, which may provide insights into evolutionary relationships. By digitally landmarking nine homologous wing vein characters of a diverse sample of bees, we quantified and compared phenotypic variation across several recognized species, genera, and families in order to assess whether the resulting morphological clusters reflect evolutionary divergence. Preliminary results demonstrate the ability to differentiate species within a genus and even among populations, testifying to a high level of precision. We are currently investigating the extent to which our groupings based on morphometric data aligns with established phylogeny and the practical implications. This study assesses the potential of geometric morphometrics to infer the phylogenetic placement of indeterminate bee species based solely on wing vein patterns and provides an effective pathway for species identification. This classification method could accelerate research in pollinator conservation and ecology by offering an accessible alternative means for bee identification and ecological morphotype hypotheses.

1:50 PM **Session 3**

- 10 min talk- Geri Urgel (She/her)- *The role large marine herbivores play in coral reef resiliency and recovery in Palmyra Atoll*
    - Authors: Geri Urgel and Peter Carlson, Caselle Lab UCSB

      Coral reefs are essential underwater ecosystems. However, due to detrimental anthropogenic factors such as overfishing, coral reef health have declined. An important contributor that helps maintain healthy coral reefs are marine herbivores who remove algae that competes with corals for space on the benthos. In this study, we investigate the role large marine herbivores (>50 cm) play in coral recruitment and reef recovery. The Caselle Lab set up 12 herbivore exclusion cages at a recovering reef at Palmyra Atoll National Wildlife Refuge. Each cage includes 2 settlement tile sandwiches that measure the rates of coral recruitment. After analyzing the tiles collected in the field, we found that the number of coral recruits in treatments where herbivores are excluded dramatically decreases. We found evidence that large herbivores prevent the

establishment of macroalgae, which may negatively impact coral growth and survival. However, we did not find a strong effect on coral settlement when only large herbivores were excluded.

- 10 min talk- Jasmine Tesoro (She/they)-*Bd Loads in Amphipods and Mayflies Across the Years... With Added Temperature Analysis!*
    - Authors: Jasmine Tesoro, Caitlin Nordheim-Maestas, Cherie Briggs

      Batrachochytrium dendrobatidis (Bd) is a fungal pathogen that causes a disease that threatens amphibians globally. Aquatic macroinvertebrates, such as amphipods and mayflies, occur in high abundance in amphibian systems. Prior research suggests that macroinvertebrates are potential reservoir hosts that may be capable of amplifying Bd. Our goals were to determine the load of Bd in macroinvertebrates across the summers of 2021, 2022, and 2023 and if Bd was found externally or internally. Amphipods and mayflies from Blue Oak Ranch Reserve (BORR) in the Bay Area of California were swabbed, dissected, and the DNA was extracted to quantify how much Bd was on or in each bug. We found that only invertebrates from 2021 tested positive for Bd.
      In 2021, the East Bay region experienced a severe drought. Droughts commonly coincide with warmer water temperatures. To explain the stark difference in Bd load across the years, a follow-up analysis was conducted to test whether water temperatures can predict Bd load in aquatic macroinvertebrates. We found that as water temperature increases, Bd load tends to decrease in bugs. However, our model only explains a fraction of the data's variation. While the Bd screening of the bugs showed only positives in 2021, a drought year, water temperature is not a factor that solely explains the variation in Bd across the years. The cause of variation in macroinvertebrate Bd loads requires further research. Nevertheless, our work points to the potential impact of drought on the Bd loads in amphipods and mayflies in California.
- 10 min talk- Michelle Colvin (She/her)-*Genetically based effects of flowering date, flower size, and plant size on flowering duration in Nemophila menziesii*
    - Authors: Michelle Colvin, Dr. Susan Mazer, UCSB

      Flowering duration is the number of days between when the first and the last flower is produced of an individual. An individual plant's early-, mid-, or late- flowering genotype and phenotypic responses to environmental cues influences its flowering duration period, such as water availability during drought conditions. Water and resource availability are also expected to influence size traits such as corolla size and stem biomass for the plant in attaining or conserving water to flower with more durability. Flower duration period length influences the opportunities of pollinator exposure for the plant's ability to produce flowers that can be developed into fruits.

      Flowering dates, corolla diameters, and total stem biomass were collected from four field populations located in the UC Natural Reserve System: Angelo Coast, Blue Oak, Bodega Bay, and Hastings Ranch. Utilizing simple regression linear models, I will examine the direct effects of first flowering date and corolla diameter on flowering duration, respectively, to assess what traits influence flowering duration. I will also utilize multiple regression with predictor variables to analyze the independent effects of stem biomass, corolla diameter, and first flowering date on flowering duration. These

regressions will be conducted by maternal and paternal family means to perceive how much a trait is influenced by maternal and paternal DNA. I will test the predictions of a negative correlation between first flowering date and flowering duration, negative correlation between flower size and flowering duration, and positive correlation between plant size (independent of flower size and first flowering date) and flowering duration, for all maternal and paternal family means.

- 10 min talk- Nicole Sun (She/her)- *Neurons adaptation mechanism in insects: how a protein in fruit flies helps ignore bitter tastes*
    - Authors: Nicole Sun, Angela Bontempo, Craig Montell

      Mosquito bites might be itching and annoying but they are also deadly. Mosquitos are the deadliest animals in the world, killing up to 750,000 people per year by spreading diseases like malaria and dengue through their bites. In addition to mosquitos, other insect disease vectors and agricultural pests threaten our health and food security. One thing pests and disease vectors have in common is that they use taste to make their final decision to drink our blood or eat our food. In order to better understand how insects use taste to inform behavior and uncover novel targets for repellants we use the powerful model organism Drosophila melanogaster. We discovered a novel sensory protein that is expressed in the taste system of flies and plays an important role in the adaptation of their gustatory neurons to bitter compounds. In a naturalistic behavior assay in which flies are given a small amount of sugar mixed with a bitter compound and then allowed to explore, we found that flies that are mutants for this sensory protein take much longer to return to the source of food than controls, supporting that it's bitter responsive neurons are active for longer. These findings are impactful in understanding the highly conserved proteins as well as potentially uncovering a new target for insect repellants.
- 10 min talk- Rishima Tewari (She/her)- *Investigating environmental factors that influence phenology of the wildflower Nemophila menziesii*
    - Authors: Rishima Tewari; Helen Payne, UCSB

      Phenology refers to the study of the timing of events in biological life cycles. Ecosystem functions and stability rely on interactions between plants and animals, and these organisms often interact based on environmental responses that initiate phenological behavior. Since factors that initiate phenological behaviors differ across trophic levels and taxonomic groups, determining the environmental factors that influence an organism's phenology allows us to assess how susceptible these relationships are to climate change. For our study, we evaluated the influence of temperature and precipitation on the phenology of the native wildflower Nemophila menziesii, and four of its associated pollinators (Bombus vosnesenskii, Andrena nigripes, Diabrotica undecimpunctata, and Trichodes ornatus). Four populations of N. menziesii were sampled every other week for 0.5 hours per site from February to June. Insects visiting N. menziesii flowers were caught via net sampling, pinned, and identified. Electronic museum specimen records were used to obtain phenological data for the identified insect specimen. Specifically, the Global Biodiversity Information Facility (GBIF) was used to obtain pollinator and N. menziesii specimen collection dates which can be used as a proxy for pollinator emergence times and flowering dates respectively.

Climatic data from the location of specimen collection was sourced from the website ClimateNA and merged with the GBIF insect specimen records. Linear regressions were performed in RStudio to determine how climate variables affect the phenology of our study organisms. We predict that the flowering phenology of N. menziesii will respond differently to climatic variables compared to two of its pollinators, B. vosnesenskii and A. nigripes, because B. vosnesenskii exhibits a narrower window of emergence time compared to other generalist pollinators while A. nigripes is a specialist pollinator species. If the phenology of these two pollinators truly does respond differently to the phenology of N. menziesii, this indicates that the insects are at risk of phenological mismatch. Our findings suggest that certain species respond differently to varying climatic cues, placing them under higher risk of phenological mismatches. Thus, efforts should be made to prioritize conservation efforts geared towards such organisms.

- 5 min talk- Macey Hartmann (She/her)-*Uncovering the Mysteries of the Giant Sea Bass: Integrating Technology and Community Science for Conservation*
    - Authors: Macey Hartmann, Andrew Pettit, UC Santa Barbara

      Nicknamed the "King of the Kelp Forest," Giant Sea Bass (Stereolepis Gigas) are the largest resident bony fishes in California and apex predators. Now classified as critically endangered by the International Union for the Conservation of Nature (ICUN) and protected by a California fishing moratorium, recent research suggests that population numbers may be slowly recovering. However, there has been no direct population assessment of their numbers. Additionally, not much is known about their spatial movements, and as aggregative fish, it is essential to identify their aggregation sites and understand how they migrate between them. To tackle these unknowns, the Spotting Giant Sea Bass (SGSB) project was created in 2017 to collect community-sourced photos of giant sea bass from the recreational diving and fishing community. Giant Sea Bass have unique spots on their flanks that create a distinct pattern, similar to a fingerprint, which can be used to identify the fish. From images collected through SGSB, we utilize highly accurate pattern recognition software to analyze the spot pattern and identify the individual. To date, we have identified 662 left-side and 627 right-side individuals out of 1,620 verified encounters from 110 community scientists. Through this data, we can determine their current population estimates crucial to assess their recovery efforts and evaluate current management efforts. In addition to monitoring population size, this repository facilitates critical research into their spatial patterns, aggregative behavior, and use of marine protected areas. It also fosters an appreciation for this flagship species, thereby promoting ocean stewardship.
- 5 min talk- Quinn Giessow (He/him)-*Tree leaf nitrogen uptake in response to wildfires*
    - Authors: Quinn Giessow, Travis Britton, Dr. Leander Love-Anderegg; UCSB

      Nutrient allocation in tree species provides us information on the environmental conditions affecting trees, as well as the physiological responses by individuals to these conditions. Leaf nitrogen content indicates the availability of nutrients in the environment, and the health of individual trees. While the factors that contribute to leaf carbon/nitrogen ratios are broadly understood, how this differs among species, and specifically in response to fire is poorly understood. In order to test this question we

conducted research in the Cleveland National Forest examining three tree species: white fir (Abies concolor), incense cedar (Calocedrus decurrens), and sugar pine (Pinus lambertiana). Leaves were collected from branch tips, recording if they were growth from that year, one year old, two years old, or three years old. These samples were dried, pulverized, foil-balled, and analyzed for carbon and nitrogen content. We found that Abies concolor had a significantly higher average carbon/nitrogen ratio compared to Calocedrus decurrens and Pinus lambertiana. All three species showed a significant increase in leaf nitrogen content following a fire that occurred in some plots, compared to plots that did not burn. This indicates that fires represent a significant input of available nitrogen in the system, and that trees are able to quickly take it up and use it in their leaves.

- 10 min talk- Sabrina Grant (She/her)-*Spatiotemporal variability of zooplankton community assemblages in the Santa Barbara Channel*
    - Authors: Sabrina Grant (UCSB), Kristen Michaud (MSI), Robert Miller (MSI)

      Marine zooplankton play a critical role in supporting kelp forest food webs and population connectivity of benthic invertebrates. However, the drivers of variability in zooplankton abundance and community structure have not been assessed in local kelp forests within the Santa Barbara Channel (SBC), where there is strong seasonality in oceanographic conditions, nutrient delivery, and primary production. To investigate the response of zooplankton communities in the SBC to temporal and spatial variability, we sampled zooplankton using vertical net tows at two sites, Mohawk reef, and 3 km offshore of the reef, seasonally over 6 days for two years. Our findings suggest that there is strong seasonality in zooplankton density, with warmer seasons typically exhibiting higher densities. Further, we found that community composition differs considerably between the offshore and reef site. Meroplanktonic echinoderm and bryozoan larvae primarily dominated the offshore station, while the inshore reef was more even in composition. Copepods were the most abundant group overall, though other holoplankton including cladocerans appeared in higher abundances at the offshore station. These findings emphasize the small-scale spatiotemporal complexities of zooplankton community dynamics in coastal ecosystems.
- 10 min talk- Jeremy Cowan (He/him)-*Tropical California: Diversity and Natural History of Baja California's Sierra de la Laguna*
    - Authors: Jeremy Cowan UCSB, Gerardo Marrón Laboratorio de Aves. Universidad Autónoma de Baja California Sur, Tom Dudley UCSB

      The Baja Peninsula of Northwestern Mexico is home to countless specialized ecosystems, each with a unique natural history and assemblage of species. The southernmost mountain range, the Sierra de la Laguna, is a particularly interesting region due to its near-tropical monsoon dependent climate, and tropical influences in flora and fauna. The Cape Region, which encompasses the Sierra de la Laguna, is a biodiversity hotspot threatened by development and agriculture. We embarked on two research expeditions to an ungrazed and undisturbed site in the Sierra de la Laguna to catalog the species present at the site, and plan future work in the region. Future research at the site will include ecotourism related studies, disturbance studies, avian research projects, and continued vegetation monitoring. The overall goal is to turn the initial study

site into a protected reserve, and to create a union of landowners who own property between the Sierra de la Laguna Biosphere Reserve and the ocean. Here we briefly present the natural history of the region, a basic outline of the ecosystem and climate, notable species present at the site, the research we completed in October and December of last year, and our goals for the future.

3:10 PM **Break**

3:30 PM **Session 4**

- REEFlection: Media Bite- Simren Gupta (She/her)-*Unveiling the Anemone Agora: Insights into Intraspecific Space Competition in the Pacific Rocky Intertidal*
    - Authors: Simren Gupta, Ryan Tang, Sophia Kaplan, Nicholas Vinas, Armand Kuris

      For decades, the Pacific rocky intertidal zone has served as a model ecosystem to elucidate how organisms compete for space. Several species of intertidal sea anemones (Actiniaria) exhibit marked intraspecific interference competition. Our research characterizes the nature and dynamics of this competition across multiple levels of biological organization. First, to quantify the strength of intraspecific competition within populations of the sea anemone Anthopleura sola, we tested whether populations exhibited a uniform dispersion due to agonistic encounters. We performed a comprehensive spatial mapping study, documenting the positions and body sizes of over 3000 anemones across two habitats at Coal Oil Point, Santa Barbara County, California. Analyzing these data using spatial point-process methods revealed significant spatial uniformity at a scale where agonistic interactions are likely to occur. Moreover, the extent of uniformity differs across the two habitats, suggesting that environmental factors and other population-specific characteristics (e.g. density) may lead to context-dependence in behavioral traits. To further understand how habitat-specific factors influence individual variation in competitive dynamics, we are staging contest experiments in the laboratory, observing agonistic encounters between individuals from different habitats. We will also report on findings from ongoing efforts to monitor agonistic interactions in natural populations of anemones. Preliminary results from these studies show that while agonistic encounters are frequent in nature, they can be patchy in space. This indicates that certain areas of the habitat space are more desirable than others. We argue that in the rocky intertidal zone, the idea of competition for "space" should be reexamined in light of the resources organisms gain by occupying a given spatial location.
- REEFlection: 10 min talk- Josie Spiegelman (She/her)-*The Bees and the Bees: Riparian Restoration Efforts and Their Effects on Pollinator Diversity*
    - Authors: Josie Spiegelman, Adam Lambert

      Riparian ecosystems provide critical habitat and water, especially in arid environments, where they also reduce the impacts of flooding and wildfire. Much of the land in these habitats has been converted to agriculture because of the abundance of moisture and fertile soil resulting in significant loss of native vegetation and wildlife, including invertebrates. Pollinators, including bees and wasps, have been in a state of severe decline due to habitat loss and climate change. The Santa Clara River (SCR) is one of the most ecologically important rivers in Southern California, and provides food

and habitat for native flora and fauna species. The Cienega Springs Ecological Reserve (CSER) is a 285-acre property in the river that has been degraded by farming, but is now being restored back to wetlands and riparian forest. UCSB is conducting restoration at the site coupled with research to evaluate wildlife response to ecosystem change. One of the central goals at CSER is to increase pollinator abundance and diversity. Potential improvements to pollinator populations have been measured bi-annually since 2022 using passive trapping methods. Insects are then identified and deposited in the CCBER entomology collection. Initial results show a robust and diverse pollinator (and general insect) community that varies by season. We expect that this remnant community will lead to significant increases in insect species abundance and diversity as restoration progresses.

- REEFlection: Media Bite- Kendra Hyles & Marine Wloczysiak (She/her; They/them)-*Effects of Geographic Region and Ocean Climate on Mesocentrotus franciscanus and Strongylocentrotus purpuratus Recruitment*
    - Authors: K. Hyles, M. Wloczysiak, S. Schroeter, R. Miller UCSB

      Sea urchins are ecosystem engineers that greatly influence the structure and function of subtidal ecosystems. Similarly to other species with a planktonic larvae stage, sea urchin recruitment varies both temporally and spatially. We believe that geographic climate regimes coupled with interspecific recruitment competition are main driving factors of recruitment density. We sought to examine the physical environment to determine the relationship between oceanographic variability with the recruitment of sea urchins and other invertebrates. Additionally, we looked at other invertebrate organisms with planktonic larvae stages, specifically Bivalvia and crabs, to compare their recruitment to that of sea urchins. A biweekly and seasonal time series was used to quantify new larvae collected on artificial substrates across three locations in the Santa Barbara Channel, mainly focused on purple sea urchins (Strongylocentrotus purpuratus) and red sea urchins (Mesocentrotus franciscanus). We found that El Nino Southern Oscillation (ENSO) had a negative correlation with sea urchin settlement. This has future implications for sea urchin populations as climate change persists. Furthermore, a negative correlation between sea urchins and bivalve recruitment density was found. There was a weakly positive correlation between sea urchins and crabs. These findings suggest that variation in geographic climate regimes play a significant role in determining the overall distribution of sea urchin larval recruitment, potentially influencing population dynamics and ecosystem dynamics across a wide geographical range. Furthermore, our discoveries offer valuable perspectives into the environmental factors influencing larval recruitment. This understanding is crucial for predicting the impact of climate on regional populations and community dynamics among marine species.

- REEFlection: 10 min talk- Sophia Cabral (She/her)-*Boiling eggs: determining the effects of simulated marine heatwaves on red sea urchin maternal provisioning*
    - Authors: S. R. Cabral, E.E. de Leon Sanchez, G. E. Hofmann. UCSB

      As MHWs increase in frequency, intensity, and duration, it is critical to understand the impacts MHWs will have on marine ecosystems and fishery species. The red sea urchin, Mesocentrotus franciscanus, is a kelp forest ecosystem engineer and a multi-million dollar fishery species marketed for their gonads or "uni". Recent MHWs in the Santa Barbara Channel have coincided with urchin mass mortality events due to disease and food shortages. With forecasted increases in MHWs, it is important to determine if future generations of red urchins can rapidly adjust their phenotypes for survival in future MHWs. Transgenerational plasticity (TGP) is a phenomenon where parental history may alter an offspring's phenotype. Here, we examine potential maternal effects in response to adult acclimation to MHWs during gametogenesis. We acclimated urchins to either multiple MHW events (18-20°C) or non-MHW conditions (15°C) in a flow-through seawater system for six weeks. We then spawned the urchins and collected eggs from the MHW-acclimated females and non-MHW-acclimated females to analyze egg quality between treatments. Results showed that differential maternal exposure to MHWs had a significant impact on egg size, with MHW urchins having smaller egg dimensions. These results may indicate that MHWs may cause a decrease in maternal provisioning or egg quality. Our findings provide insight on how MHWs may affect red sea urchin maternal provisioning, which may have important implications regarding future populations in the face of future MHWs.
- REEFlection: Media Bite- Julia Walsh (She/her)-*A Study on Ammonia-Oxidizing Archaea and Nitrite-Oxidizing Bacteria in Nitrogen Cycling*
    - Authors: Julia Walsh, Amber Briesach, Dr. Alyson Santoro, UCSB

      In the ocean, ammonia-oxidizing archaea (AOA) and nitrite-oxidizing bacteria (NOB) are microorganisms involved in nitrification, a process a part of the nitrogen cycle. In the first step of nitrification, AOA converts ammonia to nitrite. In the second step of nitrification, NOB converts nitrite to nitrate. The relationship between the two microbes and nitrogen was studied by collecting two water samples in the Santa Barbara Channel. One water sample was routinely given ammonia to isolate an enrichment culture of AOA, and the other water sample was routinely given ammonia and nitrite to isolate an enrichment culture of NOB. The concentration of nitrite present in the enrichments was measured. The nitrite concentration in the AOA enrichment increased, while the nitrite concentration in the NOB enrichment decreased; suggesting the AOA converted the ammonia to nitrite, and the NOB consumed the nitrite. The relationship between AOA and NOB in nitrification helps develop an understanding of the interactions of marine microbes and how these interactions affect the equilibrium of the ocean.
- REEFlection: 10 min talk- Andie Van Horn (She/her)- Semi-Charmed Kind of Lice: How Community Science Photos Can Enhance Understandings of Giant Sea Bass and their Ectoparasites

- Authors: A.R. Van Horn (1), A. Pettit (1), J.K. Passarelli (2) and D.J. McCauley (1). 1) Marine Science Institute, University of California, Santa Barbara, CA 93106. 2) Cabrillo Marine Aquarium, 3720 Stephen M. White Drive, San Pedro, CA 90731.

  Giant sea bass (GSB), Stereolepis gigas, are California's largest resident bony fish, often called the "king of the kelp forest." Due to their massive size and aggregative behavior, these fish were overfished to near extinction, resulting in a critically endangered classification in 1996. The Spotting Giant Sea Bass Project was created to collect community-science-sourced photos of wild giant sea bass from SCUBA divers, fishers, and other ocean enthusiasts to assess the current GSB population status and further understand their life history. To date, this data has enabled researchers to develop population estimates and gain insights into their largely unknown spatiotemporal behaviors. However, with a photo repository containing over 2000 reported encounters, it's important to consider what additional data can be collected from these photos to gain further insight into other aspects of GSB life history. One such application is utilizing these photos to quantify the infestation of Lepeophtheirus longipes, a host-specific ectoparasite, on GSB. Understanding this infestation may be beneficial to the conservation of this fish, as parasites from this genus have been known to cause mortality in heavily-infested fish of other species. To assess the potential risk posed to this critically endangered fish, we quantified the parasitic prevalence and abundance of L. longipes and investigated trends amongst GSB life stages, seasonality, and location. Additionally, this study serves as a baseline for describing this cleaning mutualism and understanding its potential impact on the ecosystem. As a result, this study highlights how community science can be a valuable resource for investigating important ecological questions.

4:40 PM **Poster Session 2**

- Emily Nix (She/her)- Optimizing two different water filtration techniques for environmental DNA detection of frog-killing pathogen
  - Authors: Emily Nix, Kathryn Koo, Renwei Chen, Caitlin Nordheim-Maestas, Cherie Briggs UCSB EEMB

    Batrachochytrium dendrobatidis (Bd), an aquatic fungus that is an amphibian-killing pathogen, is currently posing a threat to many wetland communities. For this project, I specifically looked at wetland sites in the East Bay. The goal of this project was to investigate two different water filtration techniques to optimize the detection of Bd through environmental DNA (eDNA). I compared the Bd DNA detected using an "active" filtration method to the Bd DNA detected from a "passive" filtration method using field samples. "Active" filtration is a time and labor-intensive process in which water has to be collected from each pond and stored until it can be filtered in a lab under sterile conditions. "Passive" filtering is a simplified process in which a filter is placed in a bag of pond water at the field site and then collected. After the filtration process, the DNA was extracted and analyzed using qPCR to quantify how much Bd DNA is in each sample. These results can be used to inform decisions on which method of water filtration is most reliable for eDNA detection of Bd moving forward. This can help conservation and management efforts for amphibians.

- Kaitlyn Briggs (She/her)- *Conserving Riparian Ecosystems in Southern California: Assessing Genetic Integrity and Hybridization Impacts on the Western Sycamore*
    - Authors: Kaitlyn Briggs, Jamie Lopez, Kelly Kerr, Jared Williams, Adam Lambert

      The Western Sycamore (Platanus racemosa) is native to California and is a foundational species in riparian and coastal ecosystems. It is drought tolerant and provides important ecosystem functions along streams, including moderating thermal conditions for aquatic wildlife through shading and providing food resources and nesting sites. The London Plane Tree (Platanus hispanica) is a hybrid created by English botanists during the late 1600s as a hardy variety to withstand the high particulate atmosphere of the Industrial Revolution. It is unclear when it was introduced to North America, but this hybrid readily hybridizes with native P. racemosa throughout California, leading to genetic deterioration and potential loss of important functional characteristics of this species. This study will evaluate the degree of introgression occurring in natural areas and genetically identify individuals to determine pure native genotypes. We sampled naturally occurring trees, and ones planted for restoration or at urban sites with an emphasis on evaluating a variety of trees that looked either native, introduced, or hybrid. Leaf samples for DNA extraction and tree cores for aging were collected from each tree. Trunk diameter correlates to tree age, allowing us to detect native trees predating P. hispanica introduction and act as a tool for practitioners to identify natives by trunk diameter. We will use genetic results to understand the genetic makeup of trees in the region to determine the degree of hybridization and whether some locations remain isolated from P. hispanica. We will take cuttings from identified true natives for propagation for future restoration, ensuring the pure lineage, and its ecosystem benefits, will be maintained.
- Jessilin Lee (She/they)- *Plasticity and Evolutionary Responses to Changing Environmental Conditions in the Mixotrophic Chrysophyte Ochromonas*
    - Authors: Jessilin Lee (UCSB), Meredith Honig (UCSB), Holly Moeller (UCSB)

      Marine plankton are essential regulators of global carbon cycles. Mixotrophic plankton combine autotrophy and heterotrophy to obtain energy, allowing them to act as both a carbon sink and source. With rising ocean temperatures, mixotrophs have been documented to become increasingly heterotrophic rather than photosynthetic, contributing carbon dioxide into the atmosphere rather than fixing it. Thus, it is important to understand how mixotrophs respond to changing thermal conditions. The genus of the mixotrophic nanoflagellate Ochromonas is phenotypically plastic allowing individuals to rapidly acclimate their metabolic needs to changing environmental conditions over short periods of time. However, little is known about the relationship between short-term plasticity and long-term evolutionary responses in mixotrophs. To quantify this, we created evolutionary lines of eight strains of Ochromonas at hot and cold temperatures. To understand thermal adaptation, we quantified mixotroph growth rates, chlorophyll content, and photosynthetic efficiency in hot and cold lineages over time. We predict that strains less plastic in their short-term response to hot and cold temperatures will be more likely to show adaptation resulting in higher growth rates to each temperature over time. Our results are important for understanding how mixotroph

metabolism changes with climate change and provides insights on how mixotrophs will contribute to or mitigate changing carbon cycling dynamics in the ocean.

- Kylie Malone (She/her)- Aquatic Invertebrate Assessment at the North Campus Open Space
    - Authors: Kylie Malone (UCSB), Valeria Estrada-Ramirez (UCSB)

      Aquatic macroinvertebrates are critical indicators of ecological health because of their role as primary consumers, supporting many species within their respective food chains. Birds, as key components of wetland ecosystems, heavily rely on these aquatic macroinvertebrates as a food source. Understanding the dynamics between aquatic macroinvertebrates and environmental factors is crucial for effective ecosystem management efforts. This study compares surface sampling data and benthic dipnetting sampling data across multiple sites within North Campus Open Space (NCOS) from the summer of 2023 to the spring of 2024.

      Our research aims to determine the species abundance and diversity of key aquatic invertebrates and zooplankton using the Shannon–Wiener diversity index. By utilizing two distinct sampling methods, we investigate the effectiveness of the sampling techniques through potential variations in species abundance. Moreover, we correlate this data with water quality parameters such as pH, salinity, and dissolved oxygen to assess their influence on the distribution and abundance of aquatic macroinvertebrates. Overall, this research contributes to a deeper understanding of the intricate relationships between environmental variables and aquatic macroinvertebrate abundance across two different sampling mediums.
- Madison Feenstra (She/her)- *Exploring the Heart of Migration: Comparative analysis of cardiac health on migration outcomes in sockeye salmon (Oncorhynchus nerka)*
    - Authors: Madison Feenstra, Jacey Van Wert, Dr. Erika Eliason; UCSB

      The once-in-a-lifetime upstream migration of Pacific salmon is a challenging feat. Due to environmental challenges and physiological constraints, some fish die before reaching their spawning grounds to reproduce . Heart function plays an important role in this life cycle, because upriver swimming requires oxygen, which is supplied via the cardiovascular system. However, certain pathologies, such as coronary arteriosclerosis, develop in the coronary artery of maturing salmon and can restrict blood flow to the heart. We compared the heart pathology of sockeye salmon (Oncorhynchus nerka) at different locations along their migration route to determine if cardiac health is linked to migratory success. We examined cross-sections of the coronary artery and analyzed the tissue composition of the heart. We found that the fish that strayed tended to have less compact myocardium (i.e. the outer layer of the ventricle, supported by the coronary artery), indicating that these fish hearts were dependent on a less reliable source of oxygen . Additionally, 100% of sampled fish had arteriosclerotic lesions. The fish that strayed had similar lesion severity to those at the spawning grounds. These results suggest that coronary arteriosclerosis is prevalent in migrating sockeye salmon, and fish

with a reduced compact myocardium are less likely to make it to their spawning grounds, indicating a link for cardiac function and migratory success.

- Maiya Romero (She/her)- *Compositional comparison of ectoparasites on frugivorous bats along a human disturbance gradient in Monteverde, Costa Rica*
    - Authors: Maiya Romero, UCEAP Monteverde Institute

      Frugivorous bat presence and their inhabiting ectoparasites could prove to be bioindicators of the health of ecosystems and the impact humans play in bat health. Neotropical bats are known to play host to various families of ectoparasites and as ectoparasite presence is a product of the bat habitats both in roosting type and degree of fragmented forest, the composition of frugivorous Phyllostomidae was assessed. Along a human disturbance gradient, from high, intermediate, and low disturbance, frugivorous bat composition and coinciding ectoparasites were evaluated over a two-and-a-half-week period. Using mist nets, bats were caught and ectoparasites were collected using tweezers and then placed into vitals with 70% alcohol to preserve their bodies. The differences in ectoparasite quantity between genera and the likelihood of a host-specific relationship were evaluated to understand how the presence of ectoparasites affects populations along a disturbance gradient. Fifty- six frugivorous bats were caught in total and thirty-six were Sturnira. Sturnira also had the greatest number of ectoparasites, hosting seventy-five of the ninety-two collected. Ecosystems deemed to have low human disturbance had not only the greatest presence of frugivorous bats but also the greatest quantity of ectoparasites. Bat populations were greatest in locations of low disturbance, stressing the importance of the conservation of intact forests that serve as their habitats.
- Matthew Rosen, Nico Symons Galassi (He/him; He/him)-*Occurence of Organic UV Filters in the Sierra Nevada*
    - Authors: Matthew Rosen UCSB, Nico Symons Galassi UCSB, Tianqi Jia UCSB Bren, Dr. Weiwei Li UCSB Bren, Dr. Hillary Young UCSB EEMB, Dr. Arturo Keller UCSB Bren

      Sunscreens and other personal care products often contain active ingredients known as organic UV filters (UV-Fs), which prevent erythema and cellular damage or protect photosensitive compounds within the products. When UV-Fs are introduced to aquatic environments, they pose an ecotoxicological concern due to the effects they can produce. Especially noted has been UV-Fs' ability to cause coral bleaching, leading to Hawaiian legislature outlawing the sale of sunscreens containing two common UV-Fs.

      These compounds' physiochemical properties create a high risk for toxicity and bioaccumulation. Toxicity in aquatic organisms has been shown in various model fish, aquatic insects, protozoans, green algae, and daphnia, with bioaccumulation observed in fish, crustaceans, echinoderms, mollusks, and dolphins. Because of their demonstrated toxicity, a growing body of research is examining the occurrence of UV-Fs in marine environments. Freshwater rivers and lakes remain in need of UV-F detection-focused research, especially in areas such as alpine ecosystems where high levels of recreation can occur, as there is a potential risk for UV-F wash-off from visitors.

      In this study, we examined the occurrence of the common UV-Fs approved for use in the US at eleven different alpine to subalpine lake sites within the Sierra Nevada

Mountains. This study aimed to (A) examine the occurrence of UV-Fs in a previously unstudied environment and (B) see how recreational density affects total in-lake UV-F levels. Our work helps to better understand the presence of emerging anthropogenic chemical contaminants in sensitive alpine environments and the pathways of their introduction.

- Megan Sward and Amelia Fuentes (She/hers; She/hers)-*A study of territorial contests in kelp forest snapping shrimp*
    - Authors: Megan Sward, Amelia Fuentes, Patrick Green; UCSB EEMB

      Understanding how animals interact with conspecifics provides key insights into the role of animal behavior in ecology and evolution. One example of conspecific interactions is contests over access to resources such as food and territory. Winners of contests gain access to these limited and essential resources; therefore, contests can drive aspects of resource ecology–how individuals in populations utilize resources. Alpheus clamator, the "twistclaw" snapping shrimp, is abundant off of the Santa Barbara coast, living in kelp holdfasts and complex networks created by tubeworms. Although, in general, snapping shrimp contribute to undersea noise and act as important predators and prey, this species is incredibly understudied. Both sexes have enlarged claws that "snap" with bullet-like speeds, stunning prey and potentially crippling competitors. We studied contests between same-sex pairs of snapping shrimp to understand their contest behaviors and what factors determined the winners of contests. Our analyses are important to revealing how animals with potentially deadly weapons navigate competitive interactions and whether this species uses signals in aggressive contexts. The current study seeks to provide an insight into potential conflict resolution strategies and the implications of these behaviors on resource use and availability, as well as how this species functions in the ecology of coastal kelp forests.
- Nic Noel (Pronouns)-*Description of Skogsbergia sp.*
    - Authors: Nic Noel, UCSB

      This study presents the initial description of Skogsbergia sp., a previously undescribed species of Myodocopid Ostracod within the Cypridinidae family, collected off the Belize coast. Although bearing a close resemblance to Skogsbergia lerneri, Skogsbergia sp. demonstrates distinct genetic and morphological characteristics. Our research employs confocal microscopy, leveraging the natural autofluorescent properties of chitin within the organism's exoskeleton, to capture high-resolution imagery elucidating the morphology of each appendage. Additionally, light microscopy has been utilized to observe brooding females over time, enabling a detailed study of the embryogenesis and the quantification of sexual dimorphism concerning eye and body traits. This comprehensive approach offers new insights into the taxonomy and developmental biology of Skogsbergia sp., enriching our understanding of Ostracod biodiversity and evolution.
- Nicole Harris (She/her)- *Investigating circadian rhythm in the seed shrimp, Skogsbergia sp.*
    - Authors: Nicole Harris and Cheyenne McKinley, UCSB

Circadian rhythm, defined as physiological and behavioral changes occurring on a 24-hour cycle, is associated with many biological processes across the animal kingdom, including the human sleep-wake cycle, symbiotic circadian anemones, and diel vertical migration. Despite the abundance of circadian rhythm in the sea, the mechanisms underlying circadian rhythm in marine organisms are not well understood. Studies in model systems show that while circadian rhythms can be set and maintained by external stimuli (stimulus-controlled), they can also be maintained using an endogenous clock (clock-controlled). Circadian rhythm via diel vertical migration has been observed in Cypridinid ostracods but the mechanisms (stimulus-controlled or clock-controlled) have yet to be described. Here we seek to determine if Skogsbergia sp. has a circadian rhythm and if it's being maintained via a light stimulus or an endogenous clock. We will observe, over 72 hours, male ostracods maintained in a system of three separate treatments: an entirely dark treatment, an entirely light treatment, and a control treatment tank maintained on a 12-hours of daylight and darkness. Using infrared video recordings, we will measure the ostracod's activity to compare the light and dark treatments to the control treatment. The similarity between them indicates an endogenous clock, differences indicate stimulus-controlled, or both indicate a combination. The results of this work will have future implications in understanding breeding and feeding behavior under circadian rhythm. Additionally, the results will contribute to our understanding of how human effects will impact marine systems that rely on circadian rhythms, such as light pollution, global warming, and habitat destruction.

- Olivia Schroeder, Janna Ellman, and Eva Howell (She/her, She/her, She/her)- *Beneath the Surface: Investigating Aquatic Macroinvertebrate Disease Shedding Rates of Batrachochytrium dendrobatidis (Bd) Across Mountain Yellow-legged Frog Populations*
    - Authors: Olivia Schroeder, Janna Ellman, Eva Howell, Caitlin Nordheim-Maestas, Cherie Briggs

      Batrachochytrium dendrobatidis (Bd) is an incredibly lethal and contagious aquatic fungus threatening thousands of amphibians worldwide. Specifically, the endangered Mountain Yellow-Legged Frogs (MYL Frog) in the Eastern Sierra have been found to be susceptible to the chytrid fungus. Over the summer, our team went to the Eastern Sierra and surveyed benthic macro-invertebrates across three MYL Frog population categories: Bd persistent, recovering and Bd-naive sites. Dip-net sweeps at each site were done to determine the most abundant macro-invertebrates within the lake. Following, 20 of each of the most abundant macro-invertebrate types were placed in filtered water for the individual to potentially shed Bd into the water. These water samples were processed through DNA extraction, and quantitative PCR was run to quantify the amount of Bd released by each individual. A total of 650 water samples underwent testing for Bd, yielding two positive results. One was a black-fly larva and the other was an aquatic beetle. Both of these samples were taken from Bd persistent sites, Mulkey and Conness, emphasizing the possibility of macro-invertebrates in this system as possible vectors of the disease. From the samples processed so far, a low prevalence of Bd was found, however, this has significant implications in support of continuous research concerning fungal disease spread through invertebrates. The findings suggest that macro-invertebrates have the ability to shed Bd into the environment which

ultimately supports ongoing research about the relationship between invert host communities and the spread of Bd in vulnerable amphibian populations.

- Rachel Davis (She/her)- *Artificial light at night (ALAN) decreases the diel vertical migration of zooplankton in Cuajiniquil, Costa Rica*

  Authors: Rachel Davis, UCSB

  Every night, zooplankton undergo the largest daily migration of biomass on the planet, ascending through the ocean depths in a vital process known as diel vertical migration (DVM). Fueled by both exogenous light cues and endogenous rhythms, zooplankton actively synchronize their feeding and reproductive activity with this migration. Multiple studies recognize the absence of daylight as a trigger for DVM, ultimately resulting in greater upward swimming behavior by zooplankton throughout periods of darkness. Yet, the past few decades have brought on a dramatic increase in the presence of offshore and coastal developments, many of which utilize artificial light at night (ALAN). ALAN is a significant contributor to anthropogenic pollution, having been shown to decrease vertical migration of certain zooplankton and fish species on a large-scale basis in approximately 200 meters depth of open ocean in the Antarctic. This study quantifies the differences in diel vertical migration activity of copepods in naturally-lighted versus artificially-lighted marine environments in Cuajiniquil, Costa Rica. The data shows that significant differences exist in mean copepod abundance at nighttime in the surface waters of sites with varying amounts of artificial light at night, suggesting that the effects of ALAN persist on a small-scale basis in Neotropical coastal waters.

- Rachel Sasadeusz (She/her)- *Measuring Biodegradability of PHB in Seawater*
  - Authors: Rachel Sasadeusz (UCSB), Madison Cohen (UCSB), Roger P. Kelly (University of Rhode Island), Claire Thomas (University of Rhode Island), Justine B Albers (UCSB), Melissa Omand (University of Rhode Island), Alyson Santoro (UCSB)

    An estimated 8 million metric tons of plastic enters the ocean each year, disrupting ecosystems and harming wildlife. Biodegradable materials are currently being researched to solve this problem. However, many biodegradable plastics are not designed to break down in cold marine environments and little is known about their fate in oceanic conditions. Polyhydroxybutyrate (PHB) is a bioplastic made and degraded by bacteria with the potential to be completely converted into carbon dioxide and biomass rather than leave behind harmful microplastics. Closed-system laboratory incubations give us some understanding of this process, but poorly mimic conditions in the ocean. To better characterize PHB degradation in seawater, we developed a flowthrough incubation system to monitor the biodegradation of plastic materials. This system was designed with six channels, each holds a PHB object and has a valve to control the flow rate of fresh seawater. We can use this system to explore how different variables such as temperature, surface area to volume ratio, and bioplastic formula additives affect PHB degradation rates. Imaging of the flowthrough system captures real-time degradation and SEM (Scanning Electron Microscopy) pictures show biofilm formation and topography changes of PHB objects over time. By simulating ocean conditions, bioplastic

degradation can be better observed, ensuring that microplastics are not left behind and providing insight as to how this material is a sustainable alternative to conventional plastics.

- Sophia Kaplan and Ryan Tang (She/her; They/He)- *The Behavioral Ecology of Sunburst Anemones (Anthopleura sola)*
    - Nicolas Vinas, Simren Gupta; UCSB

        The rocky intertidal zone is a paradigmatic ecosystem where the land meets the sea. It holds a plethora of unique fauna that fill various niches, facilitating various interactions between biotic and abiotic factors. The intertidal sea anemone, Anthopleura sola, is abundant along the Southern California coastline, however, it has been little studied. We examine the ecology of intraspecific aggression among A. sola and how its behaviors influence biological organization at both the individual and population levels. To further understand how habitat-specific factors influence spatial distribution, we are investigating agonistic behaviors that may differ across two different habitats: cobble and bench. We define a cobble habitat as having loose cobblestone on its surface and a bench habitat as a flat, continuous rock substrate. Previous analysis of these habitats from Coal Oil Point, Santa Barbara County, California, suggests that the spatial distribution is influenced by environmental factors and other population-specific characteristics (e.g., density). This may affect behavioral traits. Research suggests that anemones from one habitat may compete more aggressively for resources, leading to a more uniform distribution. A comparative analysis of agonistic behaviors and dietary components are being conducted to better understand how resource availability influences spatial competition. With this information, our study can provide ways to better understand and mitigate impacts on intertidal ecosystems as we experience increasing environmental changes.
- Sasha Holland (She/her)- *Drought effects on cottonwood tree growth and physiology: which species are best suited for riparian habitat restoration?*
    - Authors: Sasha S. Holland, Kelly L. Kerr, Leander D.L. Anderegg, UCSB

        Cottonwoods are phreatophytic tree species that perform a number of essential ecosystem services in riparian habitats across North America. Anthropogenic climate change increases the likelihood of drought stress in riparian habitats, and this effect is seen dramatically in the southwestern United States. Historically, restoration efforts have utilized local seeds to repopulate degraded habitats, but these may be maladaptive to future climate conditions. Therefore, to understand which cottonwood populations/genotypes tolerate drought stress most effectively, we observed growth, survival, and phenotypic traits of fremont cottonwoods (Populus fremontii), black cottonwoods (Populus trichocarpa), and their naturally occurring hybrids planted in an experimental common garden adjacent to the Santa Clara river in southern California. The common garden includes cottonwood propagules that originated from multiple sites varying in climatic conditions, ranging from hot and dry to cool and wet, in the Santa Clara river watershed. We investigated the hypothesis that naturally occurring hybrid cottonwood species would be more tolerant to drought conditions because of their ability to adapt to a range of climate conditions based on their genetic diversity compared to the parent species. We measured leaf mass per area (LMA), canopy volume, and tree

mortality and compared differences between and within the species. In general, we found large interspecific and intraspecific differences in these measurements, which suggests that genetic diversity plays a role in growth and drought tolerance physiology. The results from this analysis are crucial for future local land management operations to restore riparian habitats in the face of continuous climate changes based on which cottonwood populations/genotypes are best suited physiologically to drought stresses.

- Shadoe Dewitt (He/him)-*Investigating variation in California condor parental investment*
    - Authors: Shadoe Neri-Dewitt - UCSB; Andrea Blackburn – Conservation and Science Department, Santa Barbara Zoo; Arianna Punzalan – Hopper Mountain National Wildlife Refuge, US Fish and Wildlife Service; Joseph Brandt - Ventura Fish and Wildlife Office, US Fish and Wildlife Service; Nadya Seal-Faith - Conservation and Science Department, Santa Barbara Zoo; David Meyer - Conservation and Science Department, Santa Barbara Zoo; Amy List – Hopper Mountain National Wildlife Refuge, US Fish and Wildlife Service; Nate Melling – Hopper Mountain National Wildlife Refuge, US Fish and Wildlife Service; Estelle Sandhaus - Conservation and Science Department, Santa Barbara Zoo

      This research project delves into the nesting behavior of California condors (Gymnogyps californianus) using in-field observations and video footage retrieved from field cameras positioned at nest sites (2007-2022). The study focuses on coding parental attendance, associated nesting behaviors (feeding, incubating, etc.), and the stage of chick development across 30-day intervals, aiming to examine the relationship between parental attendance and nest survival. Condor chick stage days were separated into four categories: 0-30, 30-60, 60-90, & 90-120 days. We examined whether parental attendance at different stage days were associated with differences in nest success using ANOVA tests. We found significant differences in nest survival and amount of parental attendance. Results were consistent across the 30-day intervals of chick development, suggesting that parental attendance is an important factor in nest survival. Also, the results were consistent across 30-day intervals of chick development showing that attendance is an important factor in nest survival. We subsequently examined whether total time parents spend attending nests (minutes) correlated with chick survival rates. Interestingly, the results showed that there was no statistically significant difference between the survival rates of nests based on the amount of parental investment. While the results may contradict intuitive assumptions, they provide valuable insights into the behavioral ecology of California Condors and contribute to the broader understanding of their nesting dynamics. Furthermore, these findings have implications for conservation strategies, emphasizing the importance of parental nest attendance in efforts to safeguard the California Condor.

- Sigal Plotkin (She/her)- *Detour-Reaching Task in Mantis Shrimp*
    - Authors: Sigal Plotkin, Patrick Green, University of California Santa Barbara

      The detour-reaching task has served as a vital tool in exploring a variety of cognitive abilities such as inhibitory control, social learning, insight, and route planning. The detour-reaching task is a cognitive test of an individual's ability to learn to navigate around a transparent barrier to access a reward. The nature of its simple design has

facilitated its inclusion in many large-scale comparative studies that explore evolutionary facets of inhibitory control. Despite the task's ecological validity and widespread use in comparative studies, almost all studies have focused on vertebrates, and especially primates. By contrast, invertebrate cognition remains underexplored. Our research aims to assess the ability of mantis shrimp to complete detour-reaching challenges and to investigate variation in individual performance. If personality traits, such as neophobia or boldness, affect how an individual interacts with their environment or processes information, this could directly affect performance in the detour-reaching task. Accordingly, our study will also examine the link between detour-reaching task performance and personality traits. Here, we detail the methods we have developed for this test and show preliminary data highlighting its potential to understand invertebrate cognition and personality.

- Sophia Delap (She/her)- *Evaluating Vegetation Cover across Southern California Foredunes to Inform Restoration*
    - Authors: Sophia Delap, Karina Johnston, UCSB

      Sandy coastlines of California are highly vulnerable to climate change impacts such as flooding, sea level rise, and storm erosion, especially coastal infrastructure within heavily urbanized communities. Coastal sand dunes are globally recognized for their potential to provide a nature-based adaptation approach that helps to buffer climate impacts. These approaches are known to provide multiple benefits and services and be more cost-effective as compared to 'traditional' hardscape solutions (e.g., seawalls). Dune restoration strategies differ based on their individual project objectives, from invasive vegetation removal (e.g., iceplant) to removing impacts such as driving and beach grooming (raking). Between July and September 2023, we surveyed restored coastal foredunes at 10 field sites in southern California that varied in age from 1-25 years. We conducted geomorphic and biological surveys of each restoration site using metrics including sand accretion, elevation, foredune and hummock formation, and vegetation cover. Native vegetation cover varied substantially across sites, with more established and older restoration projects generally having higher vegetation cover and taller dunes. Native dune plants that function as ecosystem engineers to trap sand, such as Abronia maritima (red sand verbena) and Ambrosia chamissonis (beach bur), dominated the foredune habitats and were associated with plant hummocks and foredune ridges. The results showed that sand-trapping vegetation and foredunes have the potential to support nature-based strategies to adapt to climate change along developed coastlines.
- Sylvia Li (She/her)- *Human activity as a driver of mosquito abundance in the Sierra Nevadas*
    - Authors: Sylvia Li, Stephanie Copeland, Matthew Rosen, and Hillary S. Young

      Mosquito populations in the alpine Eastern Sierra Nevadas can be vastly abundant, yet the reason for this abundance is not entirely understood. Despite the presence of native vertebrate hosts, their populations remain relatively low, and may not explain the abundance of mosquito populations in alpine areas. Instead, recreational activity in the Eastern Sierra may make humans the primary host for mosquitoes in these landscapes. For approximately six weeks in the summer of 2023, from July 15th to August

29th, we sampled mosquito populations repeatedly around 12 alpine lakes. We then sorted these samples, separating those that were gravid (blood-fed). Blood taken from gravid mosquitoes underwent Next Generation Sequencing and sequence analysis to determine host identification for the samples. We expect that humans will make up most of the blood samples we collected from mosquitos, highlighting our presence as important mosquito hosts in these otherwise host-limited ecosystems. With more study and seasonal replication, this blood meal analysis could act as an indicator of environmental health as human activity and interaction with the outdoors continue to increase.

- Lauren Rappa (She/her)- *Effects of Coastal Runoff on Pocillopora Coral Relationship with Trapezia Crab*
    - Authors: Lauren Rappa: University of California Santa Barbara EEMB, Julianna J Renzi: University of California Santa Barbara EEMB, Deron E Burkepile: University of California Santa Barbara EEMB, Alexander Primo: University of Georgia Odum School of Ecology, Joseph S Curtis: University of California Santa Barbara EEMB & University of Otago, Emma Holm-Olsen: University of California Santa Barbara EEMB, Craig W Osenberg: University of Georgia Odum School of Ecology, Adrian C Stier: University of California Santa Barbara EEMB

      Pocillopora corals have a mutualistic relationship with crabs in the genus Trapezia, which helps them thrive across a range of environmental conditions. Corals provide crabs with shelter and food in the form of a secreted mucus, while the crabs clean off harmful sediments and defend corals against predators. However, this relationship may break down under environmental stress if a stressor reduces benefits provided to crab mutualists. Increased nitrogen levels, common in areas with high coastal development, can disrupt the relationship between corals and their endosymbiotic algae, resulting in less carbon for corals. This decrease in energy for corals is hypothesized to make them less able to provide high quality food to their crab mutualists, which may change crab behavior and reduce crab services. We investigated the impact of anthropogenic nitrogen addition on the mutualism between Trapezia bidentata and Pocillopora corals to determine if nitrogen enrichment changes T. bidentata feeding behavior. To this end, we observed thirty-seven T. bidentata each in a tank with one nutrient enriched Pocillopora fragment, and one Pocillopora fragment kept in ambient seawater. We quantified the number of bites taken by T. bidentata in each trial, as well as the time spent on each fragment. Preliminary analyses suggest that T. bidentata primarily remained on one fragment throughout the trial period, perhaps prioritizing shelter to coral composition. However, crab feeding rates on nutrient enriched corals were lower than on non-enriched corals. Although further work is needed to confirm, nutrient enrichment may alter T. bidentata feeding behavior.
- Geoffrey Velloze (He/him)-*Analysis of RNA Folding for Inferring Evolutionary Relationships among Organisms*

- Authors: Geoffrey Velloze, Geary Cody, Luc Jaeger, UCSB

  Bioinformatics utilizes the sequence-based comparison of RNA chains to characterize the evolutionary relationship between organisms. However, this method does not take into account the functional aspect of RNA and how differences in sequences affect its three dimensional (3D) folding. Using a comparison of different ribosomal structures coming from the RCSB protein data bank, it is possible to compare the base pairs and their interactions in evolutionarily conserved RNA chains. Data can then be organized graphically to represent the distribution of each interaction within the RNA chains. Results from the data can be analyzed and the concluding phylogeny of the organisms can then be compared to known phylogenetic relationships derived from sequence-based analysis. The viability of this method is important as it can potentially be faster and more accurate in creating phylogenies. It also can shed light on the diversity of RNA 3D structure and how that differs across different species and domains of life.

5:20 PM **Awards/ Closing Remarks**