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Robert J Miller

Back to the top

Accomplishments

* What are the major goals of the project?

The Santa Barbara Coastal LTER (SBC LTER) is an interdisciplinary research and education program established in April 2000 with the goal of developing a predictive understanding of how environmental drivers interact with terrestrial and oceanic processes to alter material flows and influence the ecology of coastal ecosystems. SBC LTER's principal study domain is the semi-arid coast and nearshore waters of the Santa Barbara Channel in southern California, and its

diverse and productive marine forests of giant kelp (Macrocystis pyrifera) serve as the focal study ecosystem. Analyses of our long-term data have identified many of the environmental drivers and ecological processes underlying the production and community dynamics of kelp forests. Still to be determined are the ecosystem consequences of wave disturbance and fishing that alter the area and architecture of giant kelp forests, the processes that sustain kelp growth during warm, low nitrate conditions, the ecological and evolutionary consequences of kelp-induced changes in pH and dissolved oxygen, and the degree to which climate variability influences forest persistence and trophic subsidies to and from kelp forests. These and other unknowns form the basis of the overarching question that motivates our proposed research: "How do natural and human drivers influence giant kelp dynamics and alter the long-term structure and function of kelp forest ecosystems?". The research proposed to address this question is integrated in a conceptual framework that focuses on the causes and ecological consequences of the dynamics of a relatively short-lived foundation species in a setting of long-term climate change and human use, and is organized in three inter-related themes:

Theme 1 - Environmental drivers of kelp persistence and community structure

Theme 2 - Dynamic biophysical coupling in kelp forest ecosystems

Theme 3 - Spatial dynamics and connectivity of kelp forests and adjacent ecosystems.

* What was accomplished under these goals and objectives (you must provide information for at least one of the 4 categories below)?

Major Activities:

We continued collecting data for a core group of long-term integrated measurements with the goal of quantifying climate, disturbance, and inorganic and organic subsidies to and from giant kelp forests and their effects on kelp forest community structure, productivity and dynamics. Unfortunately, COVID restrictions made it impossible to collect data for 3 months, April-June 2020, but data collection resumed in July 2020 under a critical research exception granted by UCSB. Our annual data collection took place in July as usual. Other major activities for each research theme follow below.

Theme 1a. Community and ecosystem consequences of climate variability, disturbance and pathways of recovery

We are continuing to document community recovery after discontinuing the annual removal of giant kelp in our long-term disturbance experiment, and comparing community recovery and net primary production in plots where kelp had been experimentally removed on an annual basis for the previous nine years to those in control plots. We continued collecting and analyzing data from our ongoing 20-year kelp forest community time series at 11 reefs and used it to test the hypothesis that the stability of a marine foundation species, giant kelp, increased the stability of the aggregate biomass of the phylogenetically diverse assemblage of understory algae and sessile invertebrates that compete for space beneath the giant kelp canopy. We are currently deploying a new long-

term experiment to examine the role of giant kelp in mediating competition between sessile invertebrates and understory macroalgae using paired circular plots (8 m radius) of two treatments: kelp removal and control, with smaller manipulated plots embedded within. Sites have been chosen and natural stone slabs procured for use as relatively homogenous experimental plots to reduce variability due to substrate heterogeneity. Although deployment progress has been delayed due to COVID, we began deploying the first site in September and hope to complete all sites by Spring 2021.

Theme 1b. Ecological consequences of fishing

Quarterly sampling of community structure and NPP in experimental plots was continued at two reefs protected from fishing and three reefs unprotected from fishing. Densities of the extensively fished spiny lobster were assessed at these reefs and lobster fishing effort is being measured twice per month during the fishing season. Past SBC LTER lobster data along with spatial fisheries catch data has been analyzed to evaluate reserve effects on lobster populations and spillover to the fishery and results are in review. We also analyzed long term data from the Channel Islands National Park's kelp Forest Monitoring program to examine the effects of reserve protection on sea urchin populations and trophic cascades.

Theme 1c. Sources and utilization of recycled nitrogen

The uptake kinetics of urea, ammonium and nitrate by kelp was measured in a series of laboratory experiments to determine whether kelp has the capacity for surge uptake of recycled nitrogen that may have pulsed availability. Studies of the excretion rates of ammonium and urea from reef fish and invertebrates are being used to estimate the importance of this source over time and the effect of giant kelp on it, using data from the long-term kelp removal experiment.

Theme 2A. Effects of kelp on physical and chemical fluxes

We have augmented our long-term kelp forest sites at Mohawk (MK) and Arroyo Quemado (AQ) with additional physical and chemical sensors to quantify the residence time and carbonate chemistry of water within these two kelp forests for the duration of SBC IV. Operation of these instruments was maintained during the COVID research shutdown due to their status as essential infrastructure. We plan to estimate residence times through the MK and AQ kelp forests by evaluating the temporal lag of temperature changes inside versus outside the forests. Reviewers felt that two sites is not enough replication for this theme. We considered adding a third site, but ultimately decided to stick with 2 sites for 2 reasons: 1) the kelp forests change considerably over time, both seasonally and interannually, and therefore 2 sites should provide the range of variability in forest size and density that we need for generalization; and 2) instrumenting another site adequately would overstretch our inventory of instruments to the point of jeopardizing long-term data streams should instrument problems arise.

Theme 2b. Effects of kelp on the processing and fate of dissolved organic matter

We published quarterly measurements of microbial community structure on kelp across a spatial gradient from the center to the edge of the kelp forest. Microbial remineralization experiments are being conducted seasonally on DOM released directly from kelp, and on DOM that accumulates in the surface waters (within the kelp forest and up to 1000 m offshore) to determine degradation rates and bioavailability. We have begun using a new high-throughput system for measuring microbial respiration that has made these experiments much more tractable.

Theme 2c. Ecological and evolutionary consequences of kelp-induced changes in seawater chemistry

Gretchen

Theme 3a. Demographic connectivity and metapopulation dynamics of giant kelp

We continued monthly surveys at two long-term kelp forest sites, Mohawk reef and Arroyo Quemado, using monthly unmanned aerial vehicle (UAV) flights to characterize canopy dynamics on sub-meter scales (except for the three months when research was shut down due to COVID). Using this new high spatial resolution time series, we are identifying small-scale extinction events and relating local patterns of recolonization to connectivity and environmental factors. These surveys also mesh with the physical and chemical flux and kelp forest process studies conducted under Theme 2 at the same two sites. We have leveraged a different project funded by the DOE (PI Siegel) to acquire multispectral and hyperspectral sensors that are being used for these surveys and provide additional information about kelp tissue pigmentation, health and nitrogen content. Preliminary results were presented at the 2020 Ocean Sciences meeting in San Diego.

Theme 3b. Trophic connectivity between kelp forests and beaches

We continued measuring variation in macrophyte wrack subsidies, wrack consumers, beach conditions and birds on six beaches located near kelp forests. We developed protocols to include whole kelp plants in wrack cover measures to allow us to distinguish the relative contribution of kelp plants vs kelp fronds to beaches. We completed analyses of our experiments and field surveys of the effect of consumer diversity on the ecosystem function of wrack consumption and a manuscript on the results is in review. We conducted analyses of time series data on kelp forests, kelp wrack and wrack consumer populations for two SBC beaches where bimonthly data on kelp wrack consumers are collected. We analysed the results of a field study of the multifunctional responses of beach ecosystems to kelp subsidies along a strong gradient of drift kelp inputs.

Theme 3c. Trophic connectivity between the coastal ocean and kelp forests

Research during this reporting period focused on characterizing nearshore flows that transport coastal phytoplankton in the Southern California Bight using ROMS modeling and satellite-derived chlorophyll data. We plan to deploy SBC's Teledyne Webb G2 glider as a virtual mooring to quantify cross-shelf fluxes of suspended particles,

chlorophyll and DO concentrations offshore of the MK and AQ kelp forests starting in spring 2021.

Specific Objectives:

The specific objectives of each research theme are as follows:

Theme 1a. Community and ecosystem consequences of climate variability, disturbance and pathways of recovery

Test the prediction that more frequently disturbed kelp forests will have a more abundant and diverse assemblage of understory macroalgae and epilithic sessile invertebrates, and lower biomass of sea urchins and carnivorous invertebrates and fishes that use giant kelp for refuge or foraging habitat, using complementary comparative and experimental approaches.

Theme 1b. Ecological consequences of fishing

Experimentally investigate the effects of fishing on kelp forest structure and function using two of our long-term kelp forest study sites where fishing was banned in 2012 with the creation of marine protected areas (MPAs), and where we had been collecting data for a decade prior to MPA establishment.

Theme 1c. Sources and utilization of recycled nitrogen

Determine the extent to which the diel light cycle mediates the partitioning of the regenerated N supply between kelp and phytoplankton by quantifying the kinetics of regenerated N use by giant kelp and phytoplankton in light and dark in the laboratory and the field.

Theme 2a. Effects of kelp on physical and chemical fluxes

Attain a mechanistic understanding of how forest size and kelp density modulate the water entering a forest and its residence time within the forest as a basis for quantifying how kelp forests modify their physicochemical environment.

Theme 2b. Effects of kelp on the processing and fate of dissolved organic matter

Quantify remineralization rates of kelp-derived DOM and its accumulation along a spatial gradient from within the forest to the waters offshore of it to provide an estimate of DOM export and the amount of kelp DOM available to kelp forest food webs via the microbial loop.

Theme 2c. Ecological and evolutionary consequences of kelp-induced changes in seawater chemistry

Evaluate the potential for giant kelp to influence the eco-evolutionary dynamics of kelp forest metazoans by examining the consequences of kelp forests as modifiers of seawater properties including DO, pCO_2, pH and $CaCO_3$ saturation state (Ω).

Theme 3a. Demographic connectivity and metapopulation dynamics of giant kelp

Test how environmental factors and demographic connectivity via spore dispersal interact to control multiple components of kelp metapopulation dynamics, using unmanned aerial vehicle (UAV) flights to characterize canopy dynamics on sub-meter scales.

Theme 3b. Trophic connectivity between kelp forests and beaches

Determine the extent to which spatial and temporal variability in beach kelp wrack abundance and form (i.e., plants, fronds, blades) are synchronous with biomass fluctuations in nearby kelp forests, and examine how the timing, amount and form of wrack subsidy influence the community structure and ecosystem function of beaches.

Theme 3c. Trophic connectivity between the coastal ocean and kelp forests

Evaluate the delivery of phytoplankton to kelp forests, the processes responsible, and the response of sessile reef suspension feeders to this delivery and to different taxonomic groups of phytoplankton.

Significant Results:

Theme 1a. Community and ecosystem consequences of climate variability, disturbance and pathways of recovery

Results from analyses of our long-term kelp forest community data showed that the stability of understory algae and sessile invertebrates was positively and indirectly related to the stability of giant kelp, which primarily resulted from giant kelp's direct positive association with species richness. This study is among the first to show that dampened temporal fluctuations in the biomass of a foundation species is an important determinant of the stability of the complex communities it supports. (Lamy et al. 2020).

Theme 1b. Ecological consequences of fishing

In 2018 we quantified lobster biomass within two marine reserves, to test whether trap yield increased outside these reserves due to spillover. Results showed that catch per trap increased by 125–465% deep inside reserves, by 223–331% at sites ≤ 1 km outside reserve boundaries, and did not increase at control sites. This study is the first to demonstrate spillover benefits for the Southern California spiny lobster fishery. We also analyzed long term data from the Channel Islands National Park's kelp Forest Monitoring program to examine the effects of reserve protection on sea urchin populations and trophic cascades. Before-After-Control-Impact (BACI) analyses revealed that purple urchin populations were unaffected by the reserves, and red urchins significantly

increased in size and abundance in response to protection from fishing. Therefore, urchin numbers and biomass overall have increased inside the reserves, rather than decreased, and we found no evidence that giant kelp is positively affected by reserves. Manuscripts reporting results from both these studies are in review.

Theme 1c. Sources and utilization of recycled nitrogen

Offshore aquaculture of giant kelp has been proposed by the US Department of Energy for large scale biofuel production along the west coast of California, and we collaborated with a DOE-funded project to better characterize dissolved inorganic nitrogen in the SBC region. We used a combination of satellite sea surface temperature imagery, in situ measurements, and modeling to determine seawater nitrate fields across multiple spatial and temporal scales. We found that daily, 1 km spatial resolution nitrate products were most sufficient for identifying localized upwelling and areas of consistently high surface nitrate concentrations (Snyder et al. 2020).

Theme 2b. Effects of kelp on the processing and fate of dissolved organic matter

Microbial communities in kelp forests may be structured by the availability of kelp DOM, and characterizing patterns in the unique microbial communities associated with the kelp canopy is critical to developing a comprehensive understanding of the mechanisms shaping kelp forest microbiomes. Using 16S rRNA gene sequencing, we characterized the bacterial and archaeal communities associated with giant kelp at two LTER study reefs. Our results indicate that kelp-associated microbial communities are altered in the presence of epiphytic bryozoans and reflect changes previously observed in other studies of stressed macroalgae. This observation is indicative of patterns of microbiome disruption (dysbiosis) and opportunistic pathogenesis that may have implications for the health and productivity of foundational species of macroalgae (James et al. 2020).

Theme 2c. Ecological and evolutionary consequences of kelp-induced changes in seawater chemistry

We examined how the red sea urchin responds to abiotic stressors associated with ocean warming and acidification during its early development. Embryos of *M. franciscanus* were raised under combinations of two temperatures (13 °C and 17 °C) and two pCO_2 levels (475 µatm and 1050 µatm) that represent current and future coastal environments. Overall, we found that early development under elevated pCO_2 conditions may adversely impact *M. franciscanus* while moderate warming may improve growth and thermal tolerance (Wong and Hofmann 2020). Gene expression plasticity can confer physiological plasticity that affect organisms' responses to the environment. We explored the extent and molecular basis of intra- and intergenerational plasticity in the purple sea urchin by examining relationships between changes in DNA methylation, transcription, and embryo spicule length. Adult urchins were conditioned in the lab for 4 months to treatments that represent upwelling (∼1200 µatm pCO2, 13◦C) and non-upwelling conditions (∼500 µatm pCO2, 17◦C). We found plasticity in DNA methylation and gene

expression in response to different maternal environments and these changes have similarities across broad functional groups of genes; yet exhibit little overlap on a gene-by-gene basis. Our results suggest that different forms of environmentally induced plasticity are observable across different time scales and that DNA methylation dynamics may be uncoupled from fast transcriptional responses to the environment and whole organism traits (Strader et al. 2020). These laboratory studies provide insight into how transgenerational effects may function in nature.

Theme 3a. Demographic connectivity and metapopulation dynamics of giant kelp

We described a fully automated protocol to classify giant kelp canopy biomass across three Landsat sensors using LTER diver-estimated kelp biomass to validate each sensor and created a 34-year, seasonal time series of kelp canopy biomass across ~1500 km of California coastline. We then used this time series to examine the role of temporal and spatial scale on the detection of long-term biomass trends. We found that kelp canopy biomass trends are associated with trends in low frequency marine climate oscillations, like the North Pacific Gyre Oscillation. Long-term (~20 year) increases in the state of the North Pacific Gyre Oscillation have led to a cooler, nutrient-rich environment that benefits the growth of giant kelp across a large portion of the kelp biomass time series, however recent warming events have led to weak, or nonexistent trends over the length of the time series. The cyclical nature of these low frequency marine climate oscillations complicates the detection of trends that may be associated with anthropogenic climate change (Bell et al. 2020).We conducted a population genetic analysis of the stalked kelp, Pt*erygophora californica*, in the SBC region. The results were compared with previous LTER work on the genetic differentiation of giant kelp. We found that oceanographic transit time, habitat continuity, and geographic distance were all associated with genetic connectivity in *P. californica*, supporting similar previous findings for *M. pyrifera* (Hargarten et al. 2019).

Theme 3b. Trophic connectivity between kelp forests and beaches

Using long-term data on the elemental composition of kelp tissue from LTER study reefs, we found that nutritional quality (carbon:nitrogen) of giant kelp tissue declined; nitrogen content of giant kelp tissue declined by ~25%, while carbon content proportionally increased over a 17 year period. This decline in nutritional quality was associated with increasing seawater temperatures, upwelling as indicated by the Biologically Effective Upwelling Transport Index (BEUTI) and the North Pacific Gyre Oscillation (NPGO). Changes in kelp stoichiometry have important implications for nutrition and behavior of key consumers on beaches and in kelp forests. We investigated effects of intertidal consumer species diversity and identity on a key ecosystem function, consumption of beach-cast kelp wrack, by experimentally manipulating richness of six common species of invertebrate detritivores and conducting field assays of kelp consumption. Consumer richness had no effect on kelp consumption. Instead, species identity and body size of intertidal detritivores drove variation in kelp consumption rates. Both of these results are in review.

Key outcomes or Other achievements:

During the past year, SBC scientists and colleagues published 23 journal articles, and currently have two additional journal articles in press and two journal manuscripts in review. They also gave 26 presentations at scientific meetings. This year, SBC graduate students and postdocs were first authors on 12 journal articles and gave 11 papers at national conferences. SBC graduate students produced one doctoral dissertation. A complete list of SBC publications and presentations can be found at: https://sbclter.msi.ucsb.edu/publications. A total of 215 SBC datasets including time series and short-term studies are now in the SBC data catalog. Since Sept 2019, 6 datasets were newly added and 95% (35 out of 37) of the long-term time-series datasets were updated. A new SBC project website, https://sbclter.msi.ucsb.edu/, was designed and launched this year.

Foundation species structure communities, promote biodiversity, and stabilize ecosystem processes by creating locally stable environmental conditions. Despite their critical importance, the role of foundation species in stabilizing natural communities has seldom been quantified. In theory, the stability of a foundation species should promote community stability by enhancing species richness, altering the population fluctuations of individual species, or both. This year SBC investigators published a study using long term LTER kelp forest community data to test the hypothesis that the stability of a marine foundation species, giant kelp, increased the stability of the aggregate biomass of a phylogenetically diverse assemblage of understory algae and sessile invertebrates that compete for space beneath the giant kelp canopy. We showed that the stability of understory algae and sessile invertebrates was positively and indirectly related to the stability of giant kelp, which primarily resulted from giant kelp's direct positive association with species richness. The stability of all community types was positively related to species richness via increased species stability and species asynchrony. The stabilizing effects of richness were three to four times stronger when algae and invertebrates were considered separately rather than in combination. Our finding that diversity–stability relationships were stronger in communities consisting of species with similar resource requirements suggests that competition for shared resources rather than differential responses to environmental conditions played a more important role in stabilizing the community (Lamy et al. 2020). This study is among the first to show that dampened temporal fluctuations in the biomass of a foundation species is an important determinant of the stability of the complex communities it supports. SBC has continued to break ground on the use of remote sensing in coastal ecosystem science. This year SBC investigators led by Bell developed a fully automated protocol to classify giant kelp canopy biomass across three Landsat sensors. Combining multiple sensors necessitated the use of SBC time series of diver estimated kelp biomass to validate each sensor, as well as a novel gap filling technique using previous SBC results on spatial scales of kelp biomass synchrony to correct for missing data due to scan line corrector failure. These developments have led to a publicly available 34-year, seasonal time series of kelp canopy biomass across ~1500 km of California coastline. We then used this time series to reveal that kelp canopy biomass trends are associated with trends in low frequency marine climate oscillations, like the North Pacific Gyre Oscillation. The cyclical nature of these low frequency marine climate oscillations complicates the detection of trends that

may be associated with anthropogenic climate change. We concluded that a longer and continuous time series is needed to analyze long-term canopy biomass trends outside of natural low frequency climate variability for giant kelp ecosystems along the coast of California, if we are to make accurate assessments of the impacts of climate change, underscoring the importance of long term research in this dynamic system.

Other key research outcomes and achievements by SBC from the past year are listed in "Accomplishments".

* What opportunities for training and professional development has the project provided?

Education and training are tightly integrated into all aspects of SBC LTER research. During the past year (year 2 of SBC IV), 4 postdoctoral fellows, 30 graduate students, and 109 undergraduate students participated in SBC research and outreach activities. 13 graduate students were suppported by the project. Unfortunately, the COVID shutdown canceled our normal REU programs this summer. Normally, a number of SBC investigators and graduate students mentored REU students in the Global Change Biology program at UCSB as well as REUs funded by the project directly. UCSB undergraduates have a high propensity to get involved in sponsored research and SBC programs contribute substantially to this trend. In addition to gaining research experience, many undergraduates earn academic credit or receive monetary compensation for participating in SBC research as interns and honors students. This year 19 students participated in SBC's undergraduate research training program. Students in the program actively assist in the collection, processing and analysis of core data. In the first term, students read primary literature to gain a foundation in core research areas, key findings, current research objectives and methods of the SBC LTER. Next, students gain hands on laboratory and field research experience. Three of these students received highly competitive university awards in Spring 2020 including Raine Detmer-the Audrey Lynn Copeland Memorial Fund, Ivan Girling-the Outstanding Transfer Student Award and Hannah Ditzler- the Distinguished Senior Thesis Award. Post-graduation, many SBC student participants are accepted into graduate studies, begin careers in their field or obtain highly competitive internships.

The focus of SBC's mentoring and training of postdoctoral scientists is on providing them with strong interdisciplinary skills, professional development opportunities, and the experience, and support required for them to transition to career faculty positions. In addition to the specific training associated with the SBC project, postdoctoral scientists are mentored through grant proposal development and writing and the job application and interview process by SBC investigators and via access to UCSB's resources for postdoctoral scientists.

SBC graduate student and postdoctoral training are coordinated with several programs on the UCSB campus to promote opportunities for interdisciplinary graduate training in ecology, physiology, geology, geography, hydrology, oceanography, and coastal policy. This enables valuable cross-training on environmental issues pertaining to coastal ecosystems, provides a common language for communicating scientific information on these issues, and contributes to the creation of a diverse scientific community of students and postdocs that fosters respect and appreciation across disciplines. SBC graduate students and postdocs were first authors on x

journal articles and gave x papers at national conferences this year. This year two SBC graduate students completed their PhD degrees and one completed an MS. Seminars hosted by SBC faculty, the SBC Annual All Scientist Meeting and SBC workshops on key research themes served to engage SBC graduate students in the culture and diverse research offered by SBC.

Opportunities for training in public education and student mentoring arise from SBC's partnership with UCSB's teaching aquarium, the REEF, which is also designed to provide UCSB undergraduates majoring in Aquatic Biology with training in communicating their marine ecology knowledge. The REEF features SBC LTER research and provides a wide range of training and professional development opportunities. A total of 52 undergraduate interns were trained in this rigorous and pedagogically sound program this year. The REEF also serves as a teaching facility for UCSB courses in Earth Sciences, Ecology Evolution & Marine Biology, English and Teacher Ed programs through the Gevirtz Graduate School of Education and for many area colleges including Cal Lutheran University, California State University Channel Islands, and local community colleges. One of the joint goals of the SBC LTER and the REEF programs is to provide UCSB undergraduates majoring in Aquatic Biology, with a solid foundation in marine ecology and research. REEF training provides them with the basis for communicating this knowledge in an educational format. To that end, The REEF develops its *Oceans-to-Classrooms* curriculum around a number of research programs at UCSB and SBC LTER is the most significant contributor to this endeavor. Support from the SBC Schoolyard LTER program has allowed the REEF to obtain teaching supplies and equipment for curriculum as well as provide salaries for professional staff and undergraduate internships. SBC graduate students, research staff, and post-docs also train REEF interns, which, in turn, enhances their training as laboratory and field assistants and research divers for SBC research.

* Have the results been disseminated to communities of interest? If so, please provide details.

SBC's Schoolyard LTER (sLTER) program is organized around a theme of kelp forest ecology in the context of the SBC LTER. Curriculum is developed for, and delivered through, UCSB's Marine Science Institute's Research Experience & Education Facility (REEF) and its Oceans-to-Classrooms (O 2 C) curricula. We focus on long-term connections with local, regional and state schools through partnerships that include both on, and off, campus programs. Our approach supports an integrated program that spans academic year activities, as well as summer programs, and includes undergraduate and graduate students, K-12 teachers and students, the UC Community and the general public. SBC LTER-based curriculum is rich in STEM content and meets Next Generation Science Standards (NGSS), Common Core State Standards, as well as NOAA's Climate, and Ocean, Literacy Principles.

2020 proved to be a very challenging year given the impacts due to the novel coronavirus. By the end of Winter Quarter 2020 (March), Oceans-To-Classrooms and the REEF had already served almost 12,700 visitors through our on-campus programs, outreach visits to schools, and community events. This included visits by primary and secondary schools from numerous southern, and central, California counties. Additionally, we served students from Taiwan. During that period, sLTER specific program content reached almost 7,000 students in grades PreK-12. Additionally, On-campus efforts communicated SBC research to UCSB undergraduate

and graduate students through training and UCSB courses and labs. We continue to develop and adapt marine science lesson plans that engage students with learning about the local marine environment in the context of the SBC LTER. These lessons incorporate ongoing SBC research and include working with SBC data. The program is developed to build student's skills in scientific literacy through activities that move from structured or guided investigation to open-ended inquiry and experimentation. It also includes a combination of school-based activities, field trips, and on-campus experiences that immerse students in the environment of a college campus.

While we had to cancel all in-person programs, both on-, and off-, campus, after some strategic planning we were able to develop remote content and utilize live, distance learning strategies to continue to deliver SBC-sLTER content through Spring and Summer! This included the creation of "The VirtualREEF" YouTube Channel, and developed the infrastructure necessary to deliver live content in the REEF Aquarium. The VirtualREEF had 3,068 views, and we shared the science and critters of the SBC with 48 (1,248 K-12 students) different schools and groups. Not only were we able to continue to support local teachers but, because we were doing it online, we delivered SBC sLTER to students in Chicago, Costa Rica and Colombia! We also participated in UCSB's Online Orientation Zoom Webinar and introduced the SBC, and MCR, LTER to over 500 incoming freshmen.

1. Focused sLTER Programming:

This year, sLTER continued to focus on partnership programs, 1) the American Association of University Women's (AAUW): Tech Trek Program, and 2) Santa Barbara County Education Office (SBCEO) .

We have been using the science of the SBC to support Tech Trek for the past 13 years. Teck Trek is an on-campus residential science and math summer program designed to develop interest, excitement and self-confidence in young women entering the eighth grade. Tech Trek is part of an interdisciplinary partnership involving science, technology, engineering, and math departments at UCSB through the Office of Education Partnerships (OEP). The goal of OEP is to build college-going communities that improve student learning, increase college-going rates in underrepresented populations, and provide equal access to higher education for California's diverse students. Although the camp was cancelled this year due to the pandemic, we were invited to participate in a virtual, online camp hosted by the Tech Trek Alumni Group (TTAG). We introduced 65 middle school girls to the SBC LTER through a live Zoom in the REEF, exploring the ecology of the kelp forests studied by the SBC LTER, as well as a live, math-based activity that explored plankton, and the role they play in structuring the ecosystems of the SBC.

SBC LTER's partnership with O 2 C and the REEF completed another very successful year in teacher professional development, as well as academic support in participant classrooms. We remain committed to equipping educators with the tools they need to teach ocean and environmental science, foster science literacy, and cultivate the next generation of ocean stewards. We have continued developing a significant relationship with the UCSB Learning Centers. While last year's PD worked with teachers in the Santa Barbara Unified School

District, this year, through a strategic new partnership with the Santa Barbara County Education Office (SBCEO), we were able to work with K-8 teachers on their science content knowledge all developed around the SBC-LTER. This included the use of the "Golden Forest" (SBC's contribution to the LTER Children's Book Series), with each of the 25 teachers receiving a copy.

Through a collaboration with Xochitl Clare, a graduate student of SBC Co-Investigator Dr. Gretchen Hofmann, we hosted, albeit virtually, the second annual REEFlections. REEFlections is symposium that provides an opportunity for undergraduates, who work, both at the REEF, and in a research lab, under a graduate student, or post-doc, mentor to communicate that work to UCSB Faculty, Staff and Students, as well as invited community members.

All of this would not have been possible without the help of the 52 UCSB undergraduate students who assist in running the REEF Aquarium and developing and delivering the content. Many of them were also serving as lab assistants and techs in the SBC and MCR labs. Even with the impact of the coronavirus, 25 interns continued to support our efforts in developing and delivering the SBC sLTER!

SBC in the News:

The health of foundation species, like giant kelp, promotes the stability of the ecosystems that depend on them

https://www.news.ucsb.edu/2020/019772/strong-foundation

https://www.futurity.org/foundation-species-ecosystems-giant-kelp-2268582-2/

https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=299959

UCSB researchers will investigate kelp restoration

https://www.news.ucsb.edu/2020/019962/kelp-help

SBC scientist leads new research network focused on coastal California

https://www.news.ucsb.edu/2020/019990/collaborative-approach

UCSB Scientists find different ways to remain productive as COVID-19 disrupts everyday life

https://www.news.ucsb.edu/2020/019865/remote-research-solutions

New multidisciplinary study at UCSB takes the long view of Santa Barbara coastline vulnerability and provides options for adaptation

https://www.news.ucsb.edu/2019/019646/preparing-future

27-Year Monitoring Project Reveals Regional Effects of ENSO on Sea Urchin Settlement

https://msi.ucsb.edu/news/27-year-monitoring-project-reveals-regional-effects-enso-sea-urchin-settlement

Re-examining Remote Kelp Forests After 45 Years

https://dailynexus.com/2020-04-09/re-examining-remote-kelp-forests-after-45-years/

Rising sea levels threaten California beaches.

https://www.sacbee.com/opinion/california-forum/article239108593.html#storylink=cpy

* What do you plan to do during the next reporting period to accomplish the goals?

We will continue research, education and outreach activities as planned. Due to the COVID situation, online meetings have become the norm, and we are successfully remaining connected as collaborators and mentors. Unfortunately, hands-on research activities, particularly for undergraduates, have gotten curtailed in the past few months. These should gradually come back during the remainder of 2021; the University is not allowing undergraduates back in the lab and field with precautionary measures in place.

Back to the top

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- L. Kui (2020). *Generating EML using Excel-to-EML tool*. ESIP Annual Meeting. Online. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- L. Kui and M.C. O'Brien (2020). *Get Your Data into a Repository*. ESA Annual Meeting . Online. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- D. Catlett and D.A. Siegel and C.A. Carlson and P.G. Matson and E.K. Wear and M.D. Iglesias-Rodriguez (2020). *Integrating high-throughput sequencing observations into remotely sensible phytoplankton functional type determinations*. Ocean Sciences Meeting . San Diego, CA, US. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Libe Washburn and Paul Matson and Chris Gotschalk and David Siegel and Debra Iglesias-Rodriguez (2018). *Interpreting phytoplankton bloom development using high-frequency radar and satellite ocean color imagery (Poster)*. American Geophysical Union. Washington, D.C., US. Status = OTHER; Acknowledgement of Federal Support = Yes
- Strader, M.E. and G.E. Hofmann (2019). *Intra- and transgenerational plasticity of DNA methylation in the purple sea urchin, Strongylocentrotus purpuratus*. ASLO 2019 Aquatic Sciences Meeting. San Juan, Puerto Rico . Status = OTHER; Acknowledgement of Federal Support = Yes
- Leach TS and GE Hofmann (2019). *Investigating the role of maternal conditioning on offspring performance and DNA methylation patterns in the purple sea urchin*. ASLO 2019 Aquatic Sciences Meeting. San Juan, Puerto Rico . Status = OTHER; Acknowledgement of Federal Support = Yes
- Jenifer E Dugan (2018). *Life on a sandy edge: conserving beach ecosystems in the face of rising seas*. 9th National Summit on Coastal and Estuarine Restoration and Management. Long Beach, CA. Status = OTHER; Acknowledgement of Federal Support = Yes
- Castorani, M.C.N. and Reed, D.C. and Miller, R.J (2018). *Loss of foundation species: disturbance frequency outweighs severity for kelp forest biodiversity*. LTER All Scientists' Meeting. Pacific Grove, CA. Status = OTHER; Acknowledgement of Federal Support = Yes
- Castorani, M.C.N. and Reed, D.C. and Miller, R.J (2019). *Loss of foundation species: disturbance frequency outweighs severity in structuring kelp forest communities*. 12th International Temperate Reef Symposium. Hong Kong. Status = OTHER; Acknowledgement of Federal Support = Yes
- M.C.N. Castorani and D. Wilcox and T.W. Bell and K. Kaufman (2019). *Mapping SAV and coastal habitats: drones and other recent technologies*. 25th Biennial Conference of the Coastal & Estuarine Research Federation. Mobile, AL, US. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- K.A. Emery and J.E. Dugan and R.J. Miller and D.M. Hubbard and J.C. Ohlmann (2019). *Marine wrack subsidies drive sandy beach community structure and ecosystem function*. 25th Biennial Conference of the Coastal & Estuarine Research

Federation. Mobile, AL, US Nov 2019. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

- K.C. Cavanaugh (2020). *Natural history from above: confronting the problem of pattern and scale in ecology with remote sensing*. 100th Western Society of Naturalists Annual Meeting. Ensenada, Mexico. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Libe Washburn and Brian Emery and A. Kirincich and Chris Gotschalk (2019). *Near-shore eddies detected by HF radar and their effects on kelp forest ecosystems*. Radiowave Oceanography Workshop. Victoria, BC, Canada. Status = OTHER; Acknowledgement of Federal Support = Yes
- T.W. Bell and D.A. Siegel (2020). *Nutrient availability and programmed senescence spatially structure the dynamics of an cosystem engineer*. Ocean Sciences Meeting. San Diego, CA, US. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Dugan, JE and DM Hubbard and B Joab and NK Schooler and KE Emery and B Duke (2018). *Oil Spills on Sandy Beaches: Population responses of intertidal talitrid amphipods to the Refugio Beach Oil Spill, Santa Barbara County 2015*. SETAC North America 39th Annual Meeting. Sacramento, CA. Status = OTHER; Acknowledgement of Federal Support = Yes
- C. Swan and E.R. Sokol andN.I. Wisnoski and R. Andrade and M.C.N. Castorani and A. Compagnoni and A. Cooper and T. Lamy and N.K. Lany and L. Marazzi and S. Record and J. Tonkin and N. Voelker and P.L. Zarnetske (2019). *Patterns and drivers of stability in long-term metacommunity data*. International Long Term Ecological Research Network 2nd Open Science Meeting. Leipzig, Germany. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- N.I. Wisnoski and E.R. Sokol and R. Andrade and M.C.N. Castorani and C.P. Catano and A. Compagnoni and T. Lamy and N.K. Lany and L. Marazzi and S. Record and A.C. Smith and C.M. Swan and J. Tonkin and N. Voelker and P.L. Zarnetske (2019). *Patterns and drivers of stability in long-term metacommunity data*. 104th Annual Meeting of the Ecological Society of America. Louisville, KY. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- T.W. Bell (2020). *Patterns and dynamics in spatially explicit ecological systems*. Society Industrial & Applied Mathematics: Mathematics of Planet Earth. Garden Grove, CA, US. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Joab, B and JE Dugan and DM Hubbard and B Duke and R Donohoe and G Baker (2018). *Polycyclic aromatic hydrocarbon uptake in three sandy beach invertebrate tissue types and porewater with corresponding forensic matches to source oil following the Refugio Beach Oil Spill, Santa Barbara County, 2015*. SETAC North America 39th Annual Meeting. Sacramento, CA. Status = OTHER; Acknowledgement of Federal Support = No
- J.E. Dugan and D.M. Hubbard and K.A. Emery and R.J. Miller and J.C. Ohlmann and J.M. Madden (2019). *Quantifying ecological responses to trophic connectivity between kelp forests and sandy beaches*. 25th Biennial Conference of the Coastal & Estuarine Research Federation. Mobile, AL, US Nov 2019. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Dugan JE and DM Hubbard and KE Emery and R Miller and C Ohlmann and J. Madden (2018). *Quantifying ecological responses to trophic connectivity between sandy*

beaches and kelp forests (poster). LTER All Scientists' Meeting. Pacific Grove, CA. Status = OTHER; Acknowledgement of Federal Support = Yes

- Jenifer E Dugan (2018). *Santa Barbara Coastal LTER and Climate Change*. LTER All Scientists' Meeting. Pacific Grove, CA. Status = OTHER; Acknowledgement of Federal Support = Yes
- Jenifer E Dugan (2018). *Santa Barbara Coastal LTER: Organic Matter at the Sea & Sand Interface*. LTER All Scientists' Meeting. Pacific Grove, CA. Status = OTHER; Acknowledgement of Federal Support = Yes
- K.C. Cavanaugh (2020). *Satelite mapping of giant kelp*. Commercial Kelp Harvest South of Pt. Montara Science Forum. Online. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- M.R. Cornish and K.A. Emery and J.E. Dugan and R.J. Miller and D.M. Hubbard (2019). *Secondary production of intertidal consumers on sandy beaches*. 25th Biennial Conference of the Coastal & Estuarine Research Federation. Mobile, AL, US. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Clare, X. and G.E. Hofmann (2019). *Snails on the menu? Using long-term ecological data to contextualize performance of a California kelp forest predator and emerging fishery species, K. kelletii.*. World Congress of Malacology. Monterey, CA. Status = OTHER; Acknowledgement of Federal Support = Yes
- Bisson, K. and S. Kramer and A. Fischer and D. Catlett and J. Allen and D. Siegel (2018). *Spatial patterns and optical analysis of wildfire-derived ash in the Santa Barbara Channel (poster)*. XXIV Ocean Optics Conference . Dubrovnik, Croatia. Status = OTHER; Acknowledgement of Federal Support = Yes
- Castorani, M.C.N. and T.W. Bell and L.W. Sheppard and J.A. Walter and D.C. Reuman (2019). *Spatial synchrony in giant kelp metapopulations: patterns, scales, and drivers*. 104th Annual Meeting of the Ecological Society of America. Louisville, KY. Status = OTHER; Acknowledgement of Federal Support = Yes
- K.C. Cavanaugh and D.C. Reed and T.W. Bell and M.C.N. Castorani and R. Beas-Luna (2020). *Spatial variability in the resistance and resilience of giant kelp in southern and Baja California to a multi-year heatwave* . Ocean Sciences Meeting . San Diego, CA, US. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- T. Lamy and S. Wang and D. Renard and D.C. Reed and R.J. Miller (2019). *Species insurance trumps spatial insurance in stabilizing biomass of a marine macroalgal metacommunity*. International Long Term Ecological Research Network 2nd Open Science Meeting. Leipzig, Germany. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- L. Kui and K.L. Vanderbilt and J.H. Porter (2020). *Streamline QA/QC for observational data*. ESA Annual Meeting. Online. Status = PUBLISHED; Acknowledgement of Federal Support = Yes
- Libe Washburn (2019). *The evolving role of surface-current measuring radar in coastal oceanography: New observations and technology developments*. Gordon Research Conference on Coastal Ocean Dynamics. Manchester NH. Status = OTHER; Acknowledgement of Federal Support = Yes
- Cavanaugh, K.C. and Bell, T. W. and J.G. Allen and D.A. Siegel (2018). *Three decades of variability in California's giant kelp forests from the Landsat satellites (poster)*. AGU

Fall Meeting. Washington DC. Status = OTHER; Acknowledgement of Federal Support = Yes

Other Products

Other Publications

Patent Applications

Technologies or Techniques

Thesis/Dissertations

- Fitzgerald, SP. *Collaborative Research and Data-Limited Assessment of Small-Scale Trap Fisheries in the Santa Barbara Channel*. (2019). UC Santa Barbara. Acknowledgement of Federal Support = No
- Emery, B.. *Improved Methods for Oceanographic High Frequency Radars*. (2019). Mechanical Engineering, UC Santa Barbara. Acknowledgement of Federal Support = Yes
- Wong, J. *Investigating the Response of Sea Urchin Early Developmental Stages to Multiple Stressors Related to Climate Change*. (2019). UC Santa Barbara. Acknowledgement of Federal Support = Yes
- Yorke, CE. *Kelp as a trophic resource to reef food webs*. (2019). UC Santa Barbara. Acknowledgement of Federal Support = Yes
- Lowman, H.E.. *Nutrient and organic matter cycling in the nearshore ocean and marine sediment of the Santa Barbara Channel.*. (2020). University of California, Santa Barbara. Acknowledgement of Federal Support = Yes

Websites or Other Internet Sites

- *Santa Barbara Coastal LTER Website*
  https://sbclter.msi.ucsb.edu/

  This is the new website for the Santa Barbara Coastal LTER which was completed and launched in December 2019. The new website uses recent technology and leverages LTER Network resources. Several primary improvements are included: 1. the frequently updated website content is stored and managed using a back-end database that allows centralized information management. 2. The website hosts a local data catalog and its customized metadata viewer pages that mirror to the EDI repository; and 3. The security and accessibility of the website have been greatly improved using Hypertext Transfer Protocol Secure (HTTPS) instead of HTTP.

Back to the top

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Miller, Robert	PD/PI	6
Hofmann, Gretchen	Co PD/PI	1
Reed, Daniel	Co PD/PI	2
Siegel, David	Co PD/PI	1
Stier, Adrian	Co PD/PI	1
Bell, Tom	Co-Investigator	1
Brzezinski, Mark	Co-Investigator	1
Burkepile, Deron	Co-Investigator	1
Carlson, Craig	Co-Investigator	1
Castorani, Max	Co-Investigator	1
Cavanaugh, Kyle	Co-Investigator	1
Dugan, Jenifer	Co-Investigator	3
Eliason, Erika	Co-Investigator	1
Guerrini, Anita	Co-Investigator	1
Iglesias-Rodriguez, Debora	Co-Investigator	1
Lenihan, Hunter	Co-Investigator	1
MacIntyre, Sally	Co-Investigator	1
Melack, John	Co-Investigator	2
Moeller, Holly	Co-Investigator	1
Nidzieko, Nicholas	Co-Investigator	1
Ohlmann, J Carter	Co-Investigator	1
Okamoto, Daniel	Co-Investigator	1
Page, Henry	Co-Investigator	1
Rassweiler, Andrew	Co-Investigator	1
Santoro, Alyson	Co-Investigator	1
Schroeter, Stephen	Co-Investigator	1
Washburn, Libe	Co-Investigator	1
Wilbanks, Elizabeth	Co-Investigator	1
Benitez-Nelson, Claudia	Faculty	1
Herman, Gema	Postdoctoral (scholar, fellow or other postdoctoral position)	1
James, Anna	Postdoctoral (scholar, fellow or other postdoctoral position)	6

Name	Most Senior Project Role	Nearest Person Month Worked
Lamy, Thomas	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Smith, Jason	Postdoctoral (scholar, fellow or other postdoctoral position)	0
Strader, Marie	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Yorke, Christie	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Gotschalk, Chris	Other Professional	2
Hubbard, David	Other Professional	1
O'Brien, Margaret	Other Professional	3
Simon, Scott	Other Professional	6
Beresford, Laura	Technician	1
Doheney, Brandon	Technician	0
Dubel, Alexandra	Technician	0
Guillocheau, Nathalie	Technician	1
Halewood, Eliza	Technician	2
Halewood, Stuart	Technician	4
Harrer, Shannon	Technician	1
Jones, Janet	Technician	6
Meyerhof, Matthew	Technician	0
Nelson, Clint	Technician	12
Ogawa, Jacob	Technician	6
Opalk, Keri	Technician	1
Purzer, Frankie	Technician	1
Romero, Eduardo	Technician	1
Salazar, David	Technician	3
Sampson, Sarah	Technician	7
Shea, Briette	Technician	1
Snyder, Jordan	Technician	1
Kui, Li	Staff Scientist (doctoral level)	8
Bogan, Samuel	Graduate Student (research assistant)	8
Bui, An	Graduate Student (research assistant)	1
Catlett, Dylan	Graduate Student (research assistant)	9
Cavanaugh, Katherine	Graduate Student (research assistant)	3
Cedano, Tiffany	Graduate Student (research assistant)	6
Chamorro, Jannine	Graduate Student (research assistant)	1

Name	Most Senior Project Role	Nearest Person Month Worked
Clare, Xochitl	Graduate Student (research assistant)	3
Difiore, Bart	Graduate Student (research assistant)	1
Doman, Natalie	Graduate Student (research assistant)	1
Eegholm, Nathalie	Graduate Student (research assistant)	3
Emery, Kyle	Graduate Student (research assistant)	3
English, Chance	Graduate Student (research assistant)	1
Esaian, Sevan	Graduate Student (research assistant)	3
Fitzgerald, Sean	Graduate Student (research assistant)	0
Hardison, Emily	Graduate Student (research assistant)	1
Huynh, Nicholas	Graduate Student (research assistant)	1
Kozal, Logan	Graduate Student (research assistant)	6
Kraskura, Krista	Graduate Student (research assistant)	6
Leach, Terence	Graduate Student (research assistant)	1
Lowman, Heili	Graduate Student (research assistant)	10
Madden, Jessica	Graduate Student (research assistant)	1
Malakhoff, Katrina	Graduate Student (research assistant)	1
McDonald, Adriane	Graduate Student (research assistant)	1
Michaud, Kristen	Graduate Student (research assistant)	1
Peters, Joey	Graduate Student (research assistant)	4
Sugano, Cailan	Graduate Student (research assistant)	12
VanderZee, David	Graduate Student (research assistant)	1
Welch, Zoe	Graduate Student (research assistant)	1
Wong, Juliet	Graduate Student (research assistant)	1
Zenteno, Jose	Graduate Student (research assistant)	1
Adamson, Carter	Undergraduate Student	0
Aguila, Zoe	Undergraduate Student	0
Aguilera, Andrea	Undergraduate Student	1
Ajina, Alia	Undergraduate Student	1
Amundsen, William	Undergraduate Student	0
Anderson, Ellyse	Undergraduate Student	0
Anderson, Claire	Undergraduate Student	1
Andrada, Nico	Undergraduate Student	1
Anujarerat, Stephanie	Undergraduate Student	1
Aplin, Ally	Undergraduate Student	2
Atkins, Micaiah	Undergraduate Student	1
Bagla, Anshika	Undergraduate Student	0

Name	Most Senior Project Role	Nearest Person Month Worked
Bakhdanyan, Alex	Undergraduate Student	1
Baldwin, Daniel	Undergraduate Student	0
Ballard, Cassidy	Undergraduate Student	1
Barton, Tyler	Undergraduate Student	1
Bawa, Simran	Undergraduate Student	0
Becker, Megan	Undergraduate Student	1
Beltran, Nelson	Undergraduate Student	1
Blasco, Gordon	Undergraduate Student	0
Boborci, Madigan	Undergraduate Student	1
Boyle, Sarah	Undergraduate Student	2
Bradley, Tori	Undergraduate Student	1
Brown , Maddie	Undergraduate Student	1
Bruggemann, Thea	Undergraduate Student	1
Bryant Williams, Dominique	Undergraduate Student	0
Cajilig-McDonald, Lauren	Undergraduate Student	0
Cam, Jefferson	Undergraduate Student	0
Campbell, Chandler	Undergraduate Student	0
Cantrell, Zach	Undergraduate Student	1
Chan, Iris	Undergraduate Student	1
Chen, Jamie	Undergraduate Student	1
Childs, Jeffrey	Undergraduate Student	0
Clarke, Madison	Undergraduate Student	1
Colucci, Makenna	Undergraduate Student	1
Combs, Annie	Undergraduate Student	0
Cook, Kassandra	Undergraduate Student	1
Cowan, Sarah	Undergraduate Student	1
Culpepper, Peter	Undergraduate Student	0
Curry, Stephen	Undergraduate Student	0
Daniel, Tyler	Undergraduate Student	2
Deardorff, Ella	Undergraduate Student	1
Deas, Evan	Undergraduate Student	1
Delmarsh, Ila	Undergraduate Student	1
Deng, Junyu	Undergraduate Student	1
Deyana, Gorman	Undergraduate Student	0
Dezzani, Alecia	Undergraduate Student	2

Name	Most Senior Project Role	Nearest Person Month Worked
Ditzler, Hannah	Undergraduate Student	4
Dorji, Shey	Undergraduate Student	1
Dugan, Emmaline	Undergraduate Student	0
Dyck, Taylor	Undergraduate Student	1
Ear, Jenny	Undergraduate Student	0
Elbayar, Samantha	Undergraduate Student	1
Ellman, Samantha	Undergraduate Student	0
English, Torreyann	Undergraduate Student	1
Evans, Thomas	Undergraduate Student	1
Fyfe, Caroline	Undergraduate Student	0
Gallagher, Jordan	Undergraduate Student	0
Galles, Charlie	Undergraduate Student	1
Galvan, Journ	Undergraduate Student	0
Garcia, Diana	Undergraduate Student	0
Garcia, Delaney	Undergraduate Student	1
Garoufalias, Nikko	Undergraduate Student	1
Girling, Ivan	Undergraduate Student	1
Goldston, Aiko	Undergraduate Student	0
Gonzales, Elise	Undergraduate Student	0
Gording, Tess	Undergraduate Student	1
Gorgas, Maya	Undergraduate Student	0
Gray, Ciara	Undergraduate Student	1
Greenslade, Annie	Undergraduate Student	1
Hakanson, Alexander	Undergraduate Student	1
Hargrove, Lindsey	Undergraduate Student	0
Hascall, Emily	Undergraduate Student	1
Hausrath, Isabel	Undergraduate Student	0
Hernandez, Marisol	Undergraduate Student	0
Hill, Allison	Undergraduate Student	1
Holbrook, Jack	Undergraduate Student	0
Hopper, Brandon	Undergraduate Student	1
Huang, Paul	Undergraduate Student	1
Iskander, Joshua	Undergraduate Student	0
Jawetz, Sean	Undergraduate Student	0
Jennings, Lauren	Undergraduate Student	1
Johnson, Lucy	Undergraduate Student	0

Name	Most Senior Project Role	Nearest Person Month Worked
Jones, Steven	Undergraduate Student	1
Jonie, Garcia	Undergraduate Student	0
Juengling Bean, Eva	Undergraduate Student	1
Katsiouleris, Dimitri	Undergraduate Student	1
Katsiovleris, Dimitri	Undergraduate Student	0
Kaur, Sami	Undergraduate Student	0
Keeling, Lukas	Undergraduate Student	2
Kelton, Allison	Undergraduate Student	1
Kern, Iris	Undergraduate Student	1
Kernkamp, Charles	Undergraduate Student	0
Koolmees, Wyatt	Undergraduate Student	0
Krebs, Karina	Undergraduate Student	0
Krotine, Kimberly	Undergraduate Student	1
LaManna, Renee	Undergraduate Student	3
Lao, Chihei	Undergraduate Student	0
Lawrence, Catherine	Undergraduate Student	1
Le, Katherine	Undergraduate Student	0
LeDonne, Tasi	Undergraduate Student	0
Lin, Justin	Undergraduate Student	0
Listori, Mykala	Undergraduate Student	1
Lombardo, Mia	Undergraduate Student	1
Loo, Emmaline	Undergraduate Student	1
Manalo, Zoe	Undergraduate Student	1
Mangino, Inez	Undergraduate Student	1
Martinka, Arielle	Undergraduate Student	0
Mattos, Isaiah	Undergraduate Student	1
Mayne, Noah	Undergraduate Student	1
McNeill, David	Undergraduate Student	1
Meoni, Mirabella	Undergraduate Student	1
Moran, Tristen	Undergraduate Student	1
Moreno, Luiza	Undergraduate Student	2
Morrison, Seamus	Undergraduate Student	1
Ngo, Katie	Undergraduate Student	1
Nortier-Tilly, Cassiel	Undergraduate Student	1
O'Brien, Alex	Undergraduate Student	0
Ochoa, Jacob	Undergraduate Student	0

Name	Most Senior Project Role	Nearest Person Month Worked
Oda, Kai	Undergraduate Student	3
Packard, Ian	Undergraduate Student	1
Pampeyan, Kristin	Undergraduate Student	0
Parks, Emily	Undergraduate Student	0
Patil, Ashwini	Undergraduate Student	1
Perez, Yanelyn	Undergraduate Student	1
Pettit, Andrew	Undergraduate Student	1
Piedad, Kristine	Undergraduate Student	1
Piozet, Tim	Undergraduate Student	0
Platonoff, Kristina	Undergraduate Student	1
Plewe, Gabi	Undergraduate Student	1
Plouffe, Kyler	Undergraduate Student	1
Powers, James	Undergraduate Student	1
Price , Sean	Undergraduate Student	1
Pyle, Brenden	Undergraduate Student	0
Rathle, Shane	Undergraduate Student	1
Reamey, Maya	Undergraduate Student	1
Reitman, Fred	Undergraduate Student	0
Riley, Katie	Undergraduate Student	1
Roberts, Claire	Undergraduate Student	2
Robles, Melanee	Undergraduate Student	0
Rollins, Sophia	Undergraduate Student	1
Ross, Vivian	Undergraduate Student	1
Ruggles, Logan	Undergraduate Student	1
Rupprecht, Andie	Undergraduate Student	1
Salsbury, Lauren	Undergraduate Student	1
Santos, Julia	Undergraduate Student	1
Schauerman, Eileen	Undergraduate Student	1
Shei, Jessica	Undergraduate Student	1
Shelby, Ben	Undergraduate Student	0
Singleton, Hana	Undergraduate Student	0
Siu, Daniel	Undergraduate Student	1
Sloan, Katie	Undergraduate Student	1
Soglin, Tatiana	Undergraduate Student	0
Solvay, Margot	Undergraduate Student	0
Soto, Abraham	Undergraduate Student	0

Name	Most Senior Project Role	Nearest Person Month Worked
St. Pierre, Zoe	Undergraduate Student	1
Stead, Courtney	Undergraduate Student	1
Tang, Irvin	Undergraduate Student	0
Ulloa, Gabbie	Undergraduate Student	0
Ulloa Gutierrez, Imanol	Undergraduate Student	1
Van de Wyngaerde, Kylie	Undergraduate Student	2
Van Gieson, Amir	Undergraduate Student	1
Vargas, Jennifer	Undergraduate Student	1
Vasquez, Jennifer	Undergraduate Student	0
Vega, Jessica	Undergraduate Student	1
Venkatachalam, Divyaa	Undergraduate Student	1
Wachtell, Lauren	Undergraduate Student	2
Wagner, Theresa	Undergraduate Student	2
Wagner, Noah	Undergraduate Student	0
Walton, Miette	Undergraduate Student	1
Wellington, Bethlehem	Undergraduate Student	0
Whightsil, Lauren	Undergraduate Student	1
Williams, Jonathan	Undergraduate Student	0
Witonsky, Lilly	Undergraduate Student	1
Yeung, Sammi	Undergraduate Student	1
Yocom, Mira	Undergraduate Student	1

Full details of individuals who have worked on the project:

Robert J Miller
Email: miller@msi.ucsb.edu
Most Senior Project Role: PD/PI
Nearest Person Month Worked: 6

Contribution to the Project: Miller is the Principal Investigator and coordinates and leads the project. He also does research and contributes towards project objectives.

Funding Support: NSF Federal, State

Change in active other support: No

International Collaboration: Yes, new zealand
International Travel: No

Gretchen E Hofmann
Email: hofmann@lifesci.ucsb.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Leads research on ecological and evolutionary consequences of kelp-induced change in seawater chemistry

Funding Support: State, Federal

Change in active other support: No

International Collaboration: No
International Travel: No

Daniel C Reed
Email: reed@lifesci.ucsb.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 2

Contribution to the Project: Kelp forest population and community ecology

Funding Support: State, Private

Change in active other support: No

International Collaboration: No
International Travel: No

David A Siegel
Email: davey@eri.ucsb.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Leads coastal ocean research

Funding Support: State

Change in active other support: No

International Collaboration: No
International Travel: No

Adrian C Stier
Email: adrian.stier@lifesci.ucsb.edu

Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 1

Contribution to the Project: Kelp forest community research

Funding Support: State. Federal

Change in active other support: No

International Collaboration: No
International Travel: No

Tom Bell
Email: thomas.bell@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Investigates biomass dynamics in kelp forests, remote sensing

Funding Support: State

International Collaboration: No
International Travel: No

Mark Brzezinski
Email: brzezins@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Leads research on recycled nitrogen in kelp forests, Direct monthly monitoring of water chemistry at core kelp forests

Funding Support: State

International Collaboration: No
International Travel: No

Deron Burkepile
Email: deron.berkepile@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Recycled nitrogen in kelp forests

Funding Support: State

International Collaboration: No
International Travel: No

Craig Carlson
Email: carlson@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Leads research on organic matter dynamics in kelp forests

Funding Support: State

International Collaboration: No
International Travel: No

Max Castorani
Email: castorani@virginia.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Community and disturbance ecology of kelp forests, metapopulation dynamics

Funding Support: State

International Collaboration: Yes, mexico
International Travel: No

Kyle Cavanaugh
Email: kcavanaugh@geog.ucla.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Population dynamics of giant kelp and trophic connectivity between kelp forests and beaches

Funding Support: State

International Collaboration: No
International Travel: No

Jenifer Dugan
Email: j_dugan@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 3

Contribution to the Project: Trophic connectivity between kelp forests and beaches, project coordinator

Funding Support: NSF, Federal state

International Collaboration: Yes, australia, chile
International Travel: No

Erika Eliason
Email: erika.eliason@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Ecological physiology and fishing

Funding Support: State

International Collaboration: No
International Travel: No

Anita Guerrini
Email: anita.guerrini@oregonstate.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: environmental and landscape history

Funding Support: none

International Collaboration: No
International Travel: No

Debora Iglesias-Rodriguez
Email: iglesias@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Coastal ocean and kelp forest connectivity

Funding Support: State

International Collaboration: No
International Travel: No

Hunter Lenihan
Email: lenihan@bren.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Fisheries biology, ecology and management

Funding Support: State

International Collaboration: No
International Travel: No

Sally MacIntyre
Email: sally@eri.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Physical -biological coupling in kelp forests

Funding Support: State

International Collaboration: No
International Travel: No

John Melack
Email: john.melack@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 2

Contribution to the Project: Recycled nitrogen in kelp forests and trophic connectivity

Funding Support: State

International Collaboration: No
International Travel: No

Holly Moeller
Email: holly.moeller@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Recycled nitrogen in kelp forests and dissolved organic matter dynamics

Funding Support: State

International Collaboration: No
International Travel: No

Nicholas Nidzieko
Email: nidzieko@ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Leads research on effects of kelp on physical and chemical fluxes

Funding Support: State

International Collaboration: No
International Travel: No

J Carter Ohlmann
Email: carter@eri.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Trophic connectivity between kelp forests and beaches

Funding Support: Federal

International Collaboration: No
International Travel: No

Daniel Okamoto
Email: dokamoto@bio.fsu.edu,
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Urchin settlement studies

Funding Support: none

International Collaboration: No
International Travel: No

Henry Page
Email: page@lifesci.ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Trophic connectivity between kelp forests and beaches and the coastal ocean

Funding Support: Private, Federal

International Collaboration: No
International Travel: No

Andrew Rassweiler
Email: rassweiler@bio.fsu.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Ecological consequences of fishing in kelp forests and kelp forest community and disturbance ecology

Funding Support: State

International Collaboration: No
International Travel: No

Alyson Santoro
Email: asantoro@ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Recycled nitrogen in kelp forests and dissolved organic matter dynamics

Funding Support: State

International Collaboration: No
International Travel: No

Stephen Schroeter
Email: schroete@ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Urchin settlement studies

Funding Support: State

International Collaboration: No
International Travel: No

Libe Washburn
Email: libe.washburn@ucsb.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Advised and helped design new mooring hardware. Assisted and advised on mooring operations. Assisted with project planning. Helped develop SBC LTER oceanographic research directions. Continued analysis and synthesis of data from SBC LTER cruises. Led analysis and interpretation effort on paper describing use of HF radar data for quantifying development of phytoplankton blooms

Funding Support: State

International Collaboration: No
International Travel: No

Elizabeth Wilbanks
Email: elizabeth.wilbanks@lifesci.ucsb.edu

Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Microbial metabolism and biogeochemistry

Funding Support: State

International Collaboration: No
International Travel: No

Claudia Benitez-Nelson
Email: benitezn@mailbox.sc.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Dr. Benitez-Nelson maintains a deep sediment trap in the Santa Barbara Channel and collaborates with SBC LTER investigators regularly on topics relevant to phytoplankton and carbon cycling.

Funding Support: SBC LTER does not currently recieve support from the project, although we have supported maintaining her trap in past years.

International Collaboration: No
International Travel: No

Gema Herman
Email: gemahmbio@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1

Contribution to the Project: Lead data analyses and papers

Funding Support: Federal

International Collaboration: No
International Travel: No

Anna James
Email: ajames@lifesci.ucsb.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 6

Contribution to the Project: Dissolved organic matter dynamics in kelp forests

Funding Support: Federal

International Collaboration: No
International Travel: No

Thomas Lamy
Email: thomas.lamy27@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1

Contribution to the Project: Kelp forest ecology and biology

Funding Support: Federal

International Collaboration: No
International Travel: No

Jason Smith
Email: smith.jason.michel@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 0

Contribution to the Project: Recycled nitrogen in kelp forests

Funding Support: Private

International Collaboration: No
International Travel: No

Marie Strader
Email: stradermarie@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1

Contribution to the Project: Urchin epigenetics

Funding Support: NSF

International Collaboration: No
International Travel: No

Christie Yorke
Email: ceyorke@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1

Contribution to the Project: Kelp forest ecology and biology

Funding Support: private

International Collaboration: No
International Travel: No

Chris Gotschalk
Email: gots@lifesci.ucsb.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 2

Contribution to the Project: Processed data from moorings and monthly water sampling. Maintained databases. Assisted investigators with data analysis issues and programming questions. Advised and consulted with information technology staff.

Funding Support: NSF, Federal

International Collaboration: No
International Travel: No

David Hubbard
Email: hubbard@lifesci.ucsb.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: assisted with sandy beach core monitoring

Funding Support: Federal, state

International Collaboration: Yes, australia, chile
International Travel: No

Margaret O'Brien
Email: mob@msi.ucsb.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 3

Contribution to the Project: data and information management for project

Funding Support: Federal

International Collaboration: No
International Travel: No

Scott Simon
Email: simon@msi.ucsb.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 6

Contribution to the Project: Coordinate SBC education and outreach activities, develop and maintain relevant partnerships, train undergraduate outreach support

Funding Support: State

International Collaboration: No
International Travel: No

Laura Beresford
Email: lauraberesford@ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field research and sample processing for sandy beaches

Funding Support: Federal, state

International Collaboration: No
International Travel: No

Brandon Doheney
Email: bdoheny13@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 0

Contribution to the Project: Assist with field research and diving surveys for kelp forests and reefs

Funding Support: Federal

International Collaboration: No
International Travel: No

Alexandra Dubel
Email: adubel@bio.fsu.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 0

Contribution to the Project: data analysis

Funding Support: Federal

International Collaboration: No
International Travel: No

Nathalie Guillocheau
Email: nathalie@eri.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: data collection and analysis

Funding Support: Federal

International Collaboration: No
International Travel: No

Eliza Halewood
Email: wallner@lifesci.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 2

Contribution to the Project: Manage DOM samples and lab processing

Funding Support: Federal

International Collaboration: No
International Travel: No

Stuart Halewood
Email: halewood@eri.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 4

Contribution to the Project: assist with oceanographic instruments and moorings

Funding Support: Federal

International Collaboration: No
International Travel: No

Shannon Harrer
Email: harrer@msi.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Assist with data analyses

Funding Support: NSF

International Collaboration: No
International Travel: No

Janet Jones
Email: ja_jones@lifesci.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 6

Contribution to the Project: Data Collection/Analysis of seawater samples

Funding Support: Federal

International Collaboration: No
International Travel: No

Matthew Meyerhof
Email: mmeyerhof@bren.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 0

Contribution to the Project: data collection; equipment/instrument maintenance; data analysis

Funding Support: NSF

International Collaboration: No
International Travel: No

Clint Nelson
Email: c_nelson@lifesci.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 12

Contribution to the Project: Lead SBC Field research activities for kelp forests and nearshore ocean

Funding Support: NSF

International Collaboration: No
International Travel: No

Jacob Ogawa
Email: jacobogawa@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 6

Contribution to the Project: Scientific Scuba diver,Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Keri Opalk
Email: kerilynno@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Phytoplankton and Carbon Cycling Sampling and Analysis, Optimized TCO2 system

Funding Support: Federal

International Collaboration: No
International Travel: No

Frankie Purzer
Email: fpuerzer7412@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities

Funding Support: Federal

International Collaboration: No
International Travel: No

Eduardo Romero
Email: romero@msi.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Designed and fabricated parts used on components of moorings. Assisted Salazar and Washburn in coordinating field sampling. Assisted with preparation of instruments for field deployments. Participated in SCUBA diving to deploy instruments. Assisted with instrument repairs. Participated in monthly water sampling

Funding Support: Federal

International Collaboration: No
International Travel: No

David Salazar
Email: Salazar@msi.ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 3

Contribution to the Project: Coordinated field sampling. Oversaw preparation of instruments for field deployments and oversaw instrument downloading from instruments and uploading to database. Operated research launch for mooring deployments and other field sampling. Kept project records, and oversaw instrument calibrations, and arranged instrument servicing. Participated in monthly water sampling

Funding Support: Federal

International Collaboration: No
International Travel: No

Sarah Sampson
Email: srsampson@ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 7

Contribution to the Project: Assisted with LTER kelp forest fieldwork, and trained LTER students in research activities and data entry

Funding Support: NSF

International Collaboration: No
International Travel: No

Briette Shea
Email: brietteshea@ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: data analysis for seawater nutrients

Funding Support: NSF

International Collaboration: No
International Travel: No

Jordan Snyder
Email: jordan_snyder@ucsb.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: data collection and analysis of ocean, reef DOM

Funding Support: Federal

International Collaboration: No
International Travel: No

Li Kui
Email: li.kui@ucsb.edu
Most Senior Project Role: Staff Scientist (doctoral level)
Nearest Person Month Worked: 8

Contribution to the Project: serves as information manager for project

Funding Support: NSF, Federal

International Collaboration: No
International Travel: No

Samuel Bogan
Email: snbogan@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 8

Contribution to the Project: processing seawater samples from field study

Funding Support: NSF

International Collaboration: No
International Travel: No

An Bui
Email: an.bui@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: community ecology and climate change

Funding Support: state

International Collaboration: No
International Travel: No

Dylan Catlett
Email: dsc@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 9

Contribution to the Project: coastal phytoplankton ecology

Funding Support: federal

International Collaboration: No
International Travel: No

Katherine Cavanaugh
Email: kccavanaugh@ucla.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 3

Contribution to the Project: Remote sensing of kelp forests

Funding Support: NSF

International Collaboration: No
International Travel: No

Tiffany Cedano
Email: tcedeno@umail.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: nutrient utilization by giant kelp

Funding Support: NSF

International Collaboration: No
International Travel: No

Jannine Chamorro
Email: jdchamorro@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Physiological response to ocean climate

Funding Support: State

International Collaboration: No
International Travel: No

Xochitl Clare
Email: xochitl.clare@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 3

Contribution to the Project: Physiological responses to ocean climate

Funding Support: state, federal

International Collaboration: No
International Travel: No

Bart Difiore
Email: bart.difiore@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Kelp forest ecology and biology

Funding Support: state

International Collaboration: No
International Travel: No

Natalie Doman
Email: nataliedornan@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Conducted nutrient analyses

Funding Support: State UCSB

International Collaboration: No
International Travel: No

Nathalie Eegholm
Email: nathalie.eegholm@geog.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 3

Contribution to the Project: Assisted with oceanographic modeling

Funding Support: NSF

International Collaboration: No
International Travel: No

Kyle Emery
Email: kyle.emery@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 3

Contribution to the Project: Beach ecosystem responses to kelp subsidies

Funding Support: NSF, state

International Collaboration: No
International Travel: No

Chance English
Email: cje@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: kelp forest DOM and microbial ecology

Funding Support: Federal, state

International Collaboration: No
International Travel: No

Sevan Esaian
Email: sevanesaian@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 3

Contribution to the Project: kelp microbiome and ecosystem drivers

Funding Support: NSF

International Collaboration: No
International Travel: No

Sean Fitzgerald
Email: Spfitzgerald@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 0

Contribution to the Project: Trap fishery biology and management

Funding Support: state

International Collaboration: No
International Travel: No

Emily Hardison
Email: emily.hardison@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: the creation of a nitrogen budget for the Santa Barbara Area

Funding Support: none

International Collaboration: No
International Travel: No

Nicholas Huynh
Email: nicholasqhuynh@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: kelp forest DOM and microbial ecology

Funding Support: state, federal

International Collaboration: No
International Travel: No

Logan Kozal
Email: logan.kozal@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Physiological responses to ocean climate

Funding Support: state, federal

International Collaboration: No
International Travel: No

Krista Kraskura
Email: krista.kraskura@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Physiological responses to ocean climate, body size effects on metabolism and thermal tolerance in fish

Funding Support: NSF

International Collaboration: No
International Travel: No

Terence Leach
Email: terence.leach@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Physiological responses to ocean climate

Funding Support: state, federal

International Collaboration: No
International Travel: No

Heili Lowman
Email: Heili.lowman@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 10

Contribution to the Project: Coastal biogeochemistry, nutrient cycling, transport and processing of organic matter.

Funding Support: NSF, state

International Collaboration: Yes, canada
International Travel: No

Jessica Madden
Email: jessicamadden831@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field researchand sample processing for sandy beaches

Funding Support: NSF, Federal, State

International Collaboration: No
International Travel: No

Katrina Malakhoff
Email: kmalakhoff@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Effects of marine management on sea urchins

Funding Support: NSF

International Collaboration: No
International Travel: No

Adriane McDonald
Email: adrianemcdonald@umail.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: processing seawater samples from field study

Funding Support: NSF

International Collaboration: No
International Travel: No

Kristen Michaud
Email: kristen.michaud@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Invasive species in kelp forests

Funding Support: NSF

International Collaboration: No
International Travel: No

Joey Peters
Email: jpeters@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 4

Contribution to the Project: consumer mediated nutrient cycling in kelp forests

Funding Support: NSF

International Collaboration: No
International Travel: No

Cailan Sugano
Email: csugano@ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 12

Contribution to the Project: Physiological responses to ocean climate

Funding Support: Federal

International Collaboration: No
International Travel: No

David VanderZee
Email: david.vanderzee@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Sandy beach and surf zone ecology

Funding Support: State UCSB

International Collaboration: No
International Travel: No

Zoe Welch
Email: zoe.welch@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: marine plankton physiology and biogeochemistry

Funding Support: NSF

International Collaboration: No
International Travel: No

Juliet Wong
Email: juliet.wong@lifesci.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: impacts of ocean acidification and ocean warming on the early developmental stages of marine invertebrates

Funding Support: NSF

International Collaboration: No
International Travel: No

Jose Zenteno
Email: jzenteno@bren.ucsb.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Fishery biology and aquaculture

Funding Support: none

International Collaboration: No
International Travel: No

Carter Adamson
Email: cpadamson@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Zoe Aguila
Email: zoelaguila@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Andrea Aguilera
Email: andrea_aguilera@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Alia Ajina
Email: aliaajina@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

William Amundsen
Email: amundsen752@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Ellyse Anderson
Email: ellyse_anderson@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Claire Anderson
Email: claire_anderson@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Nico Andrada
Email: naandrada@pipeline.sbcc.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Stephanie Anujarerat
Email: sanujarerat@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Ally Aplin
Email: allyaplin22@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Outreach activities, Assisted with kelp forest laboratory, field and data activities.

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Micaiah Atkins
Email: micaiah_atkins@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed biotic samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Anshika Bagla
Email: bagla.anshika@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Alex Bakhdanyan
Email: abakhdanyan@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Daniel Baldwin
Email: danielbaldwin@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Cassidy Ballard
Email: cassidyballard@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed biotic samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Tyler Barton
Email: tylerbarton@umail.ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Simran Bawa
Email: bawa@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Megan Becker
Email: meganbecker@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Nelson Beltran
Email: nbeltran@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Gordon Blasco
Email: gordonblasco@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Study of kelp nitrogen sources

Funding Support: none

International Collaboration: No
International Travel: No

Madigan Boborci
Email: mboborci@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Sarah Boyle
Email: sarahboyle@umail.ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Invert Settlement Project, Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Tori Bradley
Email: victoriabradley@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Maddie Brown
Email: m_brown@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Thea Bruggemann
Email: theabruggemann@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Dominique Bryant Williams
Email: dbryantwilliams@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Lauren Cajilig-McDonald
Email: laurenmcdonald@comcast.net
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jefferson Cam
Email: j_cam@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with oceanographic field data collection. Worked on design, fabrication, and assembly tasks for various lab development projects. Participated in field tests of drone research vehicles.

Funding Support: none

International Collaboration: No
International Travel: No

Chandler Campbell
Email: chandlercamp@optonline.net
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Zach Cantrell
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Iris Jane Chan
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jamie Chen
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Jeffrey Childs
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Madison Clarke
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Makenna Colucci
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Analysis of LTER images

Funding Support: none

International Collaboration: No
International Travel: No

Annie Combs
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Kassandra Cook
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Sarah Cowan
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Analysis of LTER images

Funding Support: none

International Collaboration: No
International Travel: No

Peter Culpepper
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Stephen Curry
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Tyler Daniel
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Invert Settlement Project, Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Ella Deardorff
Email: elladeardorff@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Evan Deas
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Ila Delmarsh
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: modeling of wave driven kelp transport from kelp forests to beaches

Funding Support: NSF

International Collaboration: No
International Travel: No

Junyu Deng
Email: junyudeng@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Gorman Deyana
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Alecia Dezzani
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Hannah Ditzler
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 4

Contribution to the Project: Invert Settlement Project, Scientific Scuba Diver, Assisted with kelp forest laboratory, field and data activities. Utreach

Funding Support: NSF

International Collaboration: No
International Travel: No

Shey Dorji
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Emmaline Dugan
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Taylor Dyck
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jenny Ear
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Samantha Elbayar
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Samantha Ellman
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Torreyann English
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Thomas Evans
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Caroline Fyfe
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jordan Gallagher
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Charlie Galles
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Journ Galvan
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Diana Garcia
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Delaney Garcia
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Nikko Garoufalias
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Analysis of LTER images

Funding Support: none

International Collaboration: No
International Travel: No

Ivan Girling
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Scientitic Scuba Diver, Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Aiko Goldston
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Elise Gonzales
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Fish Gut Content Analysis Project, Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Tess Gording
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Analysis of LTER images

Funding Support: none

International Collaboration: No
International Travel: No

Maya Gorgas
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Ciara Gray
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Annie Greenslade
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Alexander Hakanson
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Analysis of LTER images

Funding Support: none

International Collaboration: No
International Travel: No

Lindsey Hargrove
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Emily Hascall
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Isabel Hausrath
Email: hausrathi@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Marisol Hernandez
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Allison Hill
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory, entered and checked data

Funding Support: none

International Collaboration: No
International Travel: No

Jack Holbrook
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with oceanographic field data collection. Participated in field tests of drone research vehicles.

Funding Support: none

International Collaboration: No
International Travel: No

Brandon Hopper
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Analysis of LTER images

Funding Support: none

International Collaboration: No
International Travel: No

Paul Huang
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Joshua Iskander
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Processed biotic samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Sean Jawetz
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with oceanographic field data collection. Worked on design, fabrication, and assembly tasks for various lab development projects. Participated in field tests of drone research vehicles.

Funding Support: NSF

International Collaboration: No
International Travel: No

Lauren Jennings
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Lucy Johnson
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Steven Jones
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed biotic samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Garcia Jonie
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Eva Juengling Bean
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Dimitri Katsiouleris
Email: d_katsiouleris@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Analysis of LTER images

Funding Support: none

International Collaboration: No
International Travel: No

Dimitri Katsiovleris
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Sami Kaur
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Lukas Keeling
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Assisted with oceanographic field data collection. Participated in field tests of drone research vehicles.

Funding Support: none

International Collaboration: No
International Travel: No

Allison Kelton
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Iris Kern
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Charles Kernkamp
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Wyatt Koolmees
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Karina Krebs
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: data collection; sample analysis; equipment/instrument maintenance

Funding Support: NSF

International Collaboration: No
International Travel: No

Kimberly Krotine
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Renee LaManna
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 3

Contribution to the Project: Scientific Scuba diver, Fish Gut Content Analysis Project, Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Chihei Lao
Email: chihei@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples, volunteered at outreach events

Funding Support: none

International Collaboration: No
International Travel: No

Catherine Lawrence
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Katherine Le
Email: katherineleyq@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: State UCSB

International Collaboration: No
International Travel: No

Tasi LeDonne
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Justin Lin
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Mykala Listori
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Mia Lombardo
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Emmaline Loo
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Zoe Manalo
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Inez Mangino
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Arielle Martinka
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Isaiah Mattos
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Noah Mayne
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

David McNeill
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Mirabella Meoni
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Tristen Moran
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Luiza Moreno
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Seamus Morrison
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Katie Ngo
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Cassiel Nortier-Tilly
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Alex O'Brien
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with oceanographic field data collection. Participated in field tests of drone research vehicles.

Funding Support: none

International Collaboration: No
International Travel: No

Jacob Ochoa
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Kai Oda
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 3

Contribution to the Project: Scientific scuba diver, Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Ian Packard
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Kristin Pampeyan
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Emily Parks
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Ashwini Patil
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Yanelyn Perez
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Andrew Pettit
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Processed biotic samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

Kristine Piedad
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Tim Piozet
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Kristina Platonoff
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Gabi Plewe
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Kyler Plouffe
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

James Powers
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Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Sean Price
Email: seanprice@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Brenden Pyle
Email: brendanpyle@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with oceanographic field data collection. Worked on design, fabrication, and assembly tasks for various lab development projects. Participated in field tests of drone research vehicles.

Funding Support: none

International Collaboration: No
International Travel: No

Shane Rathle
Email: shanerather@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Maya Reamey
Email: mayareamey@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Fred Reitman
Email: freitman10@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Katie Riley
Email: kriley@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Claire Roberts
Email: claireannroberts@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Scientific scuba diver, Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Melanee Robles
Email: melanee@umail.ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Sophia Rollins
Email: srollins@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Vivian Ross
Email: vivianross@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Logan Ruggles
Email: logier12@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Andie Rupprecht
Email: andierupp@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with oceanographic field data collection. Worked on design, fabrication, and assembly tasks for various lab development projects. Participated in field tests of drone research vehicles.

Funding Support: NSF

International Collaboration: No
International Travel: No

Lauren Salsbury
Email: laurencsalsbury@gmail.com

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Julia Santos
Email: juliabeatriz@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with oceanographic field data collection. Assisted with design of drone-deployed ocean drifters

Funding Support: none

International Collaboration: No
International Travel: No

Eileen Schauerman
Email: eschauerman@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jessica Shei
Email: jessicashei@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Ben Shelby
Email: benjamintshelby@gmail.com

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Hana Singleton
Email: hanasingleton@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Assisted with field sampling and processed biotic samples

Funding Support: none

International Collaboration: No
International Travel: No

Daniel Siu
Email: danielsiu21@yahoo.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Katie Sloan
Email: katherinesloan@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Tatiana Soglin
Email: tsoglin@ucsb.edu

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Margot Solvay
Email: msolvay@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Abraham Soto
Email: sotoabraham17@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Zoe St. Pierre
Email: st.pierrezoe@yahoo.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Courtney Stead
Email: 4courtneystead@gmail.com

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Irvin Tang
Email: irvintang1@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Invert Settlement Project, Assisted with kelp forest laboratory, field and data activities.

Funding Support: NSF

International Collaboration: No
International Travel: No

Gabbie Ulloa
Email: gulloa2000@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Imanol Ulloa Gutierrez
Email: iulloagutierrez@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Kylie Van de Wyngaerde
Email: kylierae.vdw@gmail.com

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: implanted heart rate loggers into lobsters and outplanted them inside and outside the kelp forest, outreach activities

Funding Support: NSF

International Collaboration: No
International Travel: No

Amir Van Gieson
Email: amirvg00@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jennifer Vargas
Email: jennifervargas@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jennifer Vasquez
Email: vjennifer24@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jessica Vega
Email: jessicarvega@ucsb.edu

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Divyaa Venkatachalam
Email: divyaa@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with oceanographic field data collection. Participated in field tests of drone research vehicles.

Funding Support: none

International Collaboration: No
International Travel: No

Lauren Wachtell
Email: lwachtell@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Processed samples in the laboratory, outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Theresa Wagner
Email: tcmwagner7@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 2

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: none

International Collaboration: No
International Travel: No

Noah Wagner
Email: noahwagner@ucsb.edu

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Miette Walton
Email: miette.walton@gmail.com
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Bethlehem Wellington
Email: bethlehemwellington@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Lauren Whightsil
Email: laurenwhightsil@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Jonathan Williams
Email: jonathantaylorwilliams@gmail.com

Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 0

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Lilly Witonsky
Email: lwitonsky@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Outreach activities

Funding Support: Coastal Fund, NOAA BWET

International Collaboration: No
International Travel: No

Sammi Yeung
Email: samiiyeung@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with kelp forest laboratory, field and data activities.

Funding Support: None

International Collaboration: No
International Travel: No

Mira Yocom
Email: miralyna@ucsb.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with field sampling and processed samples in the laboratory

Funding Support: none

International Collaboration: No
International Travel: No

What other organizations have been involved as partners?

Name	Type of Partner Organization	Location
American Assoc. University Women Tech Trek	Other Nonprofits	Santa Barbara, CA
California Dept of Fish and Wildlife	State or Local Government	Sacramento, CA
Scripps Institution of Oceanography	Academic Institution	La Jolla, CA
Southern California Coastal Ocean Observing System (SCCOOS)	Other Organizations (foreign or domestic)	La Jolla, California
The Bay Foundation	Other Nonprofits	Santa Monica, CA
US Geological Survey	Other Organizations (foreign or domestic)	Santa Cruz, CA
University of Auckland	Academic Institution	Auckland, New Zealand
University of California, Davis	Academic Institution	Bodega Bay, CA
University of California, Los Angeles	Academic Institution	Los Angeles, CA
University of California, Santa Cruz	Academic Institution	Santa Cruz, CA
University of Quebec a Montreal	Academic Institution	Monteral, Quebeck Canada
University of Wisconsin	Academic Institution	Milwalkee, WI
California Sea Grant Extension	Academic Institution	La Jolla, CA
Channel Islands National Marine Sanctuary	Other Organizations (foreign or domestic)	Santa Barbara, CA
Channel Islands National Park	Other Organizations (foreign or domestic)	Ventura, CA
City of Santa Barbara	State or Local Government	Santa Barbara, CA
County of Santa Barbara	State or Local Government	Santa Barbara, CA
Moss Landing Marine Laboratory	Academic Institution	Moss Landing, CA
Ocean Education Trust	Other Nonprofits	Kingston, RI
Santa Barbara Unified School District	School or School Systems	Santa Barbara, CA

Full details of organizations that have been involved as partners:

American Assoc. University Women Tech Trek

Organization Type: Other Nonprofits
Organization Location: Santa Barbara, CA

Partner's Contribution to the Project:
Financial support
Facilities

More Detail on Partner and Contribution: Tech Trek is a math/science camp designed to develop interest, excitement and self-confidence in young women who will enter eighth grade in the fall. It features hands-on activities in math, science and related fields. All sleeping, eating, instructional and recreational facilities are located on a university campus where camps are held. Tech Trek is an ongoing SBC Schoolyard partner.

California Dept of Fish and Wildlife

Organization Type: State or Local Government
Organization Location: Sacramento, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborate on fishery and oil spill studies

California Sea Grant Extension

Organization Type: Academic Institution
Organization Location: La Jolla, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborate on climate change and fisheries research

Channel Islands National Marine Sanctuary

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Santa Barbara, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborate with SBC on oceanographic data collection and education activities

Channel Islands National Park

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Ventura, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Share and collaborate on long term data on kelp forest communities in the Santa Barbara Channel

City of Santa Barbara

Organization Type: State or Local Government
Organization Location: Santa Barbara, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

County of Santa Barbara

Organization Type: State or Local Government
Organization Location: Santa Barbara, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

Moss Landing Marine Laboratory

Organization Type: Academic Institution
Organization Location: Moss Landing, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

Ocean Education Trust

Organization Type: Other Nonprofits
Organization Location: Kingston, RI

Partner's Contribution to the Project:
Facilities
Personnel Exchanges

More Detail on Partner and Contribution: NautilusLive! program, ; in-kind support, supply facilities and equipment, exchange personnel.

Santa Barbara Unified School District

Organization Type: School or School Systems
Organization Location: Santa Barbara, CA

Partner's Contribution to the Project:
Financial support
Facilities

More Detail on Partner and Contribution: Collaborates to conduct Explore the Sea Summer Program and educational outreach for K-12 students

Scripps Institution of Oceanography

Organization Type: Academic Institution
Organization Location: La Jolla, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborate on climate assessment study and manuscripts

Southern California Coastal Ocean Observing System (SCCOOS)

Organization Type: Other Organizations (foreign or domestic)
Organization Location: La Jolla, California

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: SCCOOS: SBC partners with Scripps Institution of Oceanography, the University of Southern California, and Cal Poly San Luis Obispo as part of the Southern California Coastal Ocean Observing System (SCCOOS). SCCOOS has provided data and instrumentation to the SBC-LTER

The Bay Foundation

Organization Type: Other Nonprofits
Organization Location: Santa Monica, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborate on beach ecosystem research

US Geological Survey

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Santa Cruz, CA

Partner's Contribution to the Project:
In-Kind Support
Collaborative Research

More Detail on Partner and Contribution: collaborative research on kelp forest communities and coastal sediment inputs and dynamics

University of Auckland

Organization Type: Academic Institution
Organization Location: Auckland, New Zealand

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

University of California, Davis

Organization Type: Academic Institution
Organization Location: Bodega Bay, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution:

University of California, Los Angeles

Organization Type: Academic Institution
Organization Location: Los Angeles, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborate on modeling studies of nearshore oceanography and on kelp forest dynamics

University of California, Santa Cruz

Organization Type: Academic Institution
Organization Location: Santa Cruz, CA

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Collaborate on kelp forest population research

University of Quebec a Montreal

Organization Type: Academic Institution
Organization Location: Monteral, Quebeck Canada

Partner's Contribution to the Project:
Other: Performed analyses

More Detail on Partner and Contribution: benthic sediment analyses for lignin content

University of Wisconsin

Organization Type: Academic Institution
Organization Location: Milwalkee, WI

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: collaborates on population genetics of kelp

Were other collaborators or contacts involved? If so, please provide details.

SBC continues to be a leading contributor to the Kelp Ecosystem Ecology Network (KEEN) http://www.kelpecosystems.org/e, which was founded by former SBC post doc Jarrett Byrnes. KEEN is an association of ~ 70 marine scientists from around the globe interested in assessing the impacts of global change on kelp forests. Its primary objectives are to: (1) unify past kelp forest data sets from a wide variety of sources to examine the effects of different drivers of global change, (2) coordinate parallel experiments aimed at determining how kelp systems will change in the future, and (3) develop standardized sampling protocols to create a unified global kelp forest community dataset for public use. The latter objective relies extensively on sampling protocols developed by SBC. Through this group and other avenues, we continue to collaborate internationally with marine ecologists with shared interests, particularly from New Zealand and South Africa.

Impacts

What is the impact on the development of the principal discipline(s) of the project?

Ecological theory predicts mechanisms favoring the stability of ecosystems, but because natural ecosystems are complex, it is difficult to predict how their variability scales across space and levels of organization. Foundation species are considered to structure communities, promote biodiversity, and stabilize ecosystem processes by creating locally stable environmental conditions. Despite their critical importance, the role of foundation species in stabilizing natural communities has seldom been quantified. In theory, the stability of a foundation species should promote community stability by enhancing species richness, altering the population fluctuations

of individual species, or both. We tested the hypothesis that the stability of a marine foundation species, the giant kelp *Macrocystis pyrifera*, increased the stability of the aggregate biomass of a phylogenetically diverse assemblage of understory algae and sessile invertebrates that compete for space beneath the giant kelp canopy. To achieve this goal, we analyzed an SBC LTER 18-yr time series of the biomass of giant kelp and its associated benthic community collected from 32 plots distributed among nine shallow reefs in the Santa Barbara Channel, USA. We showed that the stability of understory algae and sessile invertebrates was positively and indirectly related to the stability of giant kelp, which primarily resulted from giant kelp's direct positive association with species richness. The stability of all community types was positively related to species richness via increased species stability and species asynchrony. This study is among the first to show that dampened temporal fluctuations in the biomass of a foundation species is an important determinant of the stability of the complex communities it supports.Our results illustrate how conservation and restoration of foundation species, which are often considered common and abundant and therefore ignored, can act to stabilize aggregate community properties in natural ecosystems where environmental conditions vary over broad spatial scales, and represent a relatively rare attempt to test ecological theory using long-term data from natural communities (Lamy et al. 2020).

What is the impact on other disciplines?

Nothing to report.

What is the impact on the development of human resources?

Our project provides significant opportunities for scientific training in research at multiple levels. During the past year 109 undergraduate students, 30 graduate students, and 4 post doctoral fellows were trained through substantial involvement in SBC research. Additionally, SBC faculty investigators actively incorporate the activities and findings of SBC LTER research into their teaching and curriculum development, thereby extending the project's contributions to the broader student body. The active involvement of large numbers of undergraduate students in SBC research not only provides valuable undergraduate training, but also affords SBC’s graduate students and postdocs with significant opportunities for mentorship training. In 2019-20, 29 UCSB undergraduate students received academic credit to participate in a structured SBC marine research training program that runs the entire academic year. Students in the program actively participate in the collection, processing and analysis of core data and many develop their own independent research projects. The experience gained from such training has proven to be very important to SBC graduate students and postdoctoral fellows who routinely go on to academic positions where the training legacy from SBC LTER continues.

During this reporting period, former graduate student Heili Lowman became a staff scientist at the Southern California Water Research Project, former postdoc Erin Meyer-Gutbrod became an assistant professor at the University of South Carolina, and former postdoc Tom Bell became an Assistant Scientist at Woods Hole Oceanographic Institute.

Additional impacts on the development of human resources are achieved through SBC’s extensive outreach programs (see Accomplishments), which primarily target K-12 students and

teachers. These outreach programs, particularly the REEF, provide large numbers (54 in 2019-20) of undergraduate student interns with a solid foundation in marine ecology and training in communicating their knowledge in an educational format. The REEF utilizes SBC graduate students, research staff, and post-docs to train REEF interns, which, in turn, enhances their training as laboratory and field assistants for SBC research. SBC investigators and graduate students mentor middle and high school students in developing and executing science fair projects and conducting research each year.

SBC LTER has a significant scientific scuba diving program that trains several undergraduates and graduate students per year. This training enables students to conduct underwater field research projects, and take the skills learned and hands on experience with them through their careers.

What was the impact on teaching and educational experiences?

SBC LTER research results and publicly available datasets are utilized by a wide variety of educators to enhance the educational experiences of their students. These include use by university professors at 4-year universities and community colleges including UC Santa Barbara, California Lutheran University and Alan Hancock College. Through the structured SBC marine research training program at UC Santa Barbara, undergraduate students iactively participate in the collection, processing and analysis of core datasets and many develop their own independent research projects. SBC investigators and postdocs regularly give lectures to undergraduate courses at UCSB and other universities.

What is the impact on physical resources that form infrastructure?

NSF funds awarded to SBC are being used to maintain a custom 22' research vessel that was specifically designed for diving and oceanographic research, and an autonomous ocean glider that is customized for coastal research. Both items were purchased with NSF funds awarded to SBC. Research groups collaborating with SBC have access to the vessel and glider for their research needs. Led by Investigators Hofmann and Washburn, SBC partners with other research programs (e.g. Southern California Ocean Observing System (SCOOS), California's Ocean Protection Council, the Partnership for Interdisciplinary Study of Coastal Oceans (PISCO)) to maintain an extensive array of moored sensors that is providing spatially comprehensive high frequency data on ocean properties including currents, temperature salinity, chlorophyll, oxygen and pH.

What is the impact on institutional resources that form infrastructure?

SBC LTER makes use of several shared research facilities on campus, making a significant positive impact on their sustainability. Most notable in this regard are the Marine Science Institute Analytical Laboratory (AL), the UCSB Boating program, and the UCSB scientific diving program. SBC LTER submits monthly water samples to the AL and students, postdocs, and investigators are also trained to run analyses, particularly stable isotope mass spectrometer analyses, which facilitates many theses and dissertations. In addition to the project's boat, SBC LTER makes frequent use of UCSB's small boat fleet for student research as well as our

intensive annual monitoring program. SBC investigators, postdocs and students are active boat captains and participate in the governance of the program which benefits the wider University community. Similarly, SBC LTER is one of the most significant participants in UCSB's scientific diving program, and SBC investigators play active roles on the Diving Saftey Board.

What is the impact on information resources that form infrastructure?

SBC's publicly available data holdings increased by 10% in total volume over the past year. Among the total of 215 archived datasets, 6 datasets were newly added and 95% (35 out of 37) long-term time-series datasets were updated since Sep 2019. Among six newly added datasets, five datasets were the data from students and postdoctoral scholars, specifically designed to meet journals' increasingly frequent requirement to post data along with research papers. One new dataset was a time-series ocean pH dataset that concatenated old pH time-series datasets from various sites within the Santa Barbara Channel to provide higher temporal and spatial resolutions. All metadata are available in the XML specification Ecological Metadata Language (EML), with data and metadata uploaded regularly to the repository of the Environmental Data Initiative (EDI), where it becomes available to the LTER Network catalog and DataOne. Our local infrastructure provides daily backup for all data. As documented in the 2018 SBCLTER proposal, watershed study was planned to be discontinued. Accordingly, we have completed the last update for 19 watershed time-series datasets and changed the dataset status to "completed time-series" (no future updates anticipated). Since Sep 2019, all SBC data published on EDI have shown a total of 7647 downloads.

The Information Management System (IMS) has been further enhanced and expanded in 2019-2020: 1. We completed the integrated workflow for metadata storage and management, data package generation, data publication, and regular maintenance for all the SBC data (observation and instrument data). 2. We have started consolidating the ocean instrument data to improve the data usability. Historically, the ocean instrument data packages were designed to accommodate one site and each site had a separate data package. Over the past two years, additional monitoring sites and extra ocean instruments were added into the SBC monitoring efforts. Our new approach, which is still a work in progress is to consolidate the data packages to include all sites with the same instruments. The consolidated packages ensure consistent data format and easier data accessibility for regional studies. 3. We constructed several database schemas for storing additional project-level information to support SBC's new website. The content includes project personnel, data catalog, sampling sites, and publications. The corresponding R scripts were developed to generate relevant reports (e.g. LTER annual report and Network office annual personnel update) and documents used for a variety of purposes (e.g. bibtxt files for bibliography and yml files for website).

In 2020, the ocean instrument data processing tasks were transferred from Chris Gotschalk to Li Kui, and the transition is completed in July 2020. To improve the organization and quality of the ocean data, Li Kui has involved in the experiment designs, adjusted instrument setting, and guided the technical staff to ensure the accurate documentation of the ocean instrument deployment and recovery. R and Matlab scripts were developed to ensure high-quality data.

The SBC LTER launched a new website in Dec 2019 and we have continued to improve it throughout the year. The new website uses recent technology and leverages LTER Network resources. Several primary improvements are included: 1. the frequently updated website content is stored and managed using a back-end database that allows centralized information management. 2. The website hosts a local data catalog and its customized metadata viewer pages that mirror to the EDI repository; and 3. The security and accessibility of the website have been greatly improved using Hypertext Transfer Protocol Secure (HTTPS) instead of HTTP.

What is the impact on technology transfer?

The SBC IM, Li Kui, has used SBC's information system as a model to develop a compact data management system that is currently used by several small research groups as well as large organizations such as the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO). This "Excel-to-EML" tool (https://github.com/lkuiucsb/Excel-to-EML) uses the Excel workbook as a metadata storage database and R scripts to generate the XML document used for data publication. In 2020, SBC has collaborated with the EDI on improving this tool to accommodate more data types and different intellectual rights. In summer 2020, this tool was presented and introduced to a broader data science community at the Earth Science Information Partners (ESIP) 2020 annual meeting and the Ecological Society of America (ESA) 2020 annual meeting.

At the LTER network level, the LTER non-tabular working group was established in late 2019 with a mission of developing best practices for publishing non-tabular ecological data (e.g. still image, video, genomic sequence, and code/script). Li Kui has participated in the working group and provided case studies from SBC and co-authored on the best practices. These best practices will function as guides for information management in LTER.

What is the impact on society beyond science and technology?

SBC LTER data and studies are showing the effects of marine reserves on ecosystems and fishing. New work showing spillover is likely to bolster the case for marine reserves as management tools and may help improve the design of future reserves and networks.

SBC LTER data on patterns and drivers of kelp productivity is informing the possibility of kelp farming for biofuels off the coast of California. DOE is funding several projects on this topic in southern California, and one is using SBC LTER data to develop a model for kelp farm siting and productivity.

What percentage of the award's budget was spent in a foreign country?

Nothing to report.

Back to the top

Changes/Problems

Changes in approach and reason for change

Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them

The COVID research shutdown at UCSB caused a 3 month gap in our long-term monthly data. We are now back to data collection, and fortunately the shutdown did not prevent us from collecting our annual kelp forest community data. We also were not able to host REU students over the summer of 2020.

Changes that have a significant impact on expenditures

Nothing to report.

Significant changes in use or care of human subjects

Nothing to report.

Significant changes in use or care of vertebrate animals

Nothing to report.

Significant changes in use or care of biohazards

Nothing to report.

Change in primary performance site location

Nothing to report.