FALL

UNDERGRADUATE RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITY

COMPETITION

Undergraduate Research Opportunities Center

Wednesday, November 8, 2023

CSUMB Alumni & Visitors Center

2:30 to 6:00pm

California State University
MONTEREY BAY
Undergraduate Research
Opportunities Center

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WELCOME

Created in 2015 by CSUMB faculty and staff, the *Fall Undergraduate Research, Scholarship, and Creative Activity Competition* is designed to highlight scholarly work at California State University, Monterey Bay. Modeled after the CSU Student Research Competition, students, under the guidance of one or more faculty members within their department, or multiple departments for interdisciplinary projects, are eligible to submit a project to be considered for the competition.

All presenters, especially winning presenters, will be encouraged to apply for the statewide CSU Student Research Competition, held each spring to promote and recognize outstanding student accomplishments throughout the 23 campuses of the CSU system.

Please visit the CSU Student Research Competition webpage to learn more.

UROC Fun Facts

65

UROC students have won prestigious national scholarships & fellowships since 2015:

- 32 NSF Graduate Research Fellowship Program (GRFP) awards and 10 honorable mentions
- 1 Ford Foundation Fellowship
- 23 Sally Casanova Pre-doctoral Scholars and 6 honorable mentions
- 9 Goldwater Scholar and 5 Honorable Mentions
- 4 CSU Trustee of Outstanding Achievement Awards

1000+

Number of students who have been in UROC professional development programs

1,500+

850+ Student research presentations on campus

525+ Presentations at national conferences

25+ Peer-reviewed journal articles

Students have presented in all 50 states

80+ delegates sent to CSU Research Competitions

15 students winning awards at state competitions

82%

Of UROC students have been from traditional underrepresented groups including:

42% Traditionally underrepresented minority

45% First-generation in college

44% Pell Grant recipients

41% Transfer students

1000+

Number of funded undergraduate research opportunities for CSUMB students since UROC inception

PROGRAM

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Dr. John Banks, Director of UROC

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Trend Identification of X-ray Diffraction Peaks of Historic Bullet Casings from Fort Ord, CA

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Awards and Closing Remarks │ 5:50 – 6:00
Dr. Andrew Lawson, Interim Provost and Vice President of Academic Affairs

Live Streaming on Zoom: https://csumb.zoom.us/j/82334142064

COMPETITION OVERVIEW AND FORMAT

Each fall, CSUMB undergraduate researchers are invited to enter the competition with the goal of being selected as one of the ten chosen to present their work orally at the Fall Research, Scholarship, and Creative Activity Competition. Presenters give a 10-minute oral presentation followed by a brief Q&A (questions and answers) period. Judges ask questions *first* and if time remains, the audience is invited to ask questions. This competition is the first step in preparing undergraduate researchers to apply to the statewide undergraduate and graduate CSU Student Research Competition held every spring at one of the 23 CSU campuses.

Judges will be looking for the following criteria in each of the 10 presentations:

- Clarity of Purpose of the Research
- Appropriateness of Methodology
- Quality of Analysis and/or Interpretation
- Ability to Present the Research or Creative Activity
- Organization of the Presented Materials
- Ability to Handle Questions
- Value of Research or Creative Activity to the Discipline

Based on the recommendations of the judges, prizes will be awarded to the first, second, and third-place presenters.

1st Place: $250

2nd Place: $100

3rd Place: $50

JUDGES

Kate Daniels, M.A.
Community Judge
Monterey County Planning Commissioner and Policy Advisor to State Senator John Laird

Born and raised in Monterey County, Kate serves as a County Planning Commissioner and a Policy Advisor to State Senator John Laird on issues such as water supply, homelessness, and the Big Sur coastline. A leader from the start, Kate was Carmel High's Senior Class President and as an ecology-minded youth started the first environmental club at Carmel High School. After earning a Bachelor of Arts degree from Sarah Lawrence College and a Master of Arts degree from Columbia University, she spent time teaching in New York, Los Angeles and in Mexico before returning to Monterey County. Back at home, she ran an international news publication and taught Women's Studies at Monterey Peninsula College. As former Chief of Staff to Supervisor Mary Adams, Kate led efforts on wildfire prevention, clean energy, and infrastructure. In 2019, Kate was recruited to serve as Interim Executive Director of Gathering for Women, a nonprofit serving women experiencing homelessness in Monterey, and helped secure $1.3 million in State funding to open the Casa de Noche Buena overnight shelter, the Peninsula's first homeless shelter for single women and families with children. Kate lives in Carmel Valley with her husband Dan, their sons Daniel and Nicolas, and their dogs Sal and Poppi.

Zurine De Miguel, Ph.D.
Associate Professor
School of Humanities & Communication
California State University, Monterey Bay

Zurine De Miguel is a behavioral neuroscientist who is fascinated by the interaction between brain biology and behavior. Her academic journey includes earning an MS in Clinical Neuropsychology from the University of Barcelona in Spain and a PhD in Behavioral Neuroscience, through a collaborative program between the University of Basque Country and the University of Boulder Colorado. Dr. Miguel later secured a prestigious Marie Curie Fellowship from the European Commission (EU), which allowed her to continue her research at Stanford University, where she transitioned into a senior scientist. Alongside her research career, she enthusiastically shared her knowledge and expertise by serving as a lecturer at San Jose State University for seven years, where she taught various courses in behavioral neuroscience.

Cindy Juntunen, Ph.D.

Associate Provost and Dean of Graduate Studies
and Research
Office of Graduate Studies and Research
California State University, Monterey Bay

Cindy Juntunen is Associate Provost for Research and Dean of Graduate Studies at California State University, Monterey Bay. She was faculty in the Counseling Psychology PhD program at the University of North Dakota from 1994-2016, and then served as Dean of Education & Human Development at UND until August, 2023. Her research interests are in vocational psychology, ethics, and rural behavioral health. She served as PI on several federal mental health training grants, emphasizing interprofessional practice in rural communities. She also oversaw the SAMHSA-funded Mountain Plains Addiction Technology Transfer Center from 2021-2023.

Stefanie Kortman, M.S.

Senior Lab Technician
Department of Biology & Chemistry
California State University, Monterey Bay

Stefanie Kortman has been a proud member of the CSUMB community since 2008, and is an alumna from both the B.S. and M.S. Environmental Science programs, and a former UROC and McNair Scholar. She is a Senior Lab Technician in the Haffa Laboratory of Agricultural Biogeochemistry where she manages soil greenhouse gas research projects and mentors students. Her research has focused on quantifying and characterizing gas emissions from climate smart focused agricultural management practices in specialty crop systems that aim to reduce water, fertilizer, and pathogens while maintaining industry standards for crop production and quality. She is passionate about soil health, regenerative agriculture, and working with farmers to develop decision support tools and best management practices for growing food while protecting and conserving natural resources. Having started her own journey in research as an undergraduate student, Stefanie is an enthusiastic supporter of student research experiences and is honored to be a judge in this Fall Research Competition.

Meng-Hsien (Jenny) Lin, Ph.D.
Associate Professor
College of Business
California State University, Monterey Bay

Dr. Meng-Hsien (Jenny) Lin is an Associate Professor of Marketing and is also the MBA Academic Director at California State University, Monterey Bay. She received her PhD in Marketing from Iowa State University, along with her MBA and MS in Biomedical Science. She also holds a Doctor of Veterinary Medicine from Taiwan. Dr. Lin's research focuses consumer decision making and consumer well-being, cognitive and emotional processing of online advertising and the influence of social media with the focus of empowering young women and mothers. More recently, she is focusing on topics of consumer literacy and well-being in areas of sustainability, financial literacy and use of AI technologies. She has published in top journals in marketing and advertising, and is a two-time winner of the Journal of Advertising best paper awards in 2018 and 2020, among other research awards. Jenny was a US Fulbright Scholar to Taiwan in AY2022-2023.

PRESENTERS

The California Red-Legged Frog *R. draytonii* Habitat: Defining and Predicting their Current and Future Ranges

Connor Quiroz & John Olson, Ph.D.

Department of Applied Environmental Science, California State University, Monterey Bay

California Red-legged frogs (*Rana draytonii*) play important roles in maintaining the food web functions of freshwater ecosystems; however their habitat suitability has not been defined along the California Central Coast (CCC). Species distribution models (SDMs) produced with Maxent are effective tools for estimating habitat suitability across landscapes given presence-only data. I modeled present day *R. draytonii* species distribution models based on 2018 qPCR data collected along the CCC using sets of combined environmental and anthropogenic predictor variables. I then modeled future distributions (2040-2100) for *R. draytonii* using published environmental data derived from Global Climate Models using both the 4.5 and 8.5 Representative Concentration Pathways. I tested each SDM using an independent dataset derived from metabarcoding presence and absence data to assess variable importance, model strength, and overfitting using AUC and F-score values, as well as learning curves. The combined model displayed overfitting but had a high AUC value of 0.904 and an F-score of 0.73. The combined model had the best performance of AUC and F-score values when compared to the separate environmental and anthropogenic models. The future models predicted that the *R. draytonii*'s range will shift inland, but not northward. Using combined environmental and anthropogenic predictors may help maximize our F-score, allowing more accurate predictions of species shifts in the future. Future work will include using different training and testing sample size splits and with current qPCR presence/absence data to determine how well these splits perform when developing *R. draytonii* qPCR-based SDMs.

Fun Facts about Connor
Hometown: Sacramento, CA
Career Aspiration: Become a professor that advances the frontiers of ecological research while addressing learning barriers in quantitative sciences.
Fun Facts: I have completed two Half Iron Mans; I have been inside the White House; and I know the first 50 digits of pi!

HIF-1α Expression in Adult Gopher Rockfish (*Sebastes carnatus*) Under Upwelling and Ocean Acidification Stress in Central California

Matthias Milton[1], Dailyn Jones[1,2], Scott Hamilton, Ph.D.[2], & Cheryl Logan, Ph.D.[1]

[1]*Department of Marine Science, California State University, Monterey Bay*

[2]*Moss Landing Marine Laboratories, San Jose State University*

Seasonal upwelling exposes nearshore organisms to periodic acidic and hypoxic conditions. Climate change is expected to increase the frequency and severity of these events. Nearshore fish in upwelling systems may already be well adapted to cope with fluctuations in low dissolved oxygen (DO) and low pH, but climate change may push them beyond their environmental thresholds. In this study, we examined the expression of a biochemical indicator of hypoxia (hypoxia inducible factor 1 [HIF-1α]), under varying levels of upwelling stress in adult gopher rockfish, to establish if current and future predicted levels of upwelling induce hypoxia stress. HIF-1α upregulates cellular and physiological responses to cope with low DO conditions (e.g., erythropoiesis and anaerobic metabolism). We analyzed HIF-1α protein expression in gill tissue in adult rockfish exposed to ambient (pH ~7.8, DO ~8.0mg/L), moderate (pH 7.5, DO 4.5mg/L), high (pH 7.4, DO 3.5mg/L), and extreme (pH 7.3, DO 2.8mg/L) treatments. We expect to see a significant increase in HIF-1α in the extreme treatment to compensate for low DO and pH. Future work will examine intermediate levels of upwelling stress to determine the threshold level of combined low DO and pH. Tolerance thresholds can be used to improve predictions of environmental conditions that trigger hypoxia stress in nearshore rockfish. Given the energetic cost of mounting a stress response, this information may be useful for predicting the impact on growth, fitness, and population size of nearshore rockfish.

Fun Facts about Matthias
Hometown: Elk Grove, CA

Career Aspiration: To work as a fisheries research scientist for NOAA or Fish & Wildlife.

3 Fun Facts: I play goalkeeper for CSUMB Men's soccer team; I am an interfaith peer student chaplain at CSUMB; and I have collected over 100 nutcrackers.

Arithmetical Structures on Canoe Paddle Graphs

Oscar Murillo-Espinoza[1], Jim Brown, Ph.D.[2], Abigail DiNardo[3], Ailie Wood[4], and Antonio Vinagre[5]

[1]Department of Mathematics and Statistics, California State University, Monterey Bay

[2]Department of Mathematics, Occidental College

[3]Department of Mathematics and Statistics, Vassar College

[4]Department of Mathematics, Wellesley College

[5]Department of Mathematics, Temple University

Given a connected graph G with n vertices, an arithmetical structure on G is a pair of vectors $({\bf d}, {\bf r}) \in \mathbb{Z}_{>0}^{n} \times \mathbb{Z}_{>0}^n$ satisfying $(\textrm{diag}(d) - A)r = 0$, where A is the adjacency matrix of G. These arithmetical structures originally arose in the work of Lorenzini on degenerations of curves in algebraic geometry. In his work, Lorenzini proved there are finitely many arithmetical structures on any connected graph. This raises the natural question of counting how many arithmetical structures there are on a particular graph G. The number of arithmetical structures on paths, cycles, and trees have been counted in previous work. In our work, we investigate methods of obtaining and counting arithmetical structures on canoe paddle graphs, i.e., on graphs containing a cycle of n vertices connecting to the start of a path containing m vertices.

Fun Facts about Oscar
Hometown: Watsonville, CA
Career Aspiration: To become a math professor.
3 Fun Facts: I am President of the CSUMB Men's Soccer; I watch the animated Spider-Man series, my favorite; and I like to collect old math books because I like to learn the same information but from different perspectives.
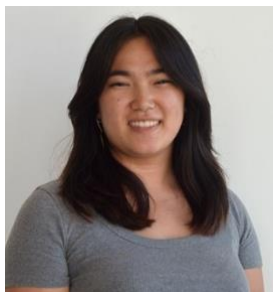
Water Chemistry Analysis of Runoff from a Watershed Treated with Different Brands and Concentrations of Fire Retardant

Lexi Yokomizo & John Olson, Ph.D.

Department of Applied Environmental Science, California State University, Monterey Bay

As wildfires increase in both intensity and frequency throughout California and the world, humans look for ways to mitigate impacts. One of those ways is spraying aerial fire retardant. While many different brands and concentrations are used in fighting wildfires, impacts on water chemistry and aquatic ecosystems are not known. By mimicking a watershed, water, and fire retardant can be applied to soil to provide a faux spraying and precipitation event. Collecting and analyzing water samples after being filtered through soil will allow different fire retardants to be chemically tested and quantified along with comparisons to other brands. With a more developed understanding of fire retardants, recommendations for wildfire management can be established to reduce negative impacts on aquatic ecosystems.

Fun Facts about Lexi
Hometown: Moraga, CA
Career Aspiration: To conduct novel research in freshwater science while focusing on environmental intersectionality and use research to inform policy nationally and internationally.
3 Fun Facts: I love to snowboard; I have over 20 types of teas in my apartment; and I love to dry and press plants.

Gods and Bases: U.S. Military Presence and Its Impacts on Japanese Spiritual Customs

Levi Mahler & Dustin Wright, Ph.D.

School of World Languages and Cultures, California State University, Monterey Bay

Japan continues to be affected by the impacts of World War II. There has been very little research into how spiritual customs have been impacted by this history. Some Japanese spiritual customs stretch back millennia. Our research analyzes how the occupation of Japanese spaces by the U.S. military has changed, informed upon, or impacted Japanese spiritual customs, specifically looking at Shintō and Buddhism religions. We interviewed various groups of Japanese, including locals of Tachikawa, a U.S. military and Japanese Self-Defense Forces base town, the Okinawa Prefectural Government's Base Affairs Division Office, and Japanese civilians. Interviews include asking questions regarding Shintō and Buddhist practices before base presence and after, how traditions have changed, and the appearance of other spiritual customs as a result of U.S. base presence. We also visited base town areas and museums, such as the Sakima Art Museum in Okinawa, to understand memories and feelings around the base presence. Our research shows how the U.S. military base presence in Japan continues to impact these spiritual customs..

Fun Facts about Levi
Hometown: Las Vegas, NV
Career Aspiration: International Affairs Lobbyist.
3 Fun Facts: I identify as a Polyglot; I helped pass a bill to my State Senate and Assembly when I was 15; and I compete in video game tournaments on a semi-professional level.

Food Preference of the Eelgrass Sea Hares

Marlenne Ortega[1], Albert Valencia[2], & Richelle L. Tanner, Ph.D.[2]

[1]*Department of Applied Environmental Science, California State University, Monterey Bay*

[2]*Schmid College of Science and Technology, Chapman University*

Eelgrass beds provide a safe nursery habitat for juvenile organisms, contribute to carbon sequestration, and protect coastlines from erosion. The eelgrass sea hares (Phyllaplysia taylori) living in this ecosystem help the eelgrass prosper by removing epiphytic material, which is composed of algae, diatoms, cyanobacteria, and decaying invertebrates. Epiphytes prevent direct sunlight from reaching eelgrass blades and compete with the eelgrass for nutrients, thus threatening the livelihood of the ecosystem. We have a limited understanding of how sea hares will continue to provide this ecosystem service as their physiology is impacted by climate change. In order to do this, we had created an Arduino circuit design to control the temperature in an aquarium setting. Then to better understand their physiology, we must mimic their food in the laboratory to conduct realistic climate resiliency experiments. We created fish food mixtures that stall disintegration and prevent it from floating, since sea hares typically graze directly from blades not in the water column. We investigated their preferred food through several feeding trials via food mixtures smeared on a 3x6 window screen that was inserted into each tank (n=40) for 3 hours. We determined the preferred food mixture by weighing the remaining food and sea hares before and after the trail. We found the sea hares preferred a brand called "vegetable shrimp pie"; the ingredients being ground shrimp meal, spirulina, and algae composition. Thus, their preferred laboratory food closely mimics their omnivorous natural diet. This work is a vital step towards creating a more robust aquarium simulation of climate change impacts on eelgrass sea hares.

Fun Facts about Marlenne
Hometown: Santa Ana, CA

Career Aspiration: Oversee restoration projects, conduct estuary research, and encourage voices from disadvantaged communities through community science.

3 Fun Facts: I have a pet snake and two chinchillas; I paid off a car in 1.5 years; and I am a CIF Div IV Water Polo Champion.

2023 Sustainability Literacy Assessment for California State University, Monterey Bay

Madison Moreno & Victoria Derr, Ph.D.

*Department of Applied Environmental Science,
California State University, Monterey Bay*

For more than 30 years, education for sustainability has been an explicit focus within higher education. The impacts of climate change and the increasing awareness of intersections between social and environmental justice have also prompted higher education institutions to value sustainable development goals to ensure an equitable future. The Association for the Advancement of Sustainability in Higher Education (AASHE) was established in 2005 as a means of sharing best practices for and documenting impacts of sustainability in higher education. Higher education institutions utilize sustainability literacy assessments to improve decision-making and self-report to the Sustainability Tracking, Assessment and Rating System (S.T.A.R.S.) developed by AASHE. This presentation summarizes CSUMB's third assessment, which aimed to capture CSUMB students' knowledge, attitudes, and behaviors about environmental concepts and issues in order to improve sustainability decision-making and programming on campus. Prior research has demonstrated that an individual's combined attitudes, knowledge of issues, and knowledge about actions comprise sustainability literacy. Sustainability literacy as a campus relies on individuals who are not only knowledgeable about issues but who also are aware of how and where they can take action. Those who demonstrate higher rates of sustainability literacy are more likely to participate and engage in behaviors that will benefit the community and the environment. This presentation identifies common trends of sustainability among CSUMB students based on the 2023 assessment.

Fun Facts about Madison
Hometown: San Diego, CA
Career Aspiration: I hope to get involved with community planning to help improve sustainability and equity for local challenges.
3 Fun Facts: I love to cook; I plan to go on to complete my master's degree; and I am an avid backpacker!

Uniendo Nuestras Voces: A Study of Collective Experiences of Oppression in Schools

Jissel Antonio[1] & Chrissy Hernandez, Ph.D.[2]

[1]*School of Humanities and Communication, California State University, Monterey Bay*

[2]*Service Learning Institute, California State University, Monterey Bay*

Using Gloria Anzaldúa's decolonial methodology of autohistoria or self-writing and practice of knowing others, this humanistic study explores the collective experience of six first generation college students, guided by the question: How do first generation Latinx students from the Central Coast of California make connections, if any, between their educational experiences and the post-colonial educational legacies of the American education system? Engaging with Anzaldúa's method of generating autohistoria-teoría or "Conectando experiencias personales con realidades sociales AND theorizing about this activity" (2), participants drew on their embodied experiences and built a collective autohistoria to theorize across their personal/historical legacies with experiences of oppressions and resistance within schools. Drawing on individual autohistorias, collective dialogue, collective storytelling, and participant surveys, I consider the emergent methodology of collective autohistoria as a means of exploring the relationships between historical legacies and collective embodied experiences of oppressions.

Fun Facts about Jissel
Hometown: Watsonville, CA
Career Aspiration: Become a university professor.
3 Fun Facts: I have been a Service Learner at the Service Learning Institute for three and a half years; I am a Youth and Family Specialist with the Community Action Board of Santa Cruz; and I have three Cockatiel birds: Luna, Panchito, and Xóchitl.

Trend Identification of X-ray Diffraction Peaks of Historic Bullet Casings from Fort Ord, CA

Sarina Regis, Katelyn Huie, & McKenzie Floyd, M.S.

Department of Biology and Chemistry, California State University, Monterey Bay

Studies have shown that the weathering of some remnant bullet casings have the ability to cause environmental and safety hazards due to their corrosive chemical compositions. Military ammunition manufactured prior or during World War II is known to contain hazardous metals such as lead and antimony. Fort Ord, a former military training base located in Monterey county, is currently undergoing mass urbanization and restoration efforts. Thousands of bullet casings have been left behind, all of which have undergone decades of weathering, potentially exposing Monterey residents and wildlife to these toxic metals. A sample of 1,228 bullet casings manufactured between the early 1940s and the early 1990s was collected from the former Fort Ord military training base. All casings were thoroughly cleaned and sorted in chronological order based on year of manufacture. A method for x-ray diffraction (XRD) analysis was developed and executed on 228 casings. Preliminary analysis on diffraction peak areas revealed potential trends in casings based on year of manufacture, manufacturer, and casing type. Future directions for this project include completing XRD analysis on remaining samples and using x-ray fluorescence to reveal more precise information on their chemical compositions. Along with increasing awareness of the hazards associated with the weathering of bullet casings, this study will provide the Monterey community with historical information about their home, and advance historic-forensic analysis of ammunition from the second half of the 20th century.

Fun Facts about Sarina
Hometown: Vallejo, CA
Career Aspiration: To be a forensic biologist.
Fun Facts: I played soccer my entire life and even played for a year at the NCAA DII level; I have traveled to Germany, my favorite country; and my favorite cartoon is Scooby-Doo**.**

Fun Facts about Katelyn
Hometown: Alamo, CA
Career Aspiration: To obtain a Doctor of Veterinary Medicine and become an Equine Veterinarian.
Fun Facts: I trained and competitively rode horses for 8 years prior to starting college; my favorite book is The Secret History by Donna Tartt; and my favorite animal is a cow!

A Fin-tastic Comprehensive Assessment and Classification of Mating Scars on Female Great White Sharks in the Northeastern Pacific

Alyssa Walter[1], Kaitlyn Yee[2], & Salvador Jorgensen, Ph.D.[1]

[1]*Department of Marine Science, California State University, Monterey Bay*

[2]*Environmental Studies Department, San Jose State University*

Great white sharks (*Carcharodon carcharias*) are one of the most studied shark species, yet their elusive mating behavior has long perplexed researchers. Valuable insights into white shark mating habits can be gained from courtship-induced mating scars, which have yet to be properly classified in published literature. This project aims to quantify and define white shark mating scars, and summarize what we know about where mating events are taking place.

Scar classifications were determined by an extensive literature review, reviewing shark encounter video data, and consulting with experts in the field. Video data has been continually collected since 2006 from Point Reyes, Ano Nuevo Island, the greater Farallon Islands, and Monterey Bay. Videos were analyzed by multiple students to score scar types, body locations, and the color of each scar. To overcome uncertainty in scar classification, we used Python and sql to create a database with consensus scar scores from multiple students. This determines scar causes, and increases accuracy of classifications by non-expert researchers.

Very low numbers of fresh 'mating grabs' were recorded in coastal California. This supports the hypothesis that white shark mating does not take place along the California coast. Additionally, white shark encounters were most frequent during peak elephant seal presence, providing an alternative explanation for coastal migration timing. Understanding these relationships can enhance our knowledge of white sharks, and contribute to the development of effective conservation and management strategies.

Fun Facts about Alyssa
Hometown: Davis, CA
Career Aspiration: Conduct research on the behavioral ecology of top predators and their influence on marine ecosystems, while integrating community science into my projects.
Fun Facts: I am on the otter dance team and represent CSUMB at national dance competitions; I can solve a Rubik's Cube in under 30 seconds; and I love exploring underwater as a scuba diver.

PROGRAM PARTNER RECOGNITIONS

Thank you to all the program partners and funding sources!

FUNDING SOURCES